US012392584B2

(12) **United States Patent**
Dabrowka

(10) **Patent No.: US 12,392,584 B2**
(45) **Date of Patent: Aug. 19, 2025**

(54) **HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER**

(71) Applicant: **Jakub Dabrowka**, Irvine, CA (US)

(72) Inventor: **Jakub Dabrowka**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 15 days.

(21) Appl. No.: **18/590,919**

(22) Filed: **Feb. 28, 2024**

(65) **Prior Publication Data**

US 2024/0337468 A1 Oct. 10, 2024

Related U.S. Application Data

(60) Provisional application No. 63/458,434, filed on Apr. 10, 2023.

(51) **Int. Cl.**
A41D 13/005 (2006.01)
F41H 1/02 (2006.01)

(52) **U.S. Cl.**
CPC ***F41H 1/02*** (2013.01)

(58) **Field of Classification Search**
CPC F41H 1/02; A41D 13/0053
See application file for complete search history.

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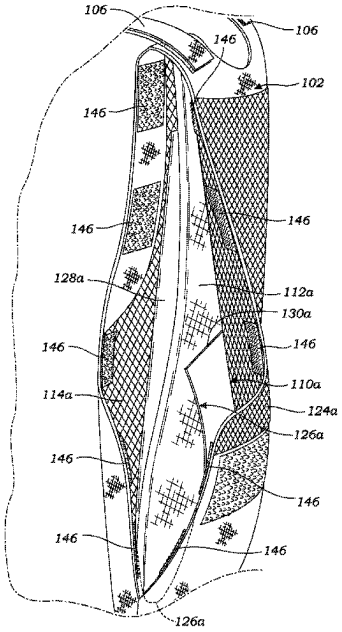
Primary Examiner — Robert H Muromoto, Jr.
(74) *Attorney, Agent, or Firm* — Vista IP Law Group LLP

(57) **ABSTRACT**

A ballistic armor carrier having a heat dispersion system for migrating heat away from between the ballistic carrier and a wearer's body. The ballistic carrier includes a carrier having a pocket for holding a ballistic panel and a thermal panel having a high thermal conductivity disposed within the pocket. The thermal panel wraps around the pocket such that the thermal panel has a first thermal panel portion configured to be positioned to the inside of the ballistic panel and a second thermal panel portion configured to be positioned to the outside of the ballistic panel. The thermal panel migrates heat away from the wearer's body from between carrier and the body to the outside of the carrier and dissipates the heat to the ambient environment.

20 Claims, 7 Drawing Sheets



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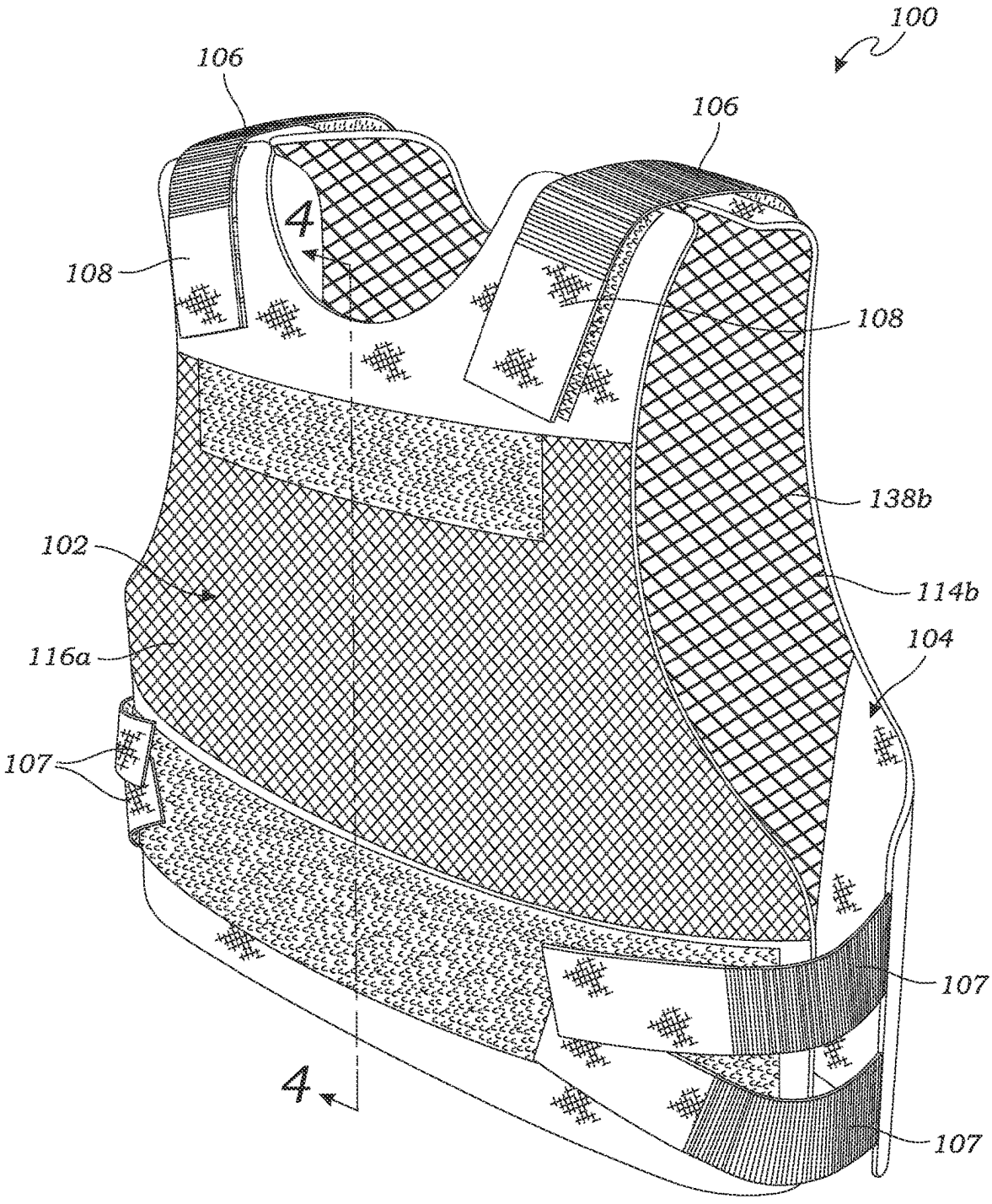

FIG. 1

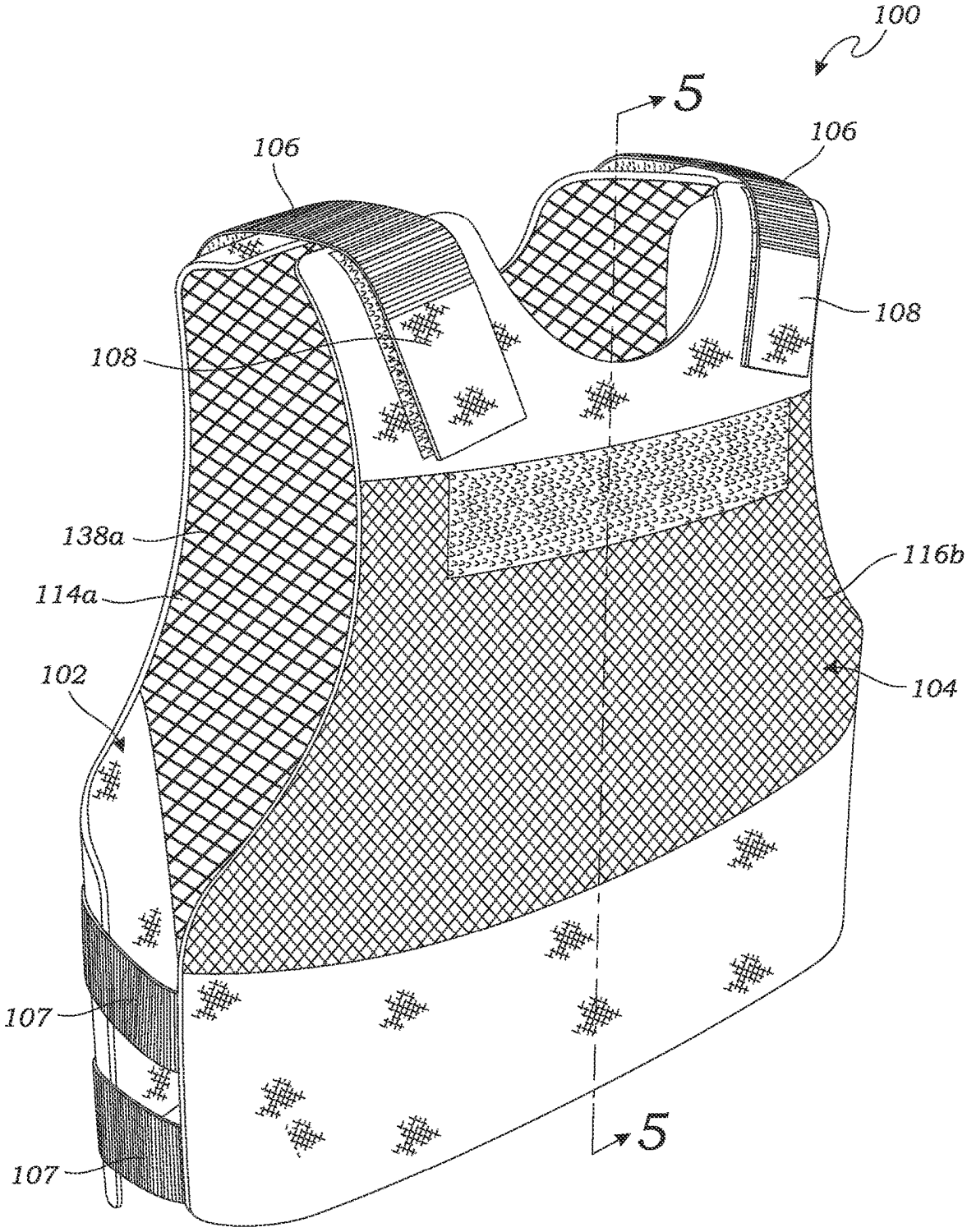

FIG. 2

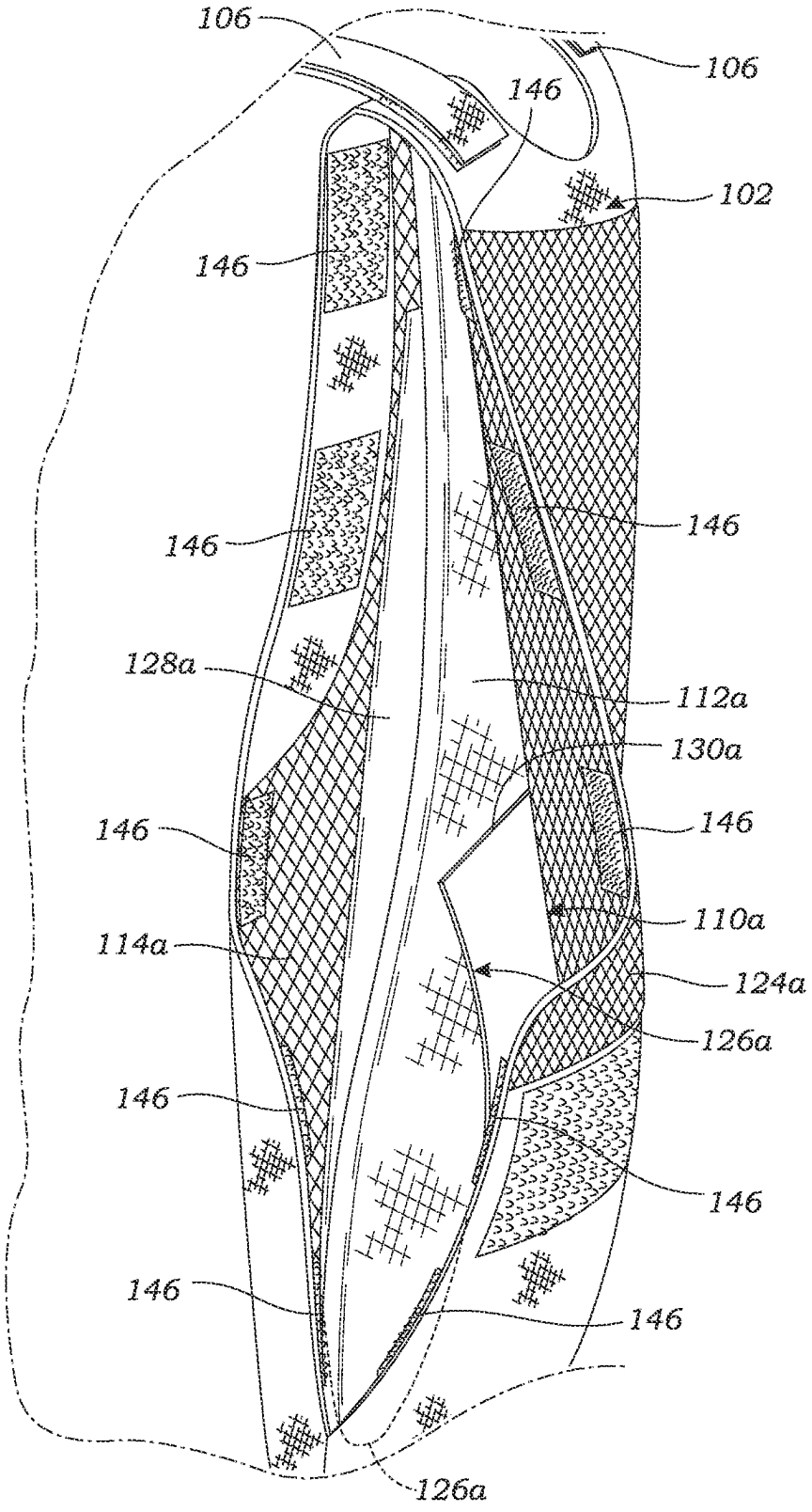
106
106
146
102
146
146
146
128a
112a
130a
146
146
110a
114a
124a
126a
146
146
146
146
126a

FIG. 3

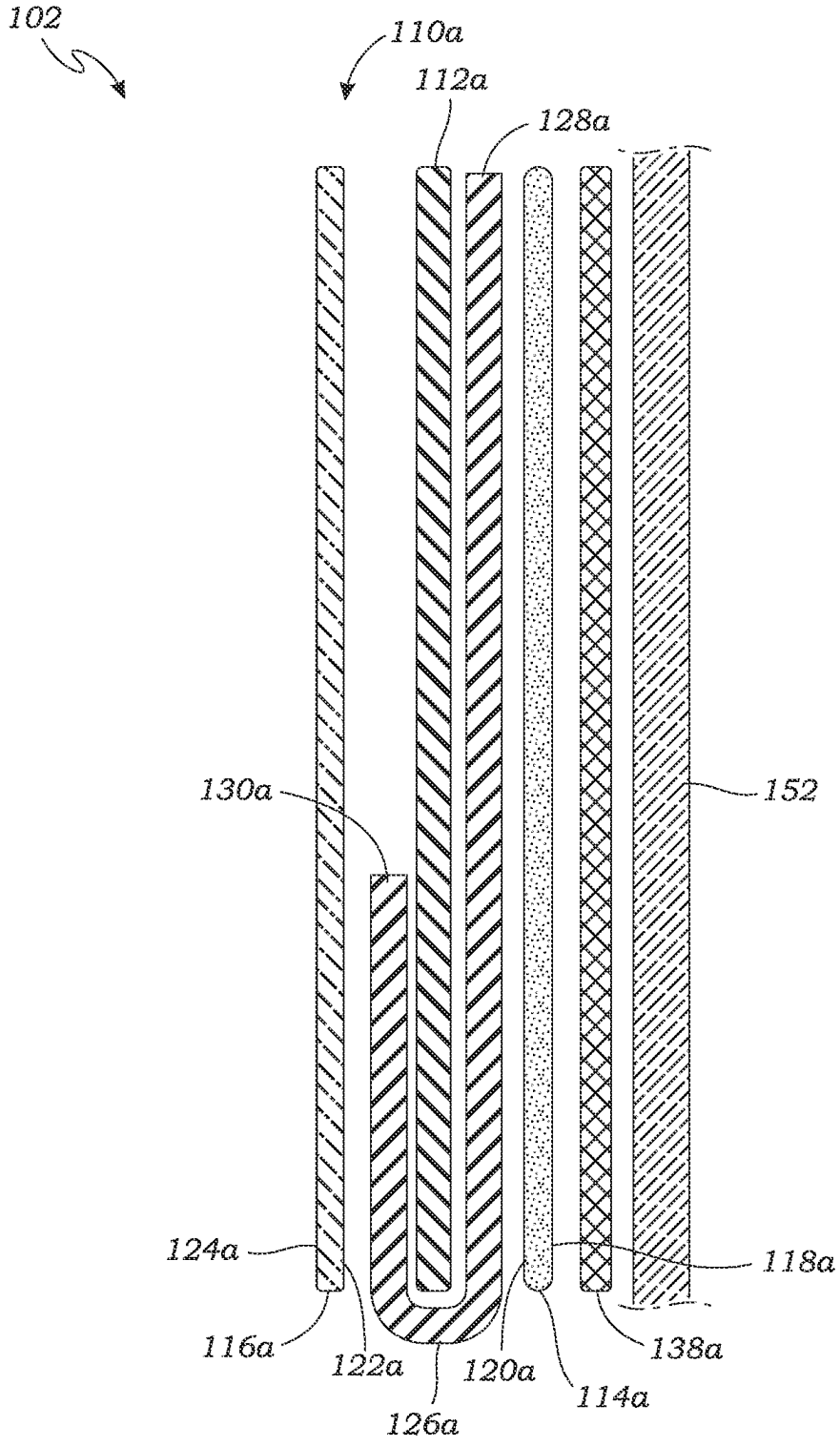
102
110a
112a
128a
130a
152
124a
118a
116a
122a
120a
114a
138a
126a

FIG. 4

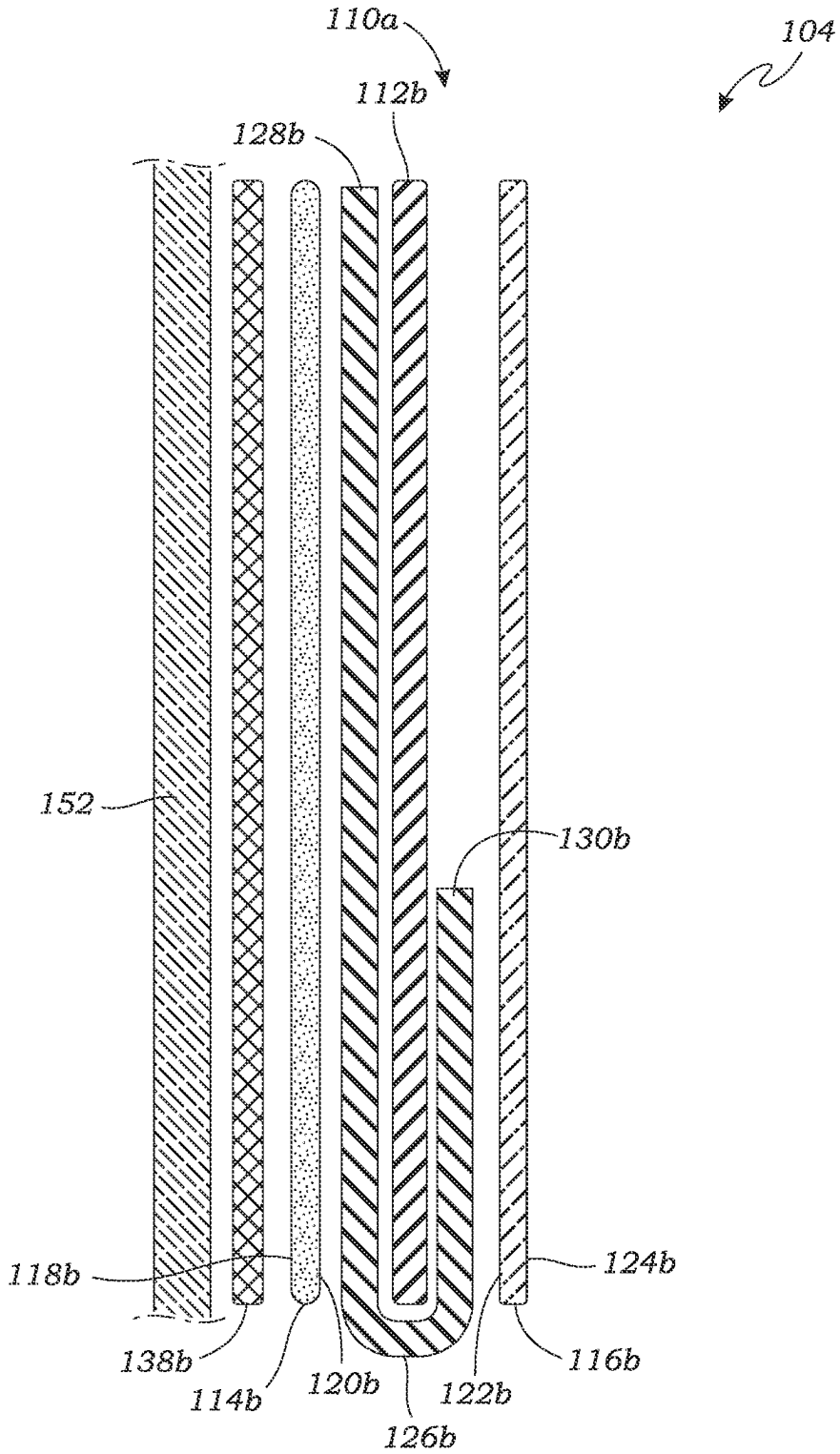
110a
104
112b
128b
152
130b
118b
124b
138b
114b
120b
122b
116b
126b

FIG. 5

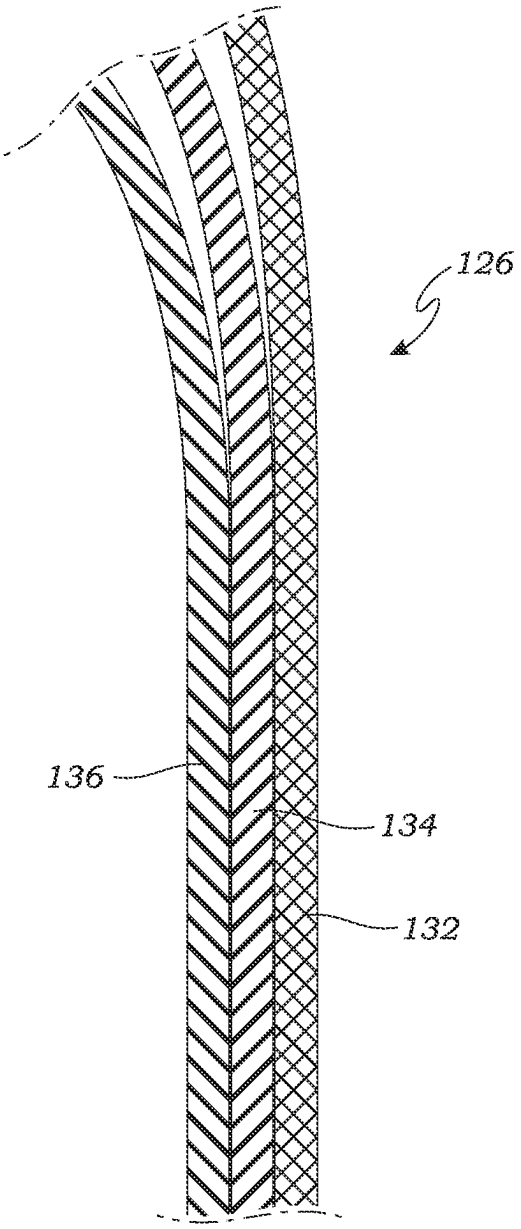

FIG. 6

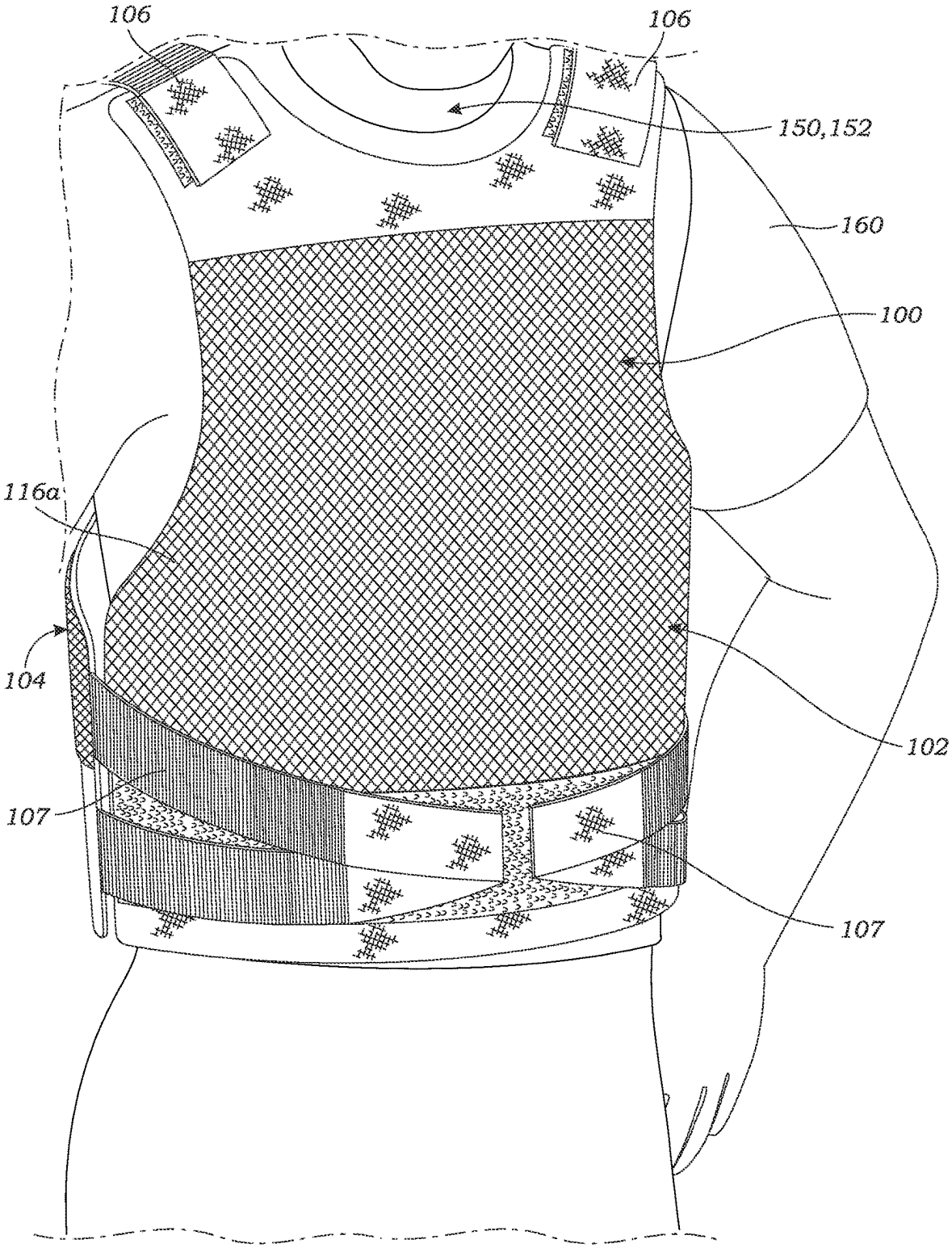

FIG. 7

HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER

RELATED APPLICATIONS

The present application claims the benefit of priority of U.S. provisional patent application No. 63/458,434, filed Apr. 10, 2023, which is incorporated by reference herein in its entirety.

BACKGROUND

The field of the present disclosure relates generally to body armor and ballistic carriers, and more specifically to a heat dispersion system for use with ballistic carriers for carrying ballistic panels and/or plates and ballistic carriers having the heat dispersion system integrated therein.

Ballistic carriers are tactical protective garments designed to carry ballistic panels such that the ballistic carrier and panels protect a wearer from bodily injury from attacks and other hazards. One of the most common ballistic carriers is a vest, commonly referred to as a "bullet proof vest." The ballistic carriers typically have pockets for inserting body armor to protect the wearer from ballistics, such as bullets and explosive fragments. There are two main types of body armor: hard-plate body armor (often referred to as "armored plates") which can protect a wearer from very high energy ballistics such as rifle rounds; and soft (non-plated) body armor (often referred to as "armored panels") which can protect a wearer from handgun rounds and small explosive fragments.

In view of their functions as protective gear and to ensure durability, ballistic carriers are made of heavy duty, strong materials capable of supporting the body armor and surviving harsh conditions and rigorous duty cycles. As a result, the weight, profile and materials used of ballistic carriers and body armor carried therein, these tactical garments are high thermal insulators which trap body heat. Combined with the environments and physical activity often associated with their use, the person wearing such tactical armor often experiences excess heat, sweat, and associated discomfort, or even heat exhaustion and dehydration.

Some devices for alleviating the heat and perspiration caused by wearing ballistic carriers have been previously disclosed. For example, air circulation devices that blow a pressurized volume of air using electric fans through the ballistic carrier have been described. However, such devices are bulky and inefficient, and require a source of electric power. Passive garments worn under the ballistic carrier have also been disclosed, but such garments are relatively ineffective, and provide at most a small amount of relief from perspiration via wicking wetness from the wearer's skin and no cooling effect. Accordingly, there is a need for an improved design for providing cooling effects for tactical garments such as ballistic carriers like bullet proof vests and other tactical and protective garments.

SUMMARY OF THE DISCLOSURE

Disclosed herein is a ballistic carrier for carrying ballistic armor and having a heat dispersion system which utilizes an innovative multi-layer thermal panel having a high thermal conductivity to transfer heat away from between the ballistic carrier and the wearer's body to the exterior side of the ballistic armor. The ballistic carrier may be worn and used with, or without, ballistic panels inserted into the carrier.

Accordingly, in one disclosed embodiment, a ballistic carrier comprises a carrier configured to be worn on a body of a person or other animal, such as a dog, horse, especially animals used in law enforcement and. The carrier has a first body panel for covering a part of a wearer's body. As used herein, the term "wearer" refers to any animal, such as a person, or other animal such as a dog, horse, etc. For example, the first body panel may be a front portion configured to cover a front of the wearer, such as the front portion of a ballistic vest. The first body panel has an inner panel configured to rest against the body and an outer panel opposing the inner panel and being external to the inner panel. The inner panel and outer panel are configured to form a pocket or housing for holding a ballistic panel. For example, the ballistic panel may be body armor such as an armored plate or armored panel. The inner panel has an inside surface which faces the body of the wearer and an outside surface which faces away from the body and forms an inner side of the pocket. The outer panel has an outside surface which faces away from the body, and an inside surface which faces toward the body and forms an outer side of the pocket opposing the inner side of the pocket. The pocket has an opening for inserting the ballistic panel and a closure for closing the opening. For instance, the closure may be a length of mating hook and loop fasteners, snaps, buttons, or the like. In another aspect, the opening is on a lateral side of the ballistic carrier (i.e., not on the bottom or top of the carrier) such that a ballistic panel is inserted into the pocket from the side.

A thermal panel is attached to the first body panel within the pocket. The thermal panel comprises a first layer of heat absorbing textile comprising phase change molecules (PCMs), and a second layer applied to, and covering, the first layer. The second layer comprises a heat transfer film comprising oriented graphite with a high thermal conductivity. The thermal panel has a first thermal panel portion attached to the outside surface of the inner panel with the heat absorbing textile side of the thermal panel against the outside surface of the inner panel. The first thermal panel portion is positioned such that it is on an inside of a ballistic panel inserted into the pocket. The first thermal panel portion covers a substantial part of the outside surface of the inner panel. As used herein, the term "substantial part" means at least 75% or more.

The thermal panel also bends around proximate to an edge of the pocket and has a second thermal panel portion which extends along a portion of the inside surface of the outer panel such that the second thermal panel portion is on an outside of a ballistic panel inserted into the pocket. In one aspect, the second thermal panel portion extends along at least 10%, or at least 20%, or at least 25%, or at least 30%, or at least 40%, or at least 50% of the full length of the pocket or of the inside surface of the outer panel, or of the full length of a ballistic panel to be inserted into the pocket. In this way, the thermal panel absorbs heat expelled by the body, dissipates the heat, and transports the heat from the first thermal panel portion close to the body to the second thermal panel portion positioned proximate the outer panel of the pocket, i.e., on an outside of a ballistic panel inserted into the pocket.

Accordingly, the ballistic carrier, when worn on a body, provides a cooling effect and relief from building up body heat within the carrier by transferring heat away from the interior of the ballistic carrier and dissipating the heat on the outside on the outside of the carrier and into the ambient environment.

In another aspect, the thermal panel may further include a backing layer applied to, and covering, the other side of the heat transfer film opposite the heat absorbing textile. The backing layer may comprise a fabric which provides a good surface for bonding the thermal panel to other materials.

In still another aspect, the inner panel may comprise a mesh fabric. In yet another aspect, the inner panel may further comprise a heat spreading layer disposed on an inside surface of the mesh fabric facing the body side of the carrier. The heat spreading layer comprises a fabric having a mesh of PCMs applied onto the fabric to absorb heat from expelled from the body and spread the heat over the area of the fabric. The heat dissipated over the heat spreading layer then migrates to the thermal panel, and is transported through the thermal panel as described above. Alternatively, the inner panel may comprise the heat spreading layer without a mesh fabric.

In yet another aspect, the outer panel may comprise a mesh fabric. The mesh fabric may be the same or similar to the mesh fabric of the inner panel. For example, the mesh fabric forming the outer panel may form at least a portion of the outer-most surface of the ballistic carrier. In yet another aspect, the outer panel may further comprise a heat spreading layer disposed on an inside surface of the mesh fabric facing the body side of the carrier. The heat spreading layer may be the same or similar material as the heat spreading layer on the inner panel. In other aspects, additional materials, layers and/or devices may be attached to an outer surface of the mesh fabric outer panel, such as hook and/or loop fasteners, "PALS" or "MOLLE" carrying systems, straps, etc.

In another aspect, the ballistic carrier is a torso worn garment, such as a vest, jacket, or the like, and the first body panel is a front portion of the garment configured to cover the front torso of the wearer. In yet another aspect, the ballistic carrier further comprises a second body panel which is a back portion of the garment configured to cover the back torso of the wearer. The second body panel is attached to the first body panel by a pair of shoulder straps. The carrier may also have side straps for attaching a lower portion of the first body panel to a lower portion of the second body panel. The side straps may be detachably fastenable using hook and loop fasteners, snaps, buttons, etc.

In still another aspect, the second body panel may also be configured to carry a back ballistic panel and also to have the heat dispersion system like the first body panel. The heat dispersion system for the second body panel may be the same or different from the first body panel, and may include any one or more of the aspects and features of the heat dispersion system described herein.

The opening for inserting the front ballistic panel may be on the side of the first body panel ballistic carrier and is oriented vertically with the opening. Similarly, the opening for inserting the back ballistic panel is on the side of the first body panel ballistic carrier and is oriented vertically with the opening. In another aspect, the opening for inserting the front ballistic panel may be on the bottom side of the first body panel ballistic carrier such that the panel is inserted by sliding the panel upward into the respective pocket of the carrier. Similarly, the opening for inserting the back ballistic panel may be on the bottom side of the first body panel ballistic carrier such that the panel is inserted by sliding the panel upward into the respective pocket of the carrier.

In still another aspect, the ballistic carrier may include a front ballistic panel inserted into the pocket of the first body panel, and/or a back ballistic panel inserted into the second body panel, if one. The ballistic panel(s) may be any suitable ballistic panel, such as an armored plate, an armored panel, or the like.

In still another aspect, the ballistic carrier may further include an undergarment configured to be worn by a wearer such that an outer surface of the undergarment contacts the interior section of the first body panel and/or the interior section of the second body panel. The undergarment may comprise phase change material molecules to absorb and spread body heat. For example, the undergarment may function as the heat spreading layer described above. In such case, the outer surface of the undergarment contacts the inside surface of the interior section, which may be an interior mesh layer of the carrier.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings illustrate the design and utility of various aspects of the disclosure, in which similar elements are referred to by common reference numerals. These drawings are not necessarily drawn to scale. In order to better appreciate how the above-recited and other advantages and objects are obtained, a more particular description of the disclosure will be rendered, which is illustrated in the accompanying drawings. These drawings depict only exemplary aspects of the disclosure for purposes of illustration and facilitating the below detailed description, and are not therefore to be considered limiting of its scope.

FIG. **1** is a front perspective view of a carrier in accordance with one example disclosed herein.

FIG. **2** is a rear perspective view of the carrier of FIG. **1**.

FIG. **3** is a side perspective view of the carrier of FIG. **1** with the side opening opened to view the internal components of the carrier.

FIG. **4** is schematic cross-sectional view of the front panel of the carrier along line **4-4** of FIG. **1**.

FIG. **5** is schematic cross-sectional view of the back panel of the carrier along line **5-5** of FIG. **1**.

FIG. **6** is a schematic cross-sectional view of the thermal panel shown in FIGS. **4** and **5**.

FIG. **7** is a front perspective view a person wearing the carrier of FIG. **1**.

DETAILED DESCRIPTION OF THE DISCLOSURE

This specification describes exemplary embodiments, aspects and applications of the disclosure. The disclosure, however, is not limited to these exemplary embodiments, aspects and applications or to the manner in which the exemplary embodiments, aspects and applications operate or are described herein. Further, the figures may show simplified or partial views, and the dimensions of elements in the figures may be exaggerated or otherwise not in proportion. Moreover, elements of similar structures or functions are represented by like reference numerals throughout the figures. In addition, an illustrated aspect need not have all the features or advantages shown. A feature or an advantage described in conjunction with a particular aspect is not necessarily limited to that aspect, and can be practiced in any other aspect even if not so illustrated.

The present specification is directed to a ballistic carrier for carrying ballistic armor having a heat dispersion system. The heat dispersion system includes multi-layer thermal panel having a high thermal conductivity to conduct heat away from between the ballistic carrier and the wearer's body to the exterior side of the ballistic armor and away

from the wearer into the ambient environment. Accordingly, the ballistic carrier delivers a cooling effect, preventing the build-up of body heat and sweat. It achieves this result by transferring heat away from between the wearer's body and the ballistic carrier and transmitting the heat to the outside, effectively releasing the heat into the surrounding environment.

Referring now to FIGS. **1-7**, one example of a ballistic carrier system **100** (also referred to as a ballistic carrier **100**) for carrying ballistic armor and having a heat dispersion system for migrating heat away from a person **150** (i.e., the wearer) wearing the carrier **100** is illustrated. Although the drawings and the related description are directed to a ballistic carrier for a person, it is understood that present invention is not limited to ballistic carriers for a person but also include ballistic carriers for other animals such as a dog, horse, etc. As shown in FIGS. **1**, **2** and **5**, the example ballistic carrier **100** is in the form of a tactical armored vest (commonly referred to as a bullet-proof vest) having a front body panel **102** (also referred to as a "first body panel **102**") and a back body panel **104** (also referred to as a "second body panel **104**"). Although the example ballistic carrier **100** disclosed herein is an armored vest, it is understood that the ballistic carrier **100** may be any suitable garment or portion of a garment configured to be worn on a part of the body of a person to protect such part of the body. For example, the ballistic carrier may be a tactical jacket, a tactical shirt, tactical pants, a tactical belt, a tactical skirt, etc. For other animals, the ballistic carrier may be a K-9 vest for a dog, or an equine vest for a horse, etc.

As illustrated in FIG. **5**, the ballistic carrier **100** is configured to be worn as a vest over the torso **154** of the body **152** of the person **150**. The front body panel **102** is configured to cover the front torso of the person **150**, and the back body panel **104** is configured to cover the back torso of the person **150**. The front body panel **102** and back body panel **104** are releasably attached at the top of the respective panels **102**, **104** by a pair of shoulder straps **106**. The straps **106** may be releasably attached using respective fasteners **108**, such as hook and loop fasteners, snaps, buttons, or the like. Alternatively, one side of the straps **106** may be permanently attached to one of the front body panel **102** or back body panel **104**, such as sewn, bonded, etc., while the other side of the straps **106** is releasably attached to the other of the front body panel **102** or back body panel **104**. The carrier **100** also has side straps **107** for attaching a lower portion of the front body panel **102** to a lower portion of the back body panel **104**. The side straps **107** may be detachably fastenable using hook and loop fasteners, snaps, buttons, etc.

The front body panel comprises an inner panel **114***a* and an outer panel **116***a* which are attached to each other around their respective periphery edges such that a pocket **110***a* for holding a front ballistic panel **112***a* is formed between the inner panel **114***a* and the outer panel **116***a*, as best shown in FIGS. **3** and **4**. The back body panel **104** has a similar pocket **110***b* for holding a back ballistic panel **112***b*, the pocket **110***a* is formed between an inner panel **114***a* and an outer panel **116***a*. The inner panel **114***a* and outer panel **116***a* may be formed of a mesh fabric or other suitable textile. The inner panel **114***a* has an inside surface **118***a* which faces the body **152** (more specifically, the front of the body **152**) and an outside surface **120***a* which faces away from the body **152** and forms the inner side of the pocket **110***a*. The outer panel **116***a* has an inside surface **122***a* which faces toward the body of the person **150** and an outside surface **124***a* which faces away from the body **152**.

The pocket **110***a* has an opening **144***a* for inserting the front ballistic panel **112***a* into the pocket **110***a*. The opening **144***a* is on the side edge of the front body panel **102** and is oriented vertically along the edge of the front body panel (the opening **144***a* can be on either side of the front body panel **102**). The opening **144***a* is formed by a portion of the opposing side edges of the inner panel **114***a* and the outer panel **116***a* which are detachably fastened together by a closure **146***a*. The closure **146***a* comprises mating hook and loop fasteners extending along a length of the side edges of the inner panel **114** and outer panel **116***a*. The closure **146***a* may comprise any other suitable fasteners such as buttons, snaps, ties, clips, or the like.

A thermal panel **126***a* is attached to the first body panel **102** within the pocket **110***a* adjacent to, and on the outside of, the inner panel **114***a*. As one example, the thermal panel **126***a* may be attached to the inner panel **114***a* such as by being sewn, bonded, or otherwise suitably attached. The thermal panel **126***a* has a first thermal panel portion **128***a* which extends from proximate the top of the pocket **110***a* and inner panel **114***a*, downward to proximate the bottom edge of the pocket **110***a* and inner panel **114***a*, such that the first thermal panel portion **128***a* is configured to be positioned on the inside of the ballistic panel **112***a*. The first thermal panel portion **128***a* covers a substantial part (i.e., at least 75% or more) of the outside surface **120***a* of the inner panel **114***a*. Alternatively, the first thermal panel portion **128***a* may cover at least 70% or more, or 65% or more, or 55% or more of the outside surface **120***a* of the inner panel **114***a*.

The thermal panel **126***a* then bends around the bottom of the pocket **110***a* to towards the front of the pocket **110***a*, and then a second thermal panel portion **130***a* of the thermal panel **126***a*, extends upward along the inside surface **112***a* of the outer panel **116***a* such that the second thermal panel portion **130***a* is configured to be positioned on the outside of the ballistic panel **112***a*. There is a space between the first thermal panel portion **128***a* and the second thermal panel portion **130***a* for inserting the ballistic panel **112***a*. The second thermal panel portion **130***a* extends along a length of the inside surface **112***a* of the outer panel **116** and a length of the ballistic panel **126***a*. For example, the second thermal panel portion **130***a* extends along at least 10%, or at least 20%, or at least 25%, or at least 30%, or at least 40%, or at least 50%: of the full length of the inside surface **122***a* of the outer panel **116***a*; or of the full length of the pocket **110***a*; or of the full length of the ballistic panel **112***a*. The second thermal panel portion **130***a* expels heat absorbed by the first thermal panel portion **128***a* and conducted by and along the thermal panel to the second thermal panel portion **130***a*. In other words, the first thermal panel portion **128***a* absorbs heat expelled by the body, dissipates the heat, and conducts the heat from the first thermal panel portion **128***a* close to the body and to the inside of the ballistic panel **112***a* to the second thermal panel portion **130***a* adjacent the outer panel **116***a* and to the outside of the ballistic panel **112***a*. As a result, the thermal panel **126***a* effectively transfers body heat around the high thermal insulating ballistic panel **112***a* and expels the heat into the ambient environment. The transfer of body heat by the thermal panel **126***a* provides a cooling effect to the body **152** and prevents body heat from building up within the carrier **100** by conducting heat away for the interior of the ballistic carrier proximate the body, dissipating the heat to the outside of the carrier **100** and into surrounding air. The second thermal panel portion **130***a* may be unattached or loose such that the thermal panel **126***a* can be wrapped around the bottom end of the front ballistic panel

112*a*. Alternatively, the second thermal panel portion **130***a* can be attached to the outer panel **116***a* by being sewn, bonded, or otherwise suitably attached.

Referring to FIG. **6**, the thermal panel **126***a* is a multi-layer panel having a high thermal conductivity for efficiently transferring heat. The thermal panel **126***a* includes a first layer **132** of heat absorbing textile (HAT) comprising phase change molecules (PCMs) (e.g., microencapsulated phase change materials (mPCMs)). The heat absorbing textile is configured to efficiently absorb heat energy at about 28° C. (82° F.) and dissipate and spread the heat over the area of the heat absorbing textile. The thermal panel also has a second layer **134** applied to, and covering the first layer **132**. The second layer comprises a heat transfer film (HTF) comprising highly oriented graphite configured to efficiently and directionally conduct heat energy. The thermal panel **126***a* may also have a third layer **136** (also referred to as a "backing layer **136**") comprising a backing fabric applied to, and covering, the other side of the second layer **134** opposite the first layer **132**. The backing layer **136** is configured to protect the second layer **134** comprising the heat transfer film and to provide a suitable surface for bonding the thermal panel **126***a* to other materials, such as the inner panel **114***a*. As one non-limiting example, the thermal panel **126** may comprise ECLIPSYS™ thermal sheet material available from Alexium Inc., Greer, South Carolina.

Turning back to FIG. **4**, the inner panel **114***a* may further comprise an inner heat spreading layer **138***a* disposed on the inside surface **118***a* of the inner panel **114***a* (e.g., on the inside surface of the mesh fabric forming part of the inner panel **114**). The inner heat spreading layer **138***a* comprises a fabric **140** having a mesh **142** of PCMs applied onto the fabric **140** to absorb heat expelled from the body **152** and distribute the heat over the area heat spreading layer **138***a*. The inner heat spreading layer **138***a* may also comprise aluminum, or other material having high thermal conductivity, embedded in the mesh **142** or otherwise distributed over the inner heat spreading layer **138***a*. For example, inner heat spreading layer **138***a* may comprise the XELERATE™ material available from OUTLAST® GmbH in Germany which is a fabric having a mesh of PCMs and aluminum. The inner heat spreading layer **138***a* is attached to the mesh fabric or other textile forming the inner panel **114***a* by being sewn, bonded or otherwise fastened to the inner layer **138***a*.

Referring now to FIG. **5**, the back body panel **104** is very similar in construction to the front body panel **102**, and includes all of the same components and features of the front body panel **102** and arranged in the same manner, including an inner panel **114***b*, an outer panel **116***b*, a pocket **110***b*, an opening **144***b*, a closure **146***b*, a thermal panel **126***b*, a first thermal panel portion **128***b*, a second thermal panel portion **130***b*, and an inner heat spreading layer **138***b*, etc. Accordingly, all of the description regarding the front body panel **102** and its components applies to the description of the back body panel **104**.

As illustrated in FIG. **7**, the ballistic carrier system **100** may further comprise an undergarment **160** configured to be worn by the person **150** such that the outer surface of the undergarment contacts the inner panels **114***a*, **114***b* of the front body panel **102** and back body panel **104**, respectively. The undergarment **160** may be shirt, for example a T-shirt, or other undergarment worn on the part of the body for which the ballistic carrier **100** is designed to be worn. The undergarment **160** may comprise PCMs same or similar to the inner heat spreading layers **138***a*, **138***b*, to absorb and dissipate the heat generated by the body **152**.

The use and functionality of the ballistic carrier system **100** will now be described. Typically, the front and back ballistic panels **112***a*, **112***b* are first inserted into the front body panel **102** and rear body panel **104**, respectively. For example, the front ballistic panel **112***a* is inserted into the pocket **110***a* through the opening **144***a* by unfastening the closure **146***a*, and sliding the front ballistic panel **112***a* into the pocket **110***a* such ballistic panel **112***a* is between the first and second thermal panel portions **128***a*, **130***a*, with the first thermal panel portion **128***a* directly to the inside of the front ballistic panel **112***a* and the second thermal panel portion **130***a* is directly to the outside of the front ballistic panel **112***a*. The closure **146***a* is then fastened to close the opening **144***a*. Similarly, the back ballistic panel **112***b* is inserted into the pocket **110***b* through the opening **144***b* by unfastening the closure **146***b*, and sliding the back ballistic panel **112***b* into the pocket **110***b* such that back ballistic panel **112***b* is between the first and second thermal panel portions **128***b*, **130***b*, with the first thermal panel portion **128***b* directly to the inside of the back ballistic panel **112***b* and the second thermal panel portion **130***b* is directly to the outside of the back ballistic panel **112***b*. The ballistic carrier **100** is now ready to be donned by the person **150**.

The person **150** may first put on the undergarment **160** to provide additional thermal dissipation. Then, with the shoulder straps **106** attached to both the front body panel **102** and the back body panel **104**, and the side straps **107** unfastened, the carrier **100** is put on over the person's head with such that the shoulder straps **106** are positioned on the shoulders of the person's body **152** with the front body panel **102** resting on and covering the front torso and the back body panel **102** resting on and covering the back torso. The side straps **107** are then fastened.

The heat dispersion system functions to absorb and transfer body heat away from the body **152**. Heat expelled by the body is first absorbed and spread over the area by the undergarment **160**, if worn by the person **150**. For the front body panel **102**, The heat is then absorbed by the inner heat spreading layer **138***a* and dispersed over the area of the inner heat spreading layer **138**. The heat then migrates outward and is absorbed by the first thermal panel portion **128***a* of the thermal panel **126***a*. The thermal panel **126***a* disperses the heat in the thermal panel **126***a* and transfers the heat along the length of the thermal panel, around the front ballistic panel **112***a* to the second thermal penal portion **130***a* in front of the front ballistic panel **112***a*. The heat then transfers from the second thermal panel portion through the outer panel **116***a* (which may be a mesh fabric) and into the air in the surrounding environment. The dissipation of body heat by the back body panel **104** is the same. Accordingly, the ballistic carrier **100** provides a cooling effect and relief from building up body heat within the carrier **100** by transferring heat away from the interior of the ballistic carrier **100** and dissipating the heat on the outside on the outside of the carrier **100** and into the ambient environment.

Although particular embodiments have been shown and described, it is to be understood that the above description is not intended to limit the scope of these embodiments. While embodiments and variations of the many aspects of the invention have been disclosed and described herein, such disclosure is provided for purposes of explanation and illustration only. Thus, various changes and modifications may be made without departing from the scope of the claims. For example, not all of the components described in the embodiments are necessary, and the invention may include any suitable combinations of the described components, and the general shapes and relative sizes of the

components of the invention may be modified. Accordingly, embodiments are intended to exemplify alternatives, modifications, and equivalents that may fall within the scope of the claims. The invention, therefore, should not be limited, except to the following claims, and their equivalents.

What is claimed is:

1. A ballistic carrier having a heat dispersion system, the ballistic carrier comprising:

a carrier configured to be worn on a body of a wearer, the carrier having a first body panel for covering a part of the body, the first body panel comprising:

an inner panel configured to lie against the body and an outer panel external and opposing the inner panel, the outer panel attached to the inner panel thereby forming a pocket between the inner panel and the outer panel for holding a ballistic panel, the inner panel having an inside surface facing the body and an outside surface facing away from the body, the outer panel having an inside surface facing the body and an outside surface facing away from the body;

a thermal panel attached to the first body panel within the pocket, the thermal panel having a first thermal panel portion attached to, and covering, at least a part of the outside surface of the inner panel and positioned such that it is to an inside of a ballistic panel when inserted into the pocket, the thermal panel bending around proximate an edge of the pocket to a second thermal panel portion, the second thermal panel portion extending along a portion of the inside surface of the outer panel such that the second thermal panel portion is to an outside of a ballistic panel when inserted into the pocket; and

wherein the thermal panel is a multi-layer material having a high thermal conductivity.

2. The ballistic carrier of claim **1**, wherein the thermal panel comprises a first layer of heat absorbing textile comprising phase change molecules (PCMs), and a second layer applied to, and covering, a first side of the first layer, the second layer comprising a heat transfer film comprising oriented graphite.

3. The ballistic carrier of claim **2**, wherein the thermal panel further comprises a backing layer applied to, and covering, a second side of the heat transfer film opposite the first side.

4. The ballistic carrier of claim **1**, wherein the first thermal panel portion covers at least 75% or more of the outside surface of the inner panel.

5. The ballistic carrier of claim **1**, wherein the first thermal panel portion covers at least 55% or more of the outside surface of the inner panel.

6. The ballistic carrier of claim **1**, wherein the second thermal panel portion extends along at least 25% of a full length of the pocket.

7. The ballistic carrier of claim **1**, wherein the inner panel comprises a mesh fabric, and the outer panel comprises a mesh fabric.

8. The ballistic carrier of claim **7**, wherein the inner panel further comprises an inner heat spreading layer attached to an inside surface of the mesh fabric, and the outer panel further comprises an outer heat spreading layer attached to an outside surface of the mesh fabric.

9. The ballistic carrier of claim **8**, wherein the inner heat spreading layer and outer heat spreading layer each comprise a fabric having a mesh of phase change molecules (PCMs) and metallic material applied onto the fabric.

10. The ballistic carrier of claim **1**, wherein the pocket has an opening has an opening for inserting the ballistic panel and a detachable closure for opening and closing the opening.

11. The ballistic carrier of claim **10**, wherein the opening is on a side edge of the front body panel and is formed by a portion of opposing side edges of the inner panel and the outer panel which are detachably fastened together by the closure.

12. The ballistic carrier of claim **1**, wherein the ballistic carrier is a torso worn garment selected from the group comprising: a vest and; a jacket.

13. The ballistic carrier of claim **1**, further comprising a ballistic panel inserted into the pocket.

14. The ballistic carrier of claim **1**, wherein the carrier is a vest, the first body panel is a front portion of the vest configured to cover the front torso of the wearer, and the carrier further comprises:

a second body panel which is a back portion of the vest and is configured to cover the back torso of the wearer, the second body panel attached to the first body panel by shoulder straps, the second body panel comprising:

an inner panel configured to lie against the body and an outer panel external and opposing the inner panel, the outer panel attached to the inner panel thereby forming a pocket between the inner panel and the outer panel for holding a ballistic panel, the inner panel having an inside surface facing the body and an outside surface facing away from the body, the outer panel having an inside surface facing the body and an outside surface facing away from the body;

a thermal panel attached to the first body panel within the pocket, the thermal panel having a first thermal panel portion attached to, and covering, at least a part of the outside surface of the inner panel and positioned such that it is to an inside of a ballistic panel when inserted into the pocket, the thermal panel bending around proximate an edge of the pocket to a second thermal panel portion, the second thermal panel portion extending along a portion of the inside surface of the outer panel such that the second thermal panel portion is to an outside of a ballistic panel when inserted into the pocket; and

wherein the thermal panel is a multi-layer material having a high thermal conductivity.

15. A ballistic carrier having a heat dispersion system, the ballistic carrier comprising:

a carrier in the form of a vest configured to be worn on a torso of a body of a wearer, the carrier having a first body panel forming a front portion of the vest and configured to cover the front torso of the wearer, and a second body panel forming a back portion of the vest and configured to cover the back torso of the wearer, the second body panel attached to the first body panel by shoulder straps;

the first body panel comprising:

an inner panel configured to lie against the body and an outer panel external and opposing the inner panel, the outer panel attached to the inner panel thereby forming a pocket between the inner panel and the outer panel for holding a ballistic panel, the inner panel having an inside surface facing the body and an outside surface facing away from the body, the outer panel having an inside surface facing the body and an outside surface facing away from the body;

a thermal panel attached to the first body panel within the pocket, the thermal panel having a first thermal

panel portion attached to, and covering, at least a part of the outside surface of the inner panel and positioned such that it is to an inside of a ballistic panel when inserted into the pocket, the thermal panel bending around proximate an edge of the pocket to a second thermal panel portion, the second thermal panel portion extending along a portion of the inside surface of the outer panel such that the second thermal panel portion is to an outside of a ballistic panel when inserted into the pocket; and

wherein the thermal panel is a multi-layer material having a high thermal conductivity;

the second body panel comprising:

an inner panel configured to lie against the body and an outer panel external and opposing the inner panel, the outer panel attached to the inner panel thereby forming a pocket between the inner panel and the outer panel for holding a ballistic panel, the inner panel having an inside surface facing the body and an outside surface facing away from the body, the outer panel having an inside surface facing the body and an outside surface facing away from the body;

a thermal panel attached to the first body panel within the pocket, the thermal panel having a first thermal panel portion attached to, and covering, at least a part of the outside surface of the inner panel and positioned such that it is to an inside of a ballistic panel when inserted into the pocket, the thermal panel bending around proximate an edge of the pocket to a second thermal panel portion, the second thermal panel portion extending along a portion of the inside surface of the outer panel such that the second thermal panel portion is to an outside of a ballistic panel when inserted into the pocket; and

wherein the thermal panel is a multi-layer material having a high thermal conductivity.

16. The ballistic carrier of claim **15**, wherein the thermal panel of each of the first body panel and the second body panel each comprises a first layer of heat absorbing textile comprising phase change molecules (PCMs), and a second layer applied to, and covering, a first side of the first layer, the second layer comprising a heat transfer film comprising oriented graphite.

17. The ballistic carrier of claim **15**, wherein the thermal panel of each of the first body panel and the second body panel each further comprises a backing layer applied to, and covering, a second side of the heat transfer film opposite the first side.

18. The ballistic carrier of claim **15**, wherein the first thermal panel portion of each of the first body panel and the second body panel each covers at least 75% or more of the respective outside surface of the inner panel.

19. The ballistic carrier of claim **15**, wherein the first thermal panel portion of each of the first body panel and the second body panel each covers at least 55% or more of the respective outside surface of the inner panel.

20. The ballistic carrier of claim **15**, wherein the second thermal panel portion of each of the first body panel and the second body panel each extends along at least 25% of a full length of the pocket.

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