

Señora
Directora de la Dirección de Nuevas Creaciones
Superintendencia de Industria y Comercio
Ministerio de Comercio, Industria y Turismo
E. S. D.

Re.:Expediente No. **NC2024/0013581**

Solicitud de patente PCT entrada en Fase Nacional, para: **“SISTEMA DE
DISPERSIÓN DE CALOR PARA PORTADOR BALÍSTICO”**

Solicitante: **Jakub DABROWKA**

RESPUESTA A EXAMEN DE FORMA

MARGARITA CASTELLANOS ABONDANO, mayor de edad, identificada y domiciliada como aparece al pie de mi firma, obrando en mi calidad de apoderada de la sociedad solicitante del asunto citado en la referencia, en atención a su oficio No. **18794** notificado electrónicamente el 22 de octubre de 2024, atentamente me permito dar respuesta al mismo de la siguiente manera:

1. Análisis de Prioridad

Se agradece al Examinador notar el error involuntario relacionado con el número de prioridad invocado para la presente solicitud. Tal como advierte el Examinador, el número correcto de la prioridad para esta solicitud es el 18/590,919 y no el 18/509,919, según se indicó en el formulario de presentación.

En vista de lo anterior, se ha presentado una solicitud de corrección de solicitud en trámite, para el asunto de la referencia, a fin de que se registre el número correcto de prioridad en la base de datos.

Para mejor referencia del Examinador, se anexa copia del radicado para esta solicitud de corrección.

2. Documento de Prioridad

Con el fin de completar los requisitos formales de esta solicitud, se anexa copia certificada de la prioridad 18/590,919, invocada para la presente solicitud, junto con su traducción simple al castellano.

3. Pago por Reivindicaciones Adicionales

Teniendo en cuenta que el pago por reivindicaciones adicionales puede ser realizado junto con el pago de la tasa de solicitud de examen de patentabilidad, se informa que en este momento el solicitante no realizará el pago por reivindicaciones adicionales.

Dicho pago será realizado posteriormente y a más tardar junto con la solicitud de examen de patentabilidad.

Se solicita atentamente tener en cuenta esta información, así como los documentos presentados y continuar el trámite de la solicitud.

4. Anexos

- Copia del radicado de solicitud de corrección para el número de prioridad.
- Copia certificada de la prioridad 18/590,919, invocada para la presente solicitud, junto con su traducción simple al castellano.

Señora Directora,



Margarita Castellanos Abondano

C.C. No. **39.779.654** de Bogotá

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P6223



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NC2024/0016232 - NC Correcciones a Patente/Modelo/Trazado - Discutir el asunto

Salir

Información

[NC2024/0016232](#)

NC Correcciones a
Patente/Modelo/Trazado

Solicitado en Patente
NC2024/0013581

Presentada

Solicitud de PI
relacionada

[NC2024/0013581](#)

Patente de Invención
Nacional

SISTEMA DE
DISPERSIÓN DE CALOR
PARA PORTADOR
BALÍSTICO

Requerimiento de
Forma

Discusión

Título	Presentación solicitud de modificación o corrección
Fecha de creación	28 nov. 2024
Estado	Cerrado

Mensajes

castellanosyconuevascreaciones - 28 nov. 2024

La solicitud de modificación o corrección ha sido presentada

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THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

October 15, 2024

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 18/590,919

FILING DATE: February 28, 2024

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US 18/590,919

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office

Rodney Glover

Rodney Glover
Certifying Officer





UNITED STATES
PATENT AND TRADEMARK OFFICE

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/590,919

RECEIPT DATE / TIME
02/28/2024 10:38:11 PM Z ET

ATTORNEY DOCKET #
DABJ-001US

Title of Invention

HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 3599

FILED BY Jocelyn Lee

PATENT CENTER # 64492293

FILING DATE -

CUSTOMER # 23410

FIRST NAMED INVENTOR Jakub Dabrowka

CORRESPONDENCE ADDRESS -

AUTHORIZED BY James Sakaguchi

Documents

TOTAL DOCUMENTS: 7

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
DABJ-001US-ADSaia0014-Signed.pdf	8	Application Data Sheet	2145 KB
DABJ-001US-TransmittalUTIL.pdf	1	Transmittal of New Application	232 KB
DABJ-001US-TransmittalFee.pdf	1	Fee Worksheet (SB06)	173 KB
DABJ-001US-Spec-FINAL1-APP.TEXT.docx	25	Application body structured text document	45 KB
DABJ-001US-Formal-Drawings-FINAL.pdf	7	Drawings-only black and white line drawings	2401 KB

Warning: The PDF file contains multiple layers and must be flattened prior to submission. Documents submitted with multiple layers will be flattened by the USPTO when converted to an image. Layers marked as "invisible" will be lost during conversion.

DABJ-001US-Spec-FINAL1.pdf	25	Auxiliary PDF of Application	153 KB
DABJ-001US-Declaration-Signed.pdf	1	Oath or Declaration filed	1415 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
DABJ-001US-ADSaia0014-Signed.pdf	C11635E8FD4AAFA4BF857FE494FBB48B55534B66431B14B159200D08FCA2F1BDE10DDE86966AC05FD8A57B8898D61C2D51F0DB9C097ECF3570F515B91BD5709D
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DABJ-001US-Spec-FINAL1-APP.TEXT.docx	28CE11F083C44660C6056BB28223BD7949ECDEC407E19F91438B01E6745D80B3CF1FC10691B95CA036FC7540900B3F2B66B927E33E5F07C3FDA0893908F26B23
DABJ-001US-Formal-Drawings-FINAL.pdf	61FD58EC1B8F62E74C54355D2BD44AFE11DE517EEE57A20CE5F57D52115E2CF3B9108CBB2B12B56B2283AED6F64C9CDDF51AD9495E89517E1EE12D65CC5AEA8F
DABJ-001US-Spec-FINAL1.pdf	CFCCDADCCB99B908C622685FCF3BDA148E8A860C1EE52A8D1A3557F0989B20EC2321DF6B7ABFF8929A8501D443237E77581D3C2ED4F1329788693D0075B2087D
DABJ-001US-Declaration-Signed.pdf	7FD8228E90ED97FB64D8A8E6B9CC070A9A0A1CA7C423849723A0DBE1962F1F8E7C674947E164ECEE90963DB2A75694EA3A1644E7B2778C02EB549D6F547EC248

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	DABJ-001US
First Named Inventor	Jakub Dabrowka
Title	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER
Priority Mail Express® Label No.	filing via USPTO-EFS web system

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (PTO/SB/17 or equivalent)
2. ☒ Applicant asserts small entity status. See 37 CFR 1.27
3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☒ Specification [Total Pages 25] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement)
5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 7]
6. ☒ Inventor's Oath or Declaration [Total Pages 1] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))
 - a. ☒ Newly executed (original or copy)
 - b. ☐ A copy from a prior application (37 CFR 1.63(d))
7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. ☐ CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix)
 ☐ Landscape Table on CD
9. ☐ Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. - c. are required)
 - a. ☐ Computer Readable Form (CRF)
 - b. ☐ Specification Sequence Listing on:
 - i. ☐ CD-ROM or CD-R (2 copies); or
 - ii. ☐ Paper
 - c. ☐ Statements verifying identity of above copies

ADDRESS TO:

 Commissioner for Patents
 P.O. Box 1450
 Alexandria, VA 22313-1450

ACCOMPANYING APPLICATION PAPERS

10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____
11. ☐ 37 CFR 3.73(c) Statement (when there is an assignee) ☐ Power of Attorney
12. ☐ English Translation Document (if applicable)
13. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449)
 ☐ Copies of citations attached
14. ☐ Preliminary Amendment
15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized)
16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☐ Other: _____

*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS). (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

☒ The address associated with Customer Number: 23410				OR ☐ Correspondence address below	
Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			
Signature	/James Sakaguchi/			Date	02/28/2024
Name (Print/Type)	James Sakaguchi			Registration No. (Attorney/Agent)	41285

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FEE TRANSMITTAL**Complete if known**

☒ Applicant asserts small entity status. See 37 CFR 1.27.	Application Number	
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or its equivalent must either be enclosed or have been submitted previously.	Filing Date	2024-02-28
	First Named Inventor	Jakub Dabrowka
	Examiner Name	N/A
	Art Unit	N/A
TOTAL AMOUNT OF PAYMENT	Practitioner Docket No.	DABJ-001US

METHOD OF PAYMENT (check all that apply)
☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 561105 Deposit Account Name: VISTA IP LAW GROUP LLP

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) ☒ Credit any overpayment of fee(s) under 37 CFR 1.16 and 1.17

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION**1. BASIC FILING, SEARCH, AND EXAMINATION FEES** (U = undiscounted fee; S = small entity fee; M = micro entity fee)

Application Type	FILING FEES			SEARCH FEES			EXAMINATION FEES			Fees Paid (\$)
	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	U (\$)	S (\$)	M (\$)	
Utility	320	128*	64	700	280	140	800	320	160	664
Design	220	88	44	160	64	32	640	256	128	
Plant	220	88	44	440	176	88	660	264	132	
Reissue	320	128	64	700	280	140	2,320	928	464	
Provisional	300	120	60	0	0	0	0	0	0	

* The \$128 small entity filing fee for a utility application is further reduced to \$64 for a small entity applicant who files the application via Patent Center or EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	Undiscounted Fee (\$)	Small Entity Fee (\$)	Micro Entity Fee (\$)
Each claim over 20 (including Reissues)	100	40	20
Each independent claim over 3 (including Reissues)	480	192	96
Multiple dependent claims	860	344	172
Total Claims			
20 - 20 or HP = _____ x _____ = _____			
HP = highest number of total claims paid for, if greater than 20.			
Indep. Claims			
2 - 3 or HP = _____ x _____ = _____			
HP = highest number of independent claims paid for, if greater than 3.			

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$420 (\$168 for small entity) (\$84 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
_____ - 100 = _____ / 50 = _____ (round up to a whole number) x _____ = _____				

4. OTHER FEE(S)

Non-English specification, \$140 fee (\$56 for small entity) (\$28 for micro entity) _____

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, \$400 fee (\$200 small or micro entity) _____

Other (e.g., late filing surcharge): _____

SUBMITTED BY

Signature	/James Sakaguchi/	Registration No. (Attorney/Agent)	41285	Telephone	760-803-5967
Name (Print/Type)	James Sakaguchi			Date	01/28/2024

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If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER

Related Applications

[0001] The present application claims the benefit of priority of U.S. provisional patent application number 63/458,434, filed April 10, 2023, which is incorporated by reference herein in its entirety.

Background

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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

[0006] 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.

[0007] 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.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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

[0019] 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.

[0020] FIG. 1 is a front perspective view of a carrier in accordance with one example disclosed herein.

[0021] FIG. 2 is a rear perspective view of the carrier of Fig. 1.

[0022] 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.

[0023] FIG. 4 is schematic cross-sectional view of the front panel of the carrier along line 4-4 of FIG. 1.

[0024] FIG. 5 is schematic cross-sectional view of the back panel of the carrier along line 5-5 of FIG. 1.

[0025] FIG. 6 is a schematic cross-sectional view of the thermal panel shown in FIGS. 4 and 5.

[0026] FIG. 7 is a front perspective view a person wearing the carrier of FIG. 1.

Detailed Description of the Disclosure

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] The front body panel comprises an inner panel 114a and an outer panel 116a which are attached to each other around their respective periphery edges such that a pocket 110a for holding a front ballistic panel 112a is formed between the inner panel 114a and the outer panel 116a, as best shown in FIGS. 3 and 4. The back body panel 104 has a similar pocket 110b for holding a back ballistic panel 112b., the pocket 110a is formed between an inner panel 114a and an outer panel 116a. The inner panel 114a and outer panel 116a may be formed of a mesh fabric or other suitable textile. The inner

panel 114a has an inside surface 118a which faces the body 152 (more specifically, the front of the body 152) and an outside surface 120a which faces away from the body 152 and forms the inner side of the pocket 110a. The outer panel 116a has an inside surface 122a which faces toward the body of the person 150 and an outside surface 124a which faces away from the body 152.

[0032] The pocket 110a has an opening 144a for inserting the front ballistic panel 112a into the pocket 110a. The opening 144a 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 144a can be on either side of the front body panel 102). The opening 144a is formed by a portion of the opposing side edges of the inner panel 114a and the outer panel 116a which are detachably fastened together by a closure 146a. The closure 146a comprises mating hook and loop fasteners extending along a length of the side edges of the inner panel 114 and outer panel 116a. The closure 146a may comprise any other suitable fasteners such as buttons, snaps, ties, clips, or the like.

[0033] A thermal panel 126a is attached to the first body panel 102 within the pocket 110a adjacent to, and on the outside of, the inner panel 114a. As one example, the thermal panel 126a may be attached to the inner panel 114a such as by being sewn, bonded, or otherwise suitably attached. The thermal panel 126a has a first thermal panel portion 128a which extends from proximate the top of the pocket 110a and inner panel 114a, downward to proximate the bottom edge of the pocket 110a and inner panel 114a, such that the first thermal panel portion 128a is configured to be positioned on the inside of the ballistic panel 112a. The first thermal panel portion 128a covers a substantial part (i.e., at least 75% or more) of the outside surface 120a of the

inner panel 114a. Alternatively, the first thermal panel portion 128a may cover at least 70% or more, or 65% or more, or 55% or more of the outside surface 120a of the inner panel 114a.

[0034] The thermal panel 126a then bends around the bottom of the pocket 110a to towards the front of the pocket 110a, and then a second thermal panel portion 130a of the thermal panel 126a, extends upward along the inside surface 112a of the outer panel 116a such that the second thermal panel portion 130a is configured to be positioned on the outside of the ballistic panel 112a. There is a space between the first thermal panel portion 128a and the second thermal panel portion 130a for inserting the ballistic panel 112a. The second thermal panel portion 130a extends along a length of the inside surface 112a of the outer panel 116 and a length of the ballistic panel 126a. For example, the second thermal panel portion 130a 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 122a of the outer panel 116a; or of the full length of the pocket 110a; or of the full length of the ballistic panel 112a. The second thermal panel portion 130a expels heat absorbed by the first thermal panel portion 128a and conducted by and along the thermal panel to the second thermal panel portion 130a. In other words, the first thermal panel portion 128a absorbs heat expelled by the body, dissipates the heat, and conducts the heat from the first thermal panel portion 128a close to the body and to the inside of the ballistic panel 112a to the second thermal panel portion 130a adjacent the outer panel 116a and to the outside of the ballistic panel 112a. As a result, the thermal panel 126a effectively transfers body heat around the high thermal insulating ballistic panel 112a and expels the heat into the ambient

environment. The transfer of body heat by the thermal panel 126a 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 130a may be unattached or loose such that the thermal panel 126a can be wrapped around the bottom end of the front ballistic panel 112a. Alternatively, the second thermal panel portion 130a can be attached to the outer panel 116a by being sewn, bonded, or otherwise suitably attached.

[0035] Referring to FIG. 6, the thermal panel 126a is a multi-layer panel having a high thermal conductivity for efficiently transferring heat. The thermal panel 126a 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 126a 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 126a to other materials, such as the inner panel 114a. As

one non-limiting example, the thermal panel 126 may comprise ECLIPSYS™ thermal sheet material available from Alexium Inc., Greer, South Carolina.

[0036] Turning back to FIG. 4, the inner panel 114a may further comprise an inner heat spreading layer 138a disposed on the inside surface 118a of the inner panel 114a (e.g., on the inside surface of the mesh fabric forming part of the inner panel 114). The inner heat spreading layer 138a 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 138a. The inner heat spreading layer 138a 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 138a. For example, inner heat spreading layer 138a 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 138a is attached to the mesh fabric or other textile forming the inner panel 114a by being sewn, bonded or otherwise fastened to the inner layer 138a.

[0037] 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 114b, an outer panel 116b, a pocket 110b, an opening 144b, a closure 146b, a thermal panel 126b, a first thermal panel portion 128b, a second thermal panel portion 130b, and an inner heat spreading layer 138b, 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.

[0038] 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 114a, 114b 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 138a, 138b, to absorb and dissipate the heat generated by the body 152.

[0039] The use and functionality of the ballistic carrier system 100 will now be described. Typically, the front and back ballistic panels 112a, 112b are first inserted into the front body panel 102 and rear body panel 104, respectively. For example, the front ballistic panel 112a is inserted into the pocket 110a through the opening 144a by unfastening the closure 146a, and sliding the front ballistic panel 112a into the pocket 110a such that ballistic panel 112a is between the first and second thermal panel portions 128a, 130a, with the first thermal panel portion 128a directly to the inside of the front ballistic panel 112a and the second thermal panel portion 130a is directly to the outside of the front ballistic panel 112a. The closure 146a is then fastened to close the opening 144a. Similarly, the back ballistic panel 112b is inserted into the pocket 110b through the opening 144b by unfastening the closure 146b, and sliding the back ballistic panel 112b into the pocket 110b such that back ballistic panel 112b is between the first and second thermal panel portions 128b, 130b, with the first thermal panel portion 128b directly to the inside of the back ballistic panel 112b and the second thermal panel

portion 130b is directly to the outside of the back ballistic panel 112b. The ballistic carrier 100 is now ready to be donned by the person 150.

[0040] 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.

[0041] 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 138a 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 128a of the thermal panel 126a. The thermal panel 126a disperses the heat in the thermal panel 126a and transfers the heat along the length of the thermal panel, around the front ballistic panel 112a to the second thermal panel portion 130a in front of the front ballistic panel 112a. The heat then transfers from the second thermal panel portion through the outer panel 116a (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.

[0042] 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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.

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.

HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER

Related Applications

[0001] The present application claims the benefit of priority of U.S. provisional patent application number 63/458,434, filed April 10, 2023, which is incorporated by reference herein in its entirety.

Background

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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

[0006] 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.

[0007] 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.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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

[0019] 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.

[0020] FIG. 1 is a front perspective view of a carrier in accordance with one example disclosed herein.

[0021] FIG. 2 is a rear perspective view of the carrier of Fig. 1.

[0022] 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.

[0023] FIG. 4 is schematic cross-sectional view of the front panel of the carrier along line 4-4 of FIG. 1.

[0024] FIG. 5 is schematic cross-sectional view of the back panel of the carrier along line 5-5 of FIG. 1.

[0025] FIG. 6 is a schematic cross-sectional view of the thermal panel shown in FIGS. 4 and 5.

[0026] FIG. 7 is a front perspective view a person wearing the carrier of FIG. 1.

Detailed Description of the Disclosure

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] The front body panel comprises an inner panel 114a and an outer panel 116a which are attached to each other around their respective periphery edges such that a pocket 110a for holding a front ballistic panel 112a is formed between the inner panel 114a and the outer panel 116a, as best shown in FIGS. 3 and 4. The back body panel 104 has a similar pocket 110b for holding a back ballistic panel 112b., the pocket 110a is formed between an inner panel 114a and an outer panel 116a. The inner panel 114a and outer panel 116a may be formed of a mesh fabric or other suitable textile. The inner

panel 114a has an inside surface 118a which faces the body 152 (more specifically, the front of the body 152) and an outside surface 120a which faces away from the body 152 and forms the inner side of the pocket 110a. The outer panel 116a has an inside surface 122a which faces toward the body of the person 150 and an outside surface 124a which faces away from the body 152.

[0032] The pocket 110a has an opening 144a for inserting the front ballistic panel 112a into the pocket 110a. The opening 144a 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 144a can be on either side of the front body panel 102). The opening 144a is formed by a portion of the opposing side edges of the inner panel 114a and the outer panel 116a which are detachably fastened together by a closure 146a. The closure 146a comprises mating hook and loop fasteners extending along a length of the side edges of the inner panel 114 and outer panel 116a. The closure 146a may comprise any other suitable fasteners such as buttons, snaps, ties, clips, or the like.

[0033] A thermal panel 126a is attached to the first body panel 102 within the pocket 110a adjacent to, and on the outside of, the inner panel 114a. As one example, the thermal panel 126a may be attached to the inner panel 114a such as by being sewn, bonded, or otherwise suitably attached. The thermal panel 126a has a first thermal panel portion 128a which extends from proximate the top of the pocket 110a and inner panel 114a, downward to proximate the bottom edge of the pocket 110a and inner panel 114a, such that the first thermal panel portion 128a is configured to be positioned on the inside of the ballistic panel 112a. The first thermal panel portion 128a covers a substantial part (i.e., at least 75% or more) of the outside surface 120a of the

inner panel 114a. Alternatively, the first thermal panel portion 128a may cover at least 70% or more, or 65% or more, or 55% or more of the outside surface 120a of the inner panel 114a.

[0034] The thermal panel 126a then bends around the bottom of the pocket 110a to towards the front of the pocket 110a, and then a second thermal panel portion 130a of the thermal panel 126a, extends upward along the inside surface 112a of the outer panel 116a such that the second thermal panel portion 130a is configured to be positioned on the outside of the ballistic panel 112a. There is a space between the first thermal panel portion 128a and the second thermal panel portion 130a for inserting the ballistic panel 112a. The second thermal panel portion 130a extends along a length of the inside surface 112a of the outer panel 116 and a length of the ballistic panel 126a. For example, the second thermal panel portion 130a 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 122a of the outer panel 116a; or of the full length of the pocket 110a; or of the full length of the ballistic panel 112a. The second thermal panel portion 130a expels heat absorbed by the first thermal panel portion 128a and conducted by and along the thermal panel to the second thermal panel portion 130a. In other words, the first thermal panel portion 128a absorbs heat expelled by the body, dissipates the heat, and conducts the heat from the first thermal panel portion 128a close to the body and to the inside of the ballistic panel 112a to the second thermal panel portion 130a adjacent the outer panel 116a and to the outside of the ballistic panel 112a. As a result, the thermal panel 126a effectively transfers body heat around the high thermal insulating ballistic panel 112a and expels the heat into the ambient

environment. The transfer of body heat by the thermal panel 126a 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 130a may be unattached or loose such that the thermal panel 126a can be wrapped around the bottom end of the front ballistic panel 112a. Alternatively, the second thermal panel portion 130a can be attached to the outer panel 116a by being sewn, bonded, or otherwise suitably attached.

[0035] Referring to FIG. 6, the thermal panel 126a is a multi-layer panel having a high thermal conductivity for efficiently transferring heat. The thermal panel 126a 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 126a 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 126a to other materials, such as the inner panel 114a. As

one non-limiting example, the thermal panel 126 may comprise ECLIPSYS™ thermal sheet material available from Alexium Inc., Greer, South Carolina.

[0036] Turning back to FIG. 4, the inner panel 114a may further comprise an inner heat spreading layer 138a disposed on the inside surface 118a of the inner panel 114a (e.g., on the inside surface of the mesh fabric forming part of the inner panel 114). The inner heat spreading layer 138a 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 138a. The inner heat spreading layer 138a 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 138a. For example, inner heat spreading layer 138a 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 138a is attached to the mesh fabric or other textile forming the inner panel 114a by being sewn, bonded or otherwise fastened to the inner layer 138a.

[0037] 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 114b, an outer panel 116b, a pocket 110b, an opening 144b, a closure 146b, a thermal panel 126b, a first thermal panel portion 128b, a second thermal panel portion 130b, and an inner heat spreading layer 138b, 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.

[0038] 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 114a, 114b 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 138a, 138b, to absorb and dissipate the heat generated by the body 152.

[0039] The use and functionality of the ballistic carrier system 100 will now be described. Typically, the front and back ballistic panels 112a, 112b are first inserted into the front body panel 102 and rear body panel 104, respectively. For example, the front ballistic panel 112a is inserted into the pocket 110a through the opening 144a by unfastening the closure 146a, and sliding the front ballistic panel 112a into the pocket 110a such that ballistic panel 112a is between the first and second thermal panel portions 128a, 130a, with the first thermal panel portion 128a directly to the inside of the front ballistic panel 112a and the second thermal panel portion 130a is directly to the outside of the front ballistic panel 112a. The closure 146a is then fastened to close the opening 144a. Similarly, the back ballistic panel 112b is inserted into the pocket 110b through the opening 144b by unfastening the closure 146b, and sliding the back ballistic panel 112b into the pocket 110b such that back ballistic panel 112b is between the first and second thermal panel portions 128b, 130b, with the first thermal panel portion 128b directly to the inside of the back ballistic panel 112b and the second thermal panel

portion 130b is directly to the outside of the back ballistic panel 112b. The ballistic carrier 100 is now ready to be donned by the person 150.

[0040] 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.

[0041] 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 138a 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 128a of the thermal panel 126a. The thermal panel 126a disperses the heat in the thermal panel 126a and transfers the heat along the length of the thermal panel, around the front ballistic panel 112a to the second thermal panel portion 130a in front of the front ballistic panel 112a. The heat then transfers from the second thermal panel portion through the outer panel 116a (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.

[0042] 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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 attached to, and covering, at least a part of the inside 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.

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.

Docket No. DABJ-001NP

PTO/AIA/01 (08-12)

Approved for use through 05/31/2024. OMB 0551-0032

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)Title of
Invention

HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER

As the below named inventor, I hereby declare that:

This declaration
is directed to:

The attached application, or



United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Jakub Dabrowka

Date (Optional):

Signature:

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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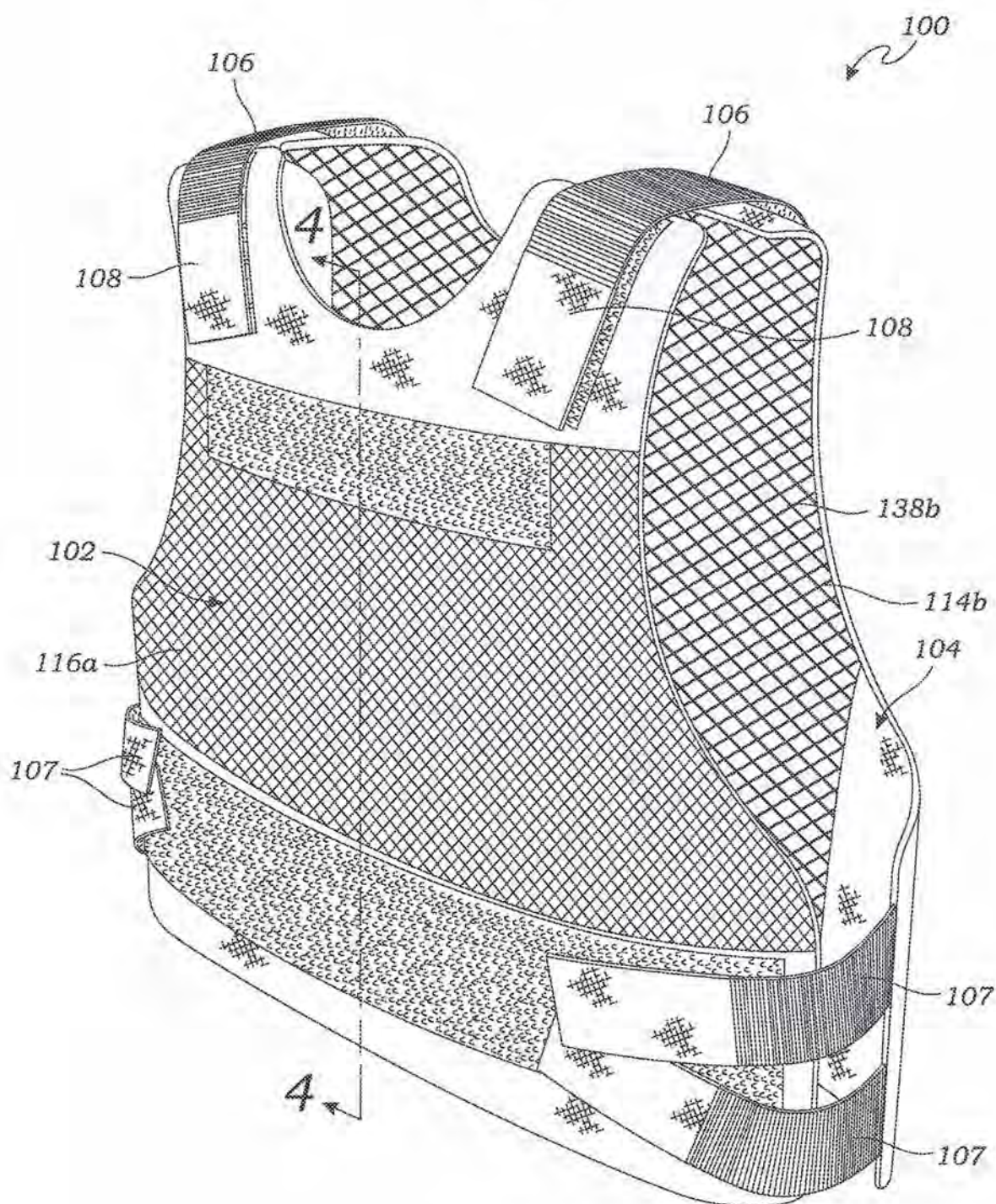


FIG. 1

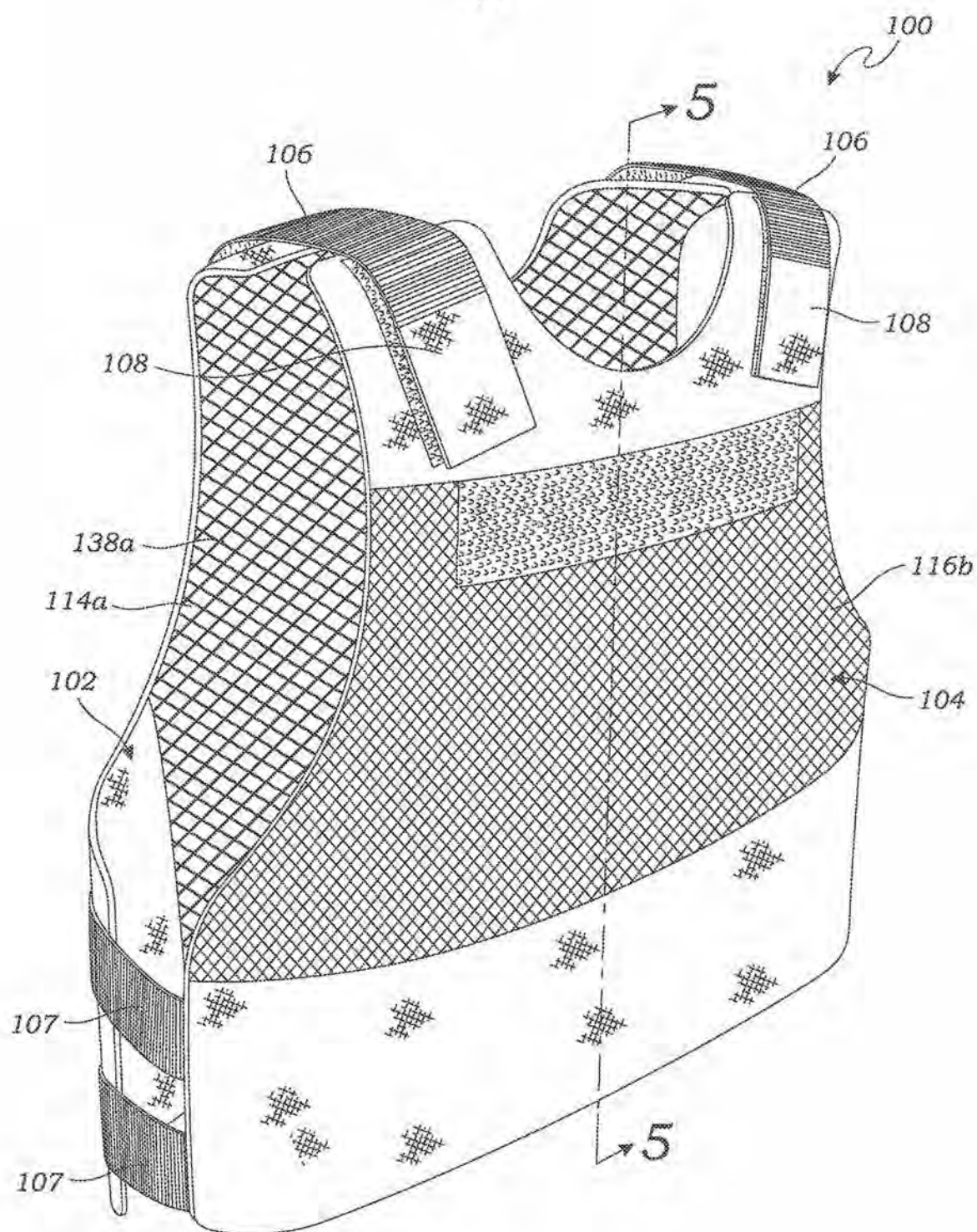


FIG. 2

3/7

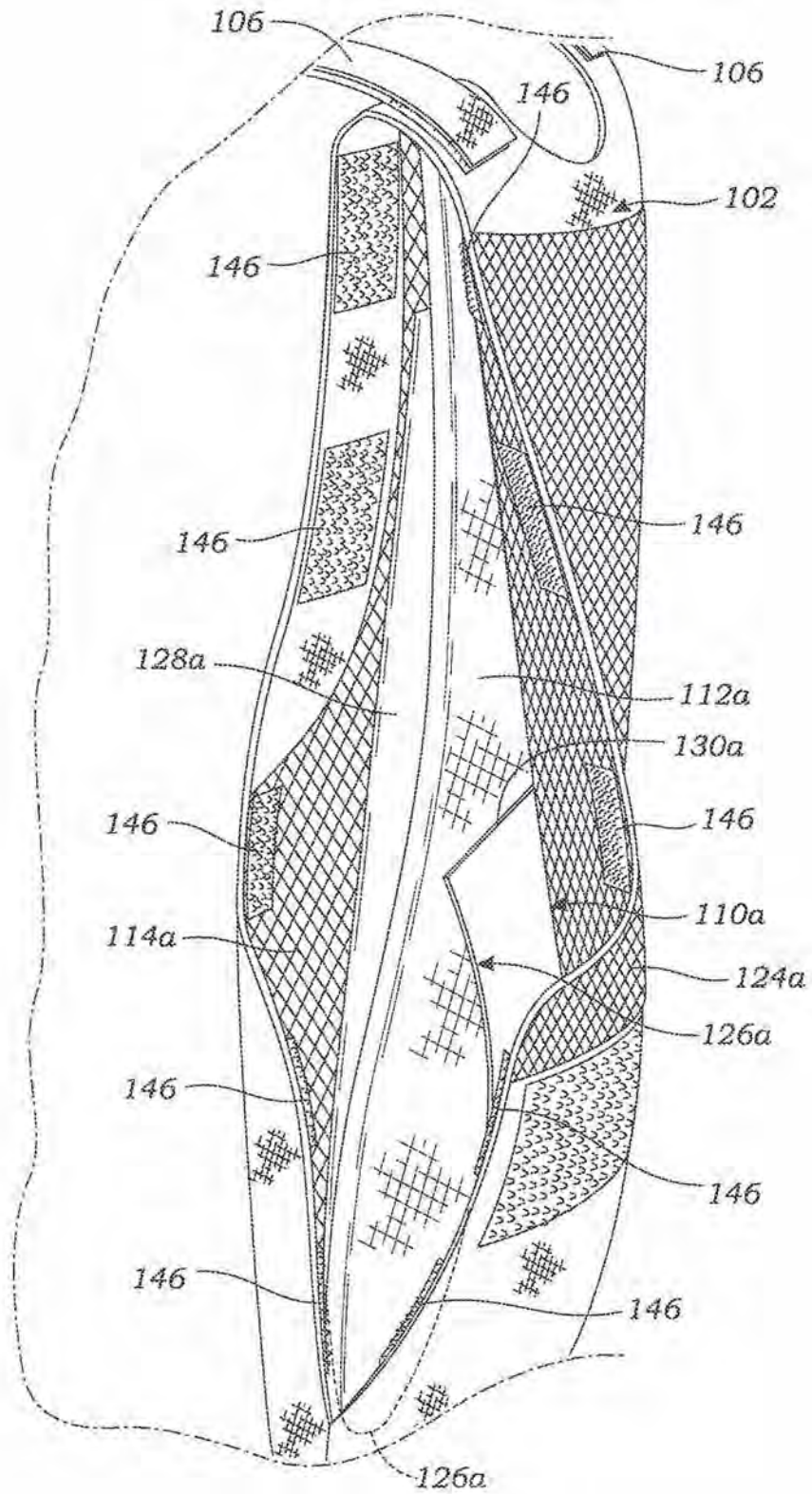


FIG. 3

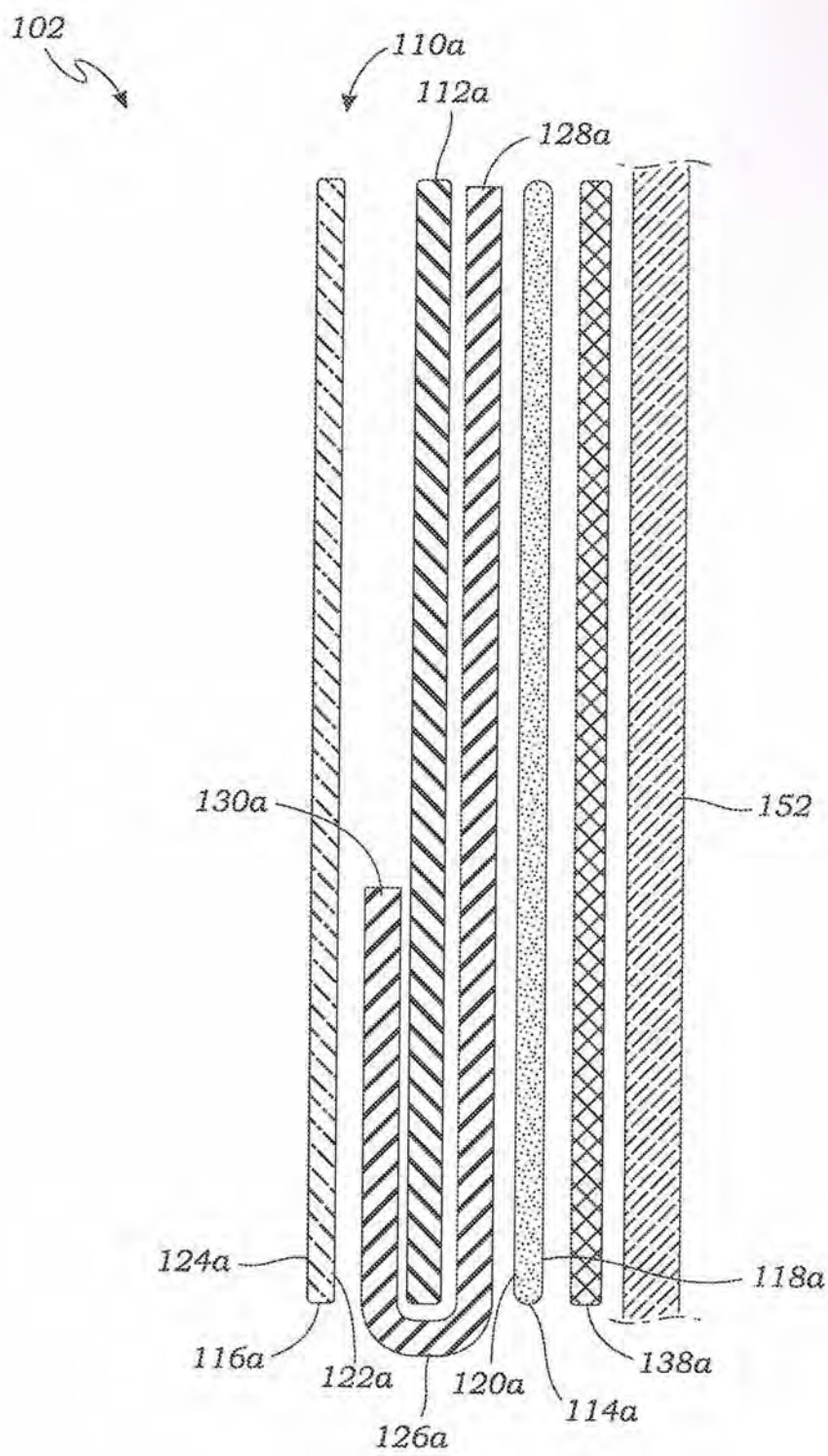


FIG. 4

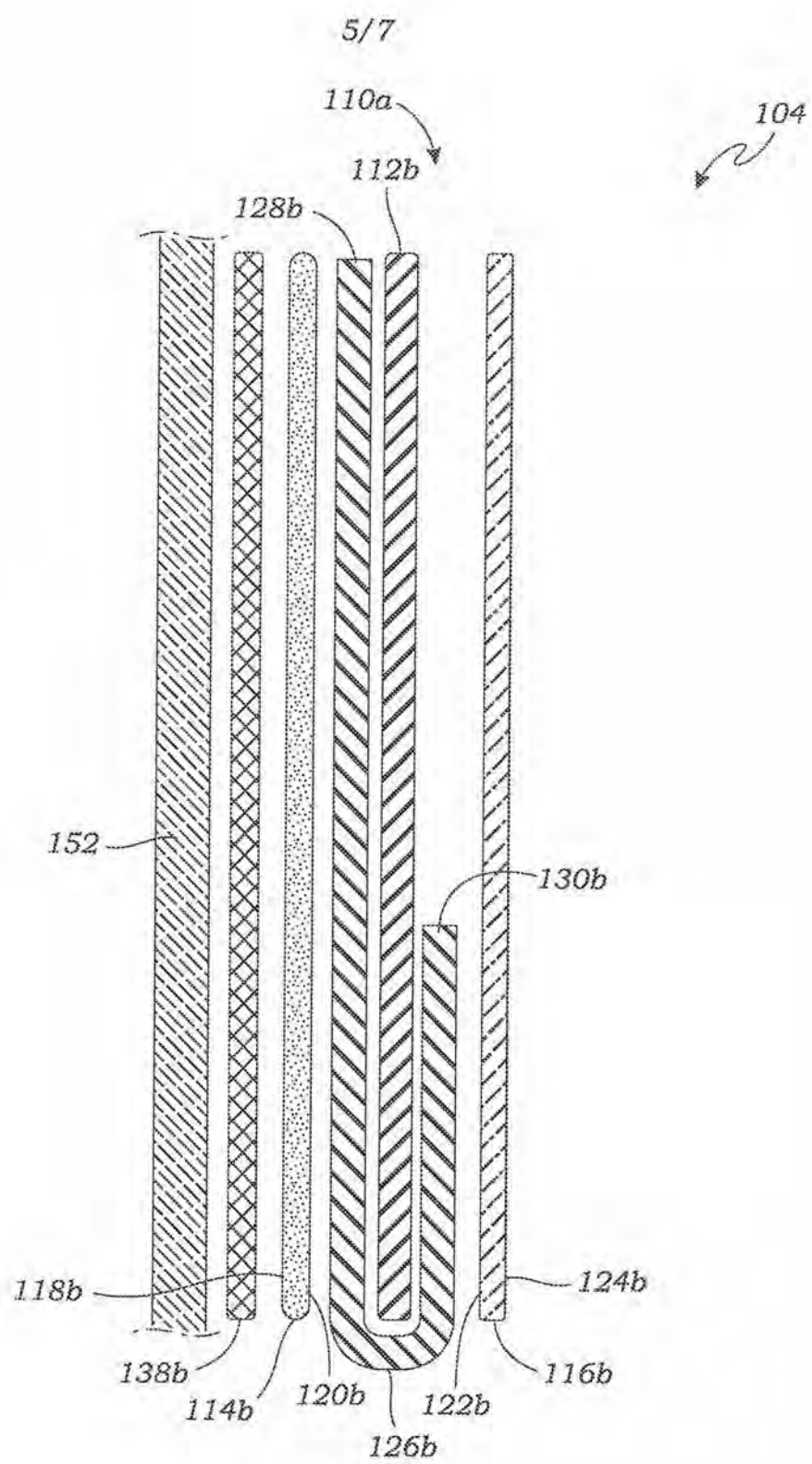


FIG. 5

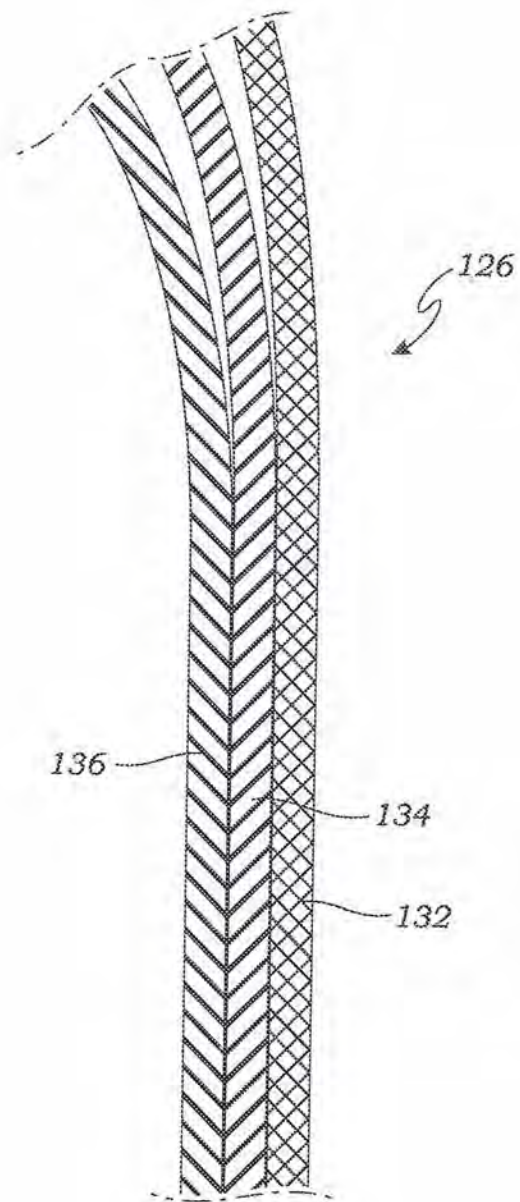


FIG. 6

7/7

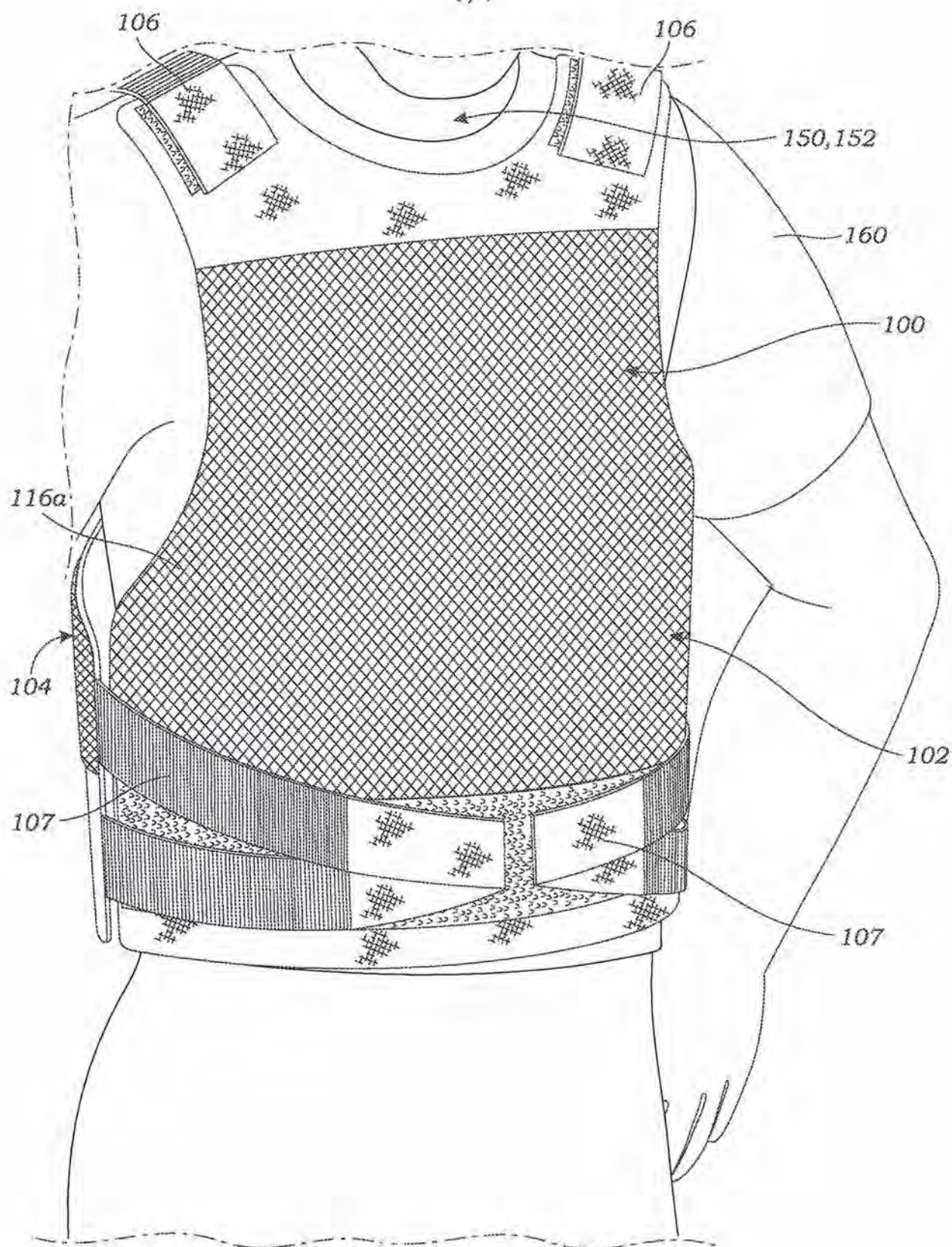


FIG. 7

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jakub		Dabrowka		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Irvine	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		111 Sculpture			
Address 2					
City	Irvine	State/Province	CA		
Postal Code	92618	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					
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Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence Information of this application.	
Customer Number	23410
Email Address	
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Application Information:

Title of the Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		
Attorney Docket Number	DABJ-001US	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	7	Suggested Figure for Publication (if any)	1

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	23410		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	63458434	2023-04-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h) (1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. ☐ If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. ☐ If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.										
Applicant 1			Remove							
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.										
Clear										
☐ Assignee	☐ Legal Representative under 35 U.S.C. 117		☐ Joint Inventor							
☐ Person to whom the inventor is obligated to assign.	☐ Person who shows sufficient proprietary interest									
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:										
Name of the Deceased or Legally Incapacitated Inventor:										
If the Applicant is an Organization check here. ☐										
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Mailing Address Information For Applicant:										
Address 1										
Address 2										
City		State/Province								
Country		Postal Code								
Phone Number		Fax Number								
Email Address										
Additional Applicant Data may be generated within this form by selecting the Add button. Add										

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

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Address 1			
Address 2			
City		State/Province	
Country i		Postal Code	
Phone Number		Fax Number	
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This Application Data Sheet must be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, all joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of all joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/James Sakaguchi/		Date (YYYY-MM-DD)	2024-02-28	
First Name	James	Last Name	Sakaguchi	Registration Number	41285

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	DABJ-001US
		Application Number	
Title of Invention	HEAT DISPERSION SYSTEM FOR BALLISTIC CARRIER		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

TRADUCCIÓN

[N. del T.: De los formularios a continuación solo se traducen las partes pertinentes.]

8534319

ESTADOS UNIDOS DE AMÉRICA. A QUIEN CORRESPONDA. DEPARTAMENTO
DE COMERCIO DE LOS ESTADOS UNIDOS DE AMÉRICA.

Oficina de Patentes y Marcas de los Estados Unidos de América.

15 de octubre de 2024

POR LA PRESENTE SE CERTIFICA QUE LA QUE SE ADJUNTA ES COPIA FIEL
DE LOS REGISTROS QUE OBRAN EN LA OFICINA DE PATENTES Y MARCAS
DE LOS ESTADOS UNIDOS DE AMÉRICA DE LOS DOCUMENTOS DE LA
SOLICITUD DE PATENTE IDENTIFICADA A CONTINUACIÓN, QUE CUMPLEN
LOS REQUISITOS PARA EL OTORGAMIENTO DE UNA FECHA DE
PRESENTACIÓN EN VIRTUD DEL ARTÍCULO 111 DEL TÍTULO 35 DEL CÓDIGO
DE LOS EE.UU.

NÚMERO DE SOLICITUD: 18/590.919

FECHA DE PRESENTACIÓN: 28 de febrero de 2024

EL CÓDIGO DE PAÍS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD, A
UTILIZAR PARA REALIZAR PRESENTACIONES EN EL EXTRANJERO EN
VIRTUD DEL CONVENIO DE PARÍS, ES US 18/590.919.

Por facultad del Subsecretario de Comercio de Propiedad Intelectual y Director de la
Oficina de Patentes y Marcas de los Estados Unidos de América.

[Aparece una firma].

Rodney Glover

Funcionario Certificador

[Aparece adherida una oblea que reza]: Oficina de Patentes y Marcas de los Estados Unidos de América. Departamento de Comercio.

[En la página siguiente.]

ACUSE DE RECIBO ELECTRÓNICO

Nro. de solicitud: 18/590.919

Fecha y hora de recepción: 28 de febrero de 2024, 10:38:11 PM Z ET

Nro. de Expediente del Agente: DABJ-001US

Título de la Invención

SISTEMA DE DISPERSIÓN DE CALOR PARA PORTADOR BALÍSTICO

Información acerca de la solicitud

TIPO DE SOLICITUD: Utilidad – Solicitud No Provisional en virtud del Art. 111(a) del Título 35 del Código de los EE.UU.

NRO. DE PATENTE: -

NRO. DE CONFIRMACIÓN: 3599

PRESENTADA POR: Jocelyn Lee

CENTRO DE PATENTES NRO. 64492293

FECHA DE PRESENTACIÓN: -

NRO. DE CLIENTE: 23410

INVENTOR MENCIONADO EN PRIMER TÉRMINO: Jakub Dabrowka

DIRECCIÓN PARA ENVÍO DE CORRESPONDENCIA: -

AUTORIZADO POR: James Sakaguchi

[En la página siguiente.]

SISTEMA DE DISPERSIÓN DE CALOR PARA PORTADOR BALÍSTICO

Solicitudes relacionadas

[0001] La presente solicitud reivindica el beneficio de la Solicitud Provisional de los Estados Unidos de América nro. 63/458.343, presentada el 10 de abril de 2023, la cual se incorpora a la presente a modo de referencia en su totalidad.

Antecedentes

[0002] El campo de la presente divulgación está relacionado en general con el blindaje corporal y los portadores balísticos, y más específicamente con un sistema para dispersión de calor para usar con portadores balísticos para portar paneles y/o placas balísticos y portadores balísticos que tienen el sistema de dispersión de calor integrado en ellos.

[0003] Los portadores balísticos son prendas de protección táctica diseñadas para portar paneles balísticos de forma tal que el portador balístico y los paneles protegen a quien los viste del daño corporal producido por ataques y otros peligros. Uno de los más comunes portadores balísticos es un chaleco, comúnmente denominado “chaleco a prueba de balas”. Los portadores balísticos generalmente tienen bolsillos para insertar blindaje corporal para proteger a quien los viste contra la balística, tales como balas y esquirlas. Existen dos tipos principales de blindaje corporal: blindaje corporal con placas duras (a menudo denominadas “placas de blindaje”) el cual puede proteger a quien lo viste de la balística con muy alta energía de impacto tal como municiones de rifles; y blindaje corporal blando (sin placas) (a menudo denominado “paneles de blindaje”) el cual puede proteger a quien lo viste de municiones de pistolas y esquirlas pequeñas.

[0004] En vista de sus funciones como equipo de protección y para asegurar su

durabilidad, los portadores balísticos están hechos de materiales fuertes, reforzados, capaces de sostener el blindaje corporal y superar condiciones duras y ciclos de servicio rigurosos. Como resultado, el peso, el perfil y los materiales usados en los portadores balísticos y el blindaje corporal que portan, hacen que estas vestimentas tácticas sean poderosos aislantes térmicos que atrapan el calor corporal. En combinación con los ambientes y la actividad física a menudo asociados con su uso, la persona que viste dicho blindaje táctico a menudo experimenta calor excesivo, sudoración y la incomodidad asociada, o incluso queda exhausta por el calor y la deshidratación.

[0005] Con anterioridad se han divulgado algunos dispositivos para aliviar el calor y la transpiración provocados por el uso de portadores balísticos. Por ejemplo, se han descrito dispositivos que soplan un volumen de aire presurizado usando ventiladores eléctricos a través del portador balístico. No obstante, tales dispositivos son voluminosos e ineficientes, y requieren una fuente de energía eléctrica. También se han divulgado prendas pasivas que se usan debajo del portador balístico, pero tales prendas son relativamente ineficaces, y proporcionan a lo sumo un escaso alivio de la transpiración mediante la absorción de la humedad de la piel del usuario y no producen un efecto refrigerante. Por consiguiente, existe la necesidad de un diseño mejorado para proporcionar efectos refrigerantes para prendas tácticas tales como portadores balísticos del tipo de los chalecos antibalas y otras prendas tácticas y de protección.

Síntesis de la divulgación

[0006] Se divulga en la presente un portador balístico para portar blindaje balístico y que tiene un sistema de dispersión de calor que utiliza un panel térmico con capas múltiples que tiene alta conductividad térmica para transferir el calor entre

el portador balístico y el cuerpo del usuario hacia el exterior del blindaje balístico. El portador balístico se puede vestir y usar con o sin paneles balísticos insertados en el portador.

[0007] Por consiguiente, en una realización divulgada, un portador balístico comprende un portador configurado para ser vestido por el cuerpo de una persona o un animal, tal como un perro, un caballo, especialmente animales usados para imponer el orden público y . *[sic]* El portador tiene un primer panel corporal para cubrir una parte del cuerpo del usuario. Como se usa en la presente, el término “usuario” se refiere tanto a una persona como a cualquier animal tal como un perro, un caballo, etc. Por ejemplo, el primer panel corporal puede ser una porción anterior configurada para cubrir una parte anterior del usuario, tal como la porción anterior de un chaleco balístico.

El primer panel corporal tiene un panel interior configurado para descansar contra el cuerpo y un panel exterior opuesto al panel interior y que es exterior al panel interior. El panel interior y el panel exterior están configurados para formar un bolsillo o alojamiento para sostener un panel balístico. Por ejemplo, el panel balístico puede ser un blindaje corporal tal como una placa de blindaje o un panel de blindaje. El panel interior tiene una superficie interna que se enfrenta con el cuerpo del usuario y una superficie externa que mira en sentido opuesto al cuerpo y forma un lado interno del bolsillo. El panel exterior tiene una superficie externa que mira en sentido opuesto al cuerpo, y una superficie interna que mira hacia el cuerpo y forma un lado externo del bolsillo opuesto al lado interno del bolsillo. El bolsillo tiene una abertura para insertar el panel balístico y un cierre para cerrar la abertura. Por ejemplo, el cierre puede ser una longitud de sujetadores velcro, a presión, botones, o similares. En otro aspecto, la abertura está sobre un lateral del portador balístico (es decir, ni

en la parte inferior ni en la parte superior del portador) de forma tal que un panel balístico se inserta en el bolsillo desde el costado.

[0008] Un panel térmico se une al primer panel corporal dentro del bolsillo. El panel térmico comprende una primera capa de material textil que absorbe el calor que comprende moléculas de cambio de fase (PCM, por sus siglas en inglés), y una segunda capa que se aplica a la primera capa y la cubre. La segunda capa comprende una película de transferencia de calor que comprende grafito orientado con alta conductividad térmica. El panel térmico tiene una primera porción de panel térmico unida con la superficie exterior del panel interior con el lado del material textil que absorbe el calor del panel térmico contra la superficie externa del panel interior. La primera porción de panel térmico está posicionada de forma tal que está sobre un interior de un panel balístico insertado en el bolsillo. La primera porción de panel térmico cubre una parte sustancial de la superficie externa del panel interior. Como se usa en la presente, la expresión “parte sustancial” significa al menos 75% o más.

[0009] El panel térmico también se curva próximo a un borde del bolsillo y tiene una segunda porción de panel térmico que se extiende a lo largo de una porción de la superficie interna del panel exterior de forma tal que la segunda porción de panel térmico está sobre un exterior de un panel balístico insertado en el bolsillo. En un aspecto, la segunda porción de panel térmico se extiende a lo largo al menos 10%, o al menos 20%, o al menos 25%, o al menos 30%, o al menos 40%, o al menos 50% de la longitud total del bolsillo o de la superficie interna del panel exterior, o de la longitud total de un panel balístico que se ha de insertar en el bolsillo. De esta forma, el panel térmico absorbe el calor expelido por el cuerpo, disipa el calor, y transporta el calor desde la primera porción de panel térmico cerca del cuerpo hacia

la segunda porción de panel térmico ubicada próxima al panel exterior del bolsillo, es decir, sobre una parte exterior de un panel balístico insertado en el bolsillo.

[0010] Por consiguiente, cuando se lo coloca en un cuerpo, el portador balístico proporciona un efecto refrigerante y alivia la acumulación de calor corporal dentro del portador transfiriendo el calor hacia afuera desde el interior del portador balístico y disipando el calor en el exterior del portador y hacia el medioambiente.

[0011] En otro aspecto, el panel térmico puede incluir además una capa de soporte aplicada en el otro lado de la película de transferencia de calor opuesto al material textil que absorbe calor, y cubriéndolo. La capa de soporte puede comprender una tela que proporcione una superficie adecuada para unir el panel térmico con otros materiales.

[0012] En inclusive otro aspecto, el panel interior puede comprender un tejido de malla. En aún otro aspecto, el panel interior puede además comprender una capa difusora de calor dispuesta sobre una superficie interna del tejido de malla de cara al lado del cuerpo del portador. La capa difusora de calor comprende una tela que tiene una malla de PCM aplicada en la tela para absorber el calor expelido por el cuerpo y esparcir el calor sobre el área de la tela. El calor disipado sobre la capa difusora de calor luego migra hacia el panel térmico, y es transportado a través del panel térmico como se describió anteriormente. Alternativamente, el panel interior puede comprender la capa difusora de calor sin un tejido de malla.

[0013] En inclusive otro aspecto, el panel exterior puede comprender un tejido de malla. El tejido de malla puede ser igual o similar al tejido de malla del panel interior. Por ejemplo, el tejido de malla que forma el panel exterior puede formar al menos una porción de la superficie más exterior del portador balístico. En aún otro aspecto, el panel exterior puede además comprender una capa difusora de calor dispuesta

sobre una superficie interna del tejido de malla de cara al lado del cuerpo del portador. La capa difusora de calor puede ser de un material igual o similar al de la capa difusora de calor sobre el panel interior. En otros aspectos, materiales, capas y/o dispositivos adicionales se pueden unir a una superficie exterior del tejido de malla del panel exterior, tales como sujetadores velcro, sistemas de transporte “PALS” (sistema de escalera de sujeción de bolsas, por sus siglas en inglés) o “MOLLE” (equipo modular de transporte de carga ligero, por sus siglas en inglés), tiras, etc.

[0014] En otro aspecto, el portador balístico es una prenda que se usa en el torso, tal como un chaleco, una chaqueta, o similar, y el primer panel corporal es una porción anterior de la vestimenta configurada para cubrir la parte anterior del torso del usuario. En inclusive otro aspecto, el portador balístico además comprende un segundo panel corporal que es una porción posterior de la vestimenta configurada para cubrir la parte posterior del torso del usuario. El segundo panel corporal está unido con el primer panel corporal mediante un par de tiras sobre los hombros. El portador también puede tener tiras laterales para unir una porción inferior del primer panel corporal con una porción inferior del segundo panel corporal. Las tiras laterales se pueden sujetar de forma desmontable utilizando sujetadores velcro, a presión, botones, etc.

[0015] En inclusive otro aspecto, el segundo panel corporal también puede estar configurado para portar un panel balístico posterior y también para tener el sistema de dispersión de calor al igual que el primer panel corporal. El sistema de dispersión de calor del segundo panel corporal puede ser igual o diferente del primer panel corporal, y puede incluir uno cualquiera o más de los aspectos y las características del sistema de dispersión de calor descrito en la presente.

[0016] La abertura para insertar el panel balístico anterior puede estar en el lateral del portador balístico del primer panel corporal y está orientado verticalmente con la abertura. De manera similar, la abertura para insertar el panel balístico posterior está en el lateral del portador balístico del primer panel corporal y está orientado verticalmente con la abertura. En otro aspecto, la abertura para insertar el panel balístico anterior puede estar en lado inferior del portador balístico del primer panel corporal de forma tal que el panel se inserta deslizando el panel hacia arriba dentro del respectivo bolsillo del portador. De manera similar, la abertura para insertar el panel balístico posterior puede estar en lado inferior del portador balístico del primer panel corporal de forma tal que el panel se inserta deslizando el panel hacia arriba dentro del respectivo bolsillo del portador.

[0017] En inclusive otro aspecto, el portador balístico puede incluir un panel balístico anterior insertado en el bolsillo del primer panel corporal, y/o un panel balístico posterior insertado en el segundo panel corporal, de existir. El o los paneles balísticos pueden ser cualquier panel balístico adecuado, tal como una placa de blindaje, un panel de blindaje, o similar.

[0018] En inclusive otro aspecto, el portador balístico puede incluir además una prenda interior configurada para ser vestida por un usuario de forma tal que una superficie exterior de la prenda interior esté en contacto con la sección interior del primer panel corporal y/o la sección interior del segundo panel corporal. La prenda interior puede comprender moléculas de material de cambio de fase para absorber y difundir el calor corporal. Por ejemplo, la prenda interior puede funcionar como la capa difusora de calor descrita anteriormente. En tal caso, la superficie exterior de la prenda interior está en contacto con la superficie interna de la sección interna, la cual puede ser una capa de malla interna del portador.

Breve descripción de los dibujos

[0019] Los dibujos ilustran el diseño y la utilidad de diversos aspectos de la divulgación, en los cuales se hace referencia a elementos similares mediante números de referencia comunes. Estos dibujos no están necesariamente realizados a escala. Para apreciar mejor cómo se obtienen las ventajas mencionadas anteriormente y otras ventajas y objetivos, se ofrecerá una descripción más detallada de la divulgación, la cual se ilustra en los dibujos adjuntos. Estos dibujos solo describen aspectos de la divulgación a modo de ejemplo, con fines ilustrativos y para facilitar la descripción detallada a continuación, y por lo tanto, no deben considerarse limitaciones a su alcance.

[0020] La FIG. 1 es una vista anterior en perspectiva de un portador de acuerdo con un ejemplo divulgado en la presente.

[0021] La FIG. 2 es una vista posterior en perspectiva del portador de la Fig. 1.

[0022] La FIG. 3 es una vista lateral en perspectiva del portador de la Fig. 1 con la abertura lateral abierta para observar los componentes internos del portador.

[0023] La FIG. 4 es una vista esquemática en corte transversal del panel anterior del portador a lo largo de la línea 4-4 de la FIG. 1.

[0024] La FIG. 5 es una vista esquemática en corte transversal del panel posterior del portador a lo largo de la línea 5-5 de la FIG. 1.

[0025] La FIG. 6 es una vista esquemática en corte transversal del panel térmico que se muestra en las FIGS. 4 y 5.

[0026] La FIG. 7 es una vista anterior en perspectiva de una persona que viste el portador de la FIG. 1.

Descripción detallada de la divulgación

[0027] Esta memoria descriptiva describe realizaciones, aspectos y aplicaciones

de la divulgación a modo de ejemplo. Sin embargo, la divulgación no se limita a tales realizaciones, aspectos y aplicaciones a modo de ejemplo ni a la manera en la cual tales realizaciones, aspectos y aplicaciones a modo de ejemplo funcionan o se describen en la presente. Asimismo, las figuras pueden mostrar vistas simplificadas o parciales, y las dimensiones de los elementos en las figuras pueden estar exageradas o fuera de proporción. Además, en todas las figuras los elementos con estructuras o funciones similares están representados por números de referencia similares. Además, un aspecto ilustrado no necesariamente tiene todas las características o ventajas que se muestran. Una característica o una ventaja descrita conjuntamente con un aspecto particular no está necesariamente limitada a ese aspecto, y se puede poner en práctica en cualquier otro aspecto inclusive si no está así ilustrado.

[0028] La presente memoria descriptiva está dirigida a un portador balístico para transportar blindaje balístico que tiene un sistema de dispersión de calor. El sistema de dispersión de calor incluye un panel térmico con capas múltiples que tiene una elevada conductividad térmica para conducir el calor entre el portador balístico y el cuerpo del usuario hacia el exterior del blindaje balístico y disipándolo desde el usuario hacia el medioambiente. Por consiguiente, el portador balístico proporciona un efecto refrigerante, evitando la acumulación del calor corporal y la transpiración. Se logra este objetivo al transferir calor entre el cuerpo del usuario y el portador balístico y transmitir el calor hacia el exterior, liberando efectivamente el calor en el entorno circundante.

[0029] Con referencia ahora a las FIGS. 1-7, se ilustra un ejemplo de un sistema de portador balístico 100 (también denominado portador balístico 100) para transportar blindaje balístico y que tiene un sistema de dispersión de calor para que

el calor migre desde una persona 150 (es decir, el usuario) que viste el portador 100. Si bien los dibujos y la descripción relacionada están dirigidos a un portador balístico para una persona, se entiende que la presente invención no está limitada a portadores balísticos para una persona sino que también incluye portadores balísticos para animales tales como un perro, un caballo, etc. Como se muestra en las FIGS. 1, 2 y 5, el portador balístico 100 a modo de ejemplo tiene la forma de un chaleco blindado táctico (comúnmente denominado chaleco a prueba de balas) que tiene un panel corporal anterior 102 (también denominado “primer panel corporal 102”) y un panel corporal posterior 104 (también denominado “segundo panel corporal 104”). Si bien el portador balístico 100 a modo de ejemplo divulgado en la presente es un chaleco blindado, se entiende que el portador balístico 100 puede ser cualquier prenda o porción de una prenda adecuada configurada para ser vestida en una parte del cuerpo de una persona para proteger dicha parte del cuerpo. Por ejemplo, el portador balístico puede ser una chaqueta táctica, una camisa táctica, pantalones tácticos, un cinturón táctico, una pollera táctica, etc. En el caso de animales, el portador balístico puede ser un chaleco canino para un perro, o un chaleco equino para un caballo, etc.

[0030] Como se ilustra en la FIG. 5, el portador balístico 100 está configurado para ser vestido como un chaleco sobre el torso 154 del cuerpo 152 de la persona 150. El panel corporal anterior 102 está configurado para cubrir la parte anterior del torso de la persona 150, y el panel corporal posterior 104 está configurado para cubrir la parte posterior del torso de la persona 150. El panel corporal anterior 102 y el panel corporal posterior 104 están unidos de forma extraíble en la parte superior de los respectivos paneles 102, 104 por un par de tiras sobre los hombros 106. Las tiras 106 se pueden unir de forma extraíble usando los sujetadores respectivos 108,

tales como sujetadores velcro, a presión, botones o similares. Alternativamente, un lado de las tiras 106 puede estar unido de forma permanente con uno del panel corporal anterior 102 o el panel corporal posterior 104, tal como cosido, adherido, etc., mientras que el otro lado de las tiras 106 está unido de forma extraíble con el otro del panel corporal anterior 102 o el panel corporal posterior 104. El portador 100 también tiene tiras laterales 107 para unir una porción inferior del panel corporal anterior 102 con una porción inferior del panel corporal posterior 104. Las tiras laterales 107 se pueden sujetar de forma desmontable utilizando sujetadores velcro, a presión, botones, etc.

[0031] El panel corporal anterior comprende un panel interior 114a y un panel exterior 116a los cuales están unidos entre sí alrededor de sus respectivos bordes periféricos de forma tal que se forma un bolsillo 110a para sostener un panel balístico anterior 112a entre el panel interior 114a y el panel exterior 116a, como se muestra mejor en las FIGS. 3 y 4. El panel corporal posterior 104 tiene un bolsillo similar 110b para sostener un panel balístico posterior 112b, el bolsillo 110a está formado entre un panel interior 114a y un panel exterior 116a. El panel interior 114a y el panel exterior 116a pueden estar formados por un tejido de malla u otro material textil adecuado. El panel interior 114a tiene una superficie interna 118a que se enfrenta con el cuerpo 152 (más específicamente, la parte anterior del cuerpo 152) y una superficie externa 120a que mira en sentido opuesto al cuerpo 152 y forma el lado interno del bolsillo 110a. El panel exterior 116a tiene una superficie interna 122a que está orientada hacia el cuerpo de la persona 150 y una superficie externa 124a que mira en sentido opuesto al cuerpo 152.

[0032] El bolsillo 110a tiene una abertura 144a para insertar el panel balístico anterior 112 en el bolsillo 110a. La abertura 144a está en el borde lateral del panel

corporal anterior 102 y está orientada verticalmente a lo largo del borde del panel corporal anterior (la abertura 144a puede estar en cualquiera de los lados del panel corporal anterior 102). La abertura 144a está formada por una porción de los bordes laterales opuestos del panel interior 114a y el panel exterior 116a los cuales están sujetos entre sí de forma desmontable por un cierre 146a. El cierre 146a comprende sujetadores velcro que se contactan extendiéndose a lo largo de una longitud de los bordes laterales del panel interior 114 y el panel exterior 116a. El cierre 146a puede comprender cualquier otro sujetador adecuado tal como botones, sujetadores de presión, lazos, broches, o similares.

[0033] Un panel térmico 126a está unido con el primer panel corporal 102 dentro del bolsillo 110a adyacente al panel interior 114a y en su exterior. Por ejemplo, el panel térmico 126a puede estar unido con el panel interior 114a tal como mediante una costura, o adherido o mediante otra forma adecuada de unión. El panel térmico 126a tiene una primera porción de panel térmico 128a la cual se extiende desde las proximidades de la parte superior del bolsillo 110a y el panel interior 114a, hacia abajo hasta las proximidades del borde inferior del bolsillo 110a y el panel interior 114a, de forma tal que la primera porción de panel térmico 128a está configurada para ser posicionada en el interior del panel balístico 112a. La primera porción de panel térmico 128a cubre una parte sustancial (es decir, al menos 75% o más) de la superficie externa 120a del panel interior 114a. Alternativamente, la primera porción de panel térmico 128a puede cubrir al menos 70% o más, o 65% o más, o 55% o más de la superficie externa 120a del panel interior 114a.

[0034] El panel térmico 126a luego se curva alrededor de la parte inferior del bolsillo 110a hacia la parte anterior del bolsillo 110a, y luego una segunda porción de panel térmico 130a del panel térmico 126a, se extiende hacia arriba a lo largo de

la superficie interna 112a del panel exterior 116a de forma tal que la segunda porción de panel térmico 130a está configurada para ser posicionada en el exterior del panel balístico 112a. Existe un espacio entre la primera porción de panel térmico 128a y la segunda porción de panel térmico 130a para insertar el panel balístico 112a. La segunda porción de panel térmico 130a se extiende a lo largo de una longitud de la superficie interna 112a del panel exterior 116 y una longitud del panel balístico 126a. Por ejemplo, la segunda porción de panel térmico 130a se extiende a lo largo al menos 10%, o al menos 20%, o al menos 25%, o al menos 30%, o al menos 40%, o al menos 50% de la longitud total de la superficie interna 122a del panel exterior 116a; o de la longitud total del bolsillo 110a; o de la longitud total del panel balístico 112a. La segunda porción de panel térmico 130a expelle el calor absorbido por la primera porción de panel térmico 128a y conducido por y a lo largo del panel térmico hacia la segunda porción de panel térmico 130a. En otras palabras, la primera porción de panel térmico 128a absorbe el calor expelido por el cuerpo, disipa el calor, y conduce el calor desde la primera porción de panel térmico 128a cerca del cuerpo y del interior del panel balístico 112a hacia la segunda porción de panel térmico 130a adyacente al panel exterior 116a y al exterior del panel balístico 112a. Como resultado, el panel térmico 126a transfiere de manera efectiva el calor corporal alrededor del panel balístico con alto aislamiento térmico 112a y expelle el calor hacia el medioambiente. La transferencia del calor corporal mediante el panel térmico 126a proporciona un efecto refrigerante al cuerpo 152 y evita la acumulación del calor corporal dentro del portador 100 al conducir hacia afuera el calor del interior del portador balístico próximo al cuerpo, disipando el calor hacia el exterior del portador 100 y al aire circundante. La segunda porción de panel térmico 130a puede no estar unida o estar suelta de forma tal que el panel térmico

126a se puede envolver alrededor del extremo inferior del panel balístico anterior 112a. Alternativamente, la segunda porción de panel térmico 130a puede estar unida al panel exterior 116a mediante una costura, o adherida o mediante otra forma adecuada de unión.

[0035] Con referencia a la FIG. 6, el panel térmico 126a es un panel con capas múltiples que tiene una alta conductividad térmica para la transferencia eficiente de calor. El panel térmico 126a incluye una primera capa 132 de material textil absorbente de calor (HAT, por sus siglas en inglés) que comprende moléculas de cambio de fase (PCM) (por ejemplo, materiales de cambio de fase microencapsulados (mPCM)). El material textil absorbente de calor está configurado para absorber eficientemente energía calórica a aproximadamente 28 °C (82 °F) y disipar y esparcir el calor sobre el área del material textil absorbente de calor. El panel térmico también tiene una segunda capa 134 aplicada a la primera capa 132 y cubriéndola. La segunda capa comprende una película de transferencia de calor (HTF) que comprende grafito altamente orientado configurado para conducir energía calórica de forma eficiente y direccionada. El panel térmico 126a también puede tener una tercera capa 136 (también denominada “capa de soporte 136”) que comprende una tela de soporte aplicada al otro lado de la segunda capa 134 opuesta a la primera capa 132 y que la recubre. La capa de soporte 136 está configurada para proteger la segunda capa 134 que comprende la película de transferencia de calor y para proporcionar una superficie de adecuada para la unión del panel térmico 126a con otros materiales, tales como el panel interior 114a. A modo de ejemplo no limitante, el panel térmico 126 puede comprender material térmico en láminas ECLIPSYS™ comercializado por Alexium Inc., Greer, Carolina del Sur, EE.UU.

[0036] Volviendo a la FIG. 4, el panel interior 114a puede además comprender una capa interna difusora de calor 138a dispuesta sobre la superficie interna 118a del panel interior 114a (por ejemplo, sobre la superficie interna del tejido de malla que forma parte del panel interior 114). La capa interna difusora de calor 138a comprende una tela 140 que tiene una malla 142 de PCM aplicada en la tela 140 para absorber el calor expelido por el cuerpo 152 y distribuir el calor sobre el área de la capa difusora de calor 138a. La capa interna difusora de calor 138a también puede comprender aluminio u otro material que tenga alta conductividad térmica, incrustado en la malla 142 o de otra forma distribuido sobre la capa interna difusora de calor 138a. Por ejemplo, la capa interna difusora de calor 138a puede comprender el material XELERATE™ comercializado por OUTLAST® GmbH en Alemania, el cual es una tela que tiene una malla de PCM y aluminio. La capa interna difusora de calor 138a está unida al tejido de malla u otro material textil que forma el panel interior 114a mediante costura, adherida o de otra forma sujeta a la capa interna 138a.

[0037] Haciendo referencia ahora a la FIG. 5, el panel corporal posterior 104 es muy similar en la construcción al panel corporal anterior 102, e incluye la totalidad de los mismos componentes y características del panel corporal anterior 102 y está dispuesto de la misma manera, incluyendo un panel interior 114b, un panel exterior 116b, un bolsillo 110b, una abertura 144b, un cierre 146b, un panel térmico 126b, una primera porción de panel térmico 128b, una segunda porción de panel térmico 130b, y una capa interna difusora de calor 138b, etc. Por consiguiente, la descripción respecto del panel corporal anterior 102 y sus componentes se aplica a la descripción del panel corporal posterior 104.

[0038] Como se ilustra en la FIG. 7, el sistema de portador balístico 100 puede

además comprender una prenda interior 160 configurada para ser vestida por la persona 150 de forma tal que la superficie externa de la prenda interior está en contacto con los paneles interiores 114a, 114b del panel corporal anterior 102 y del panel corporal posterior 104, respectivamente. La prenda interior 160 puede ser una camisa, por ejemplo, una camiseta, u otra prenda interior vestida sobre la parte del cuerpo sobre la cual se ha diseñado vestir el portador balístico 100. La prenda interior 160 puede comprender PCM iguales o similares a los de las capas internas difusoras de calor 138a, 138b, para absorber y disipar el calor generado por el cuerpo 152.

[0039] A continuación se describirá el uso y la funcionalidad del sistema de portador balístico 100. Generalmente, los paneles balísticos anterior y posterior 112a, 112b se insertan en primer lugar en el panel corporal anterior 102 y el panel balístico posterior 104, respectivamente. Por ejemplo, el panel balístico anterior 112a se inserta en el bolsillo 110a a través de la abertura 144a soltando el cierre 146a, y deslizando el panel balístico anterior 112a dentro del bolsillo 110a de forma tal que el panel balístico anterior 112a está entre la primera y la segunda porción de panel térmico 128a, 130a, con la primera porción de panel térmico 128a directamente hacia el interior del panel balístico anterior 112a y la segunda porción de panel térmico 130a está directamente hacia el exterior del panel balístico anterior 112a. Luego se cierra el cierre para cerrar la abertura 144a. De manera similar, el panel balístico posterior 112b se inserta en el bolsillo 110b a través de la abertura 144b soltando el cierre 146b, y deslizando el panel balístico posterior 112b dentro del bolsillo 110b de forma tal que el panel balístico posterior 112b está entre la primera y la segunda porción de panel térmico 128b, 130b, con la primera porción de panel térmico 128b directamente hacia el interior del panel balístico posterior

112b y la segunda porción de panel térmico 130b está directamente hacia el exterior del panel balístico posterior 112b. El portador balístico 100 ahora está listo para que la persona 150 se lo ponga.

[0040] La persona 150 se puede poner primero la prenda interior 160 para proporcionar disipación térmica adicional. Luego, con las tiras para los hombros 106 unidas a ambos, el panel corporal anterior 102 y el panel corporal posterior 104, y las tiras laterales 107 sueltas, el portador 100 se coloca sobre la cabeza de la persona de forma que las tiras para los hombros 106 estén posicionadas sobre los hombros del cuerpo de la persona 152 con el panel corporal anterior 102 descansando sobre la parte anterior del torso y cubriéndola y el panel corporal posterior 104 descansando sobre la parte posterior del torso y cubriéndola. Luego se ajustan las tiras laterales 107.

[0041] El sistema de dispersión de calor funciona para absorber y transferir el calor corporal fuera del cuerpo 152. El calor expelido por el cuerpo primero es absorbido y disipado sobre el área por la prenda interior 160, si la persona 150 la tiene puesta. En el caso del panel corporal anterior 102, el calor es luego absorbido por la capa interna difusora de calor 138a y dispersado sobre el área de la capa interna difusora de calor 138. El calor luego migra hacia afuera y es absorbido por la primera porción de panel térmico 128a del panel térmico 126a. El panel térmico 126a dispersa el calor en el panel térmico 126a y transfiere el calor a lo largo de la longitud del panel térmico, alrededor del panel balístico anterior 112a hacia la segunda porción del panel térmico 130a frente al panel balístico anterior 112a. El calor luego se transfiere desde la segunda porción de panel térmico a través del panel exterior 116a (el cual puede ser un tejido de malla) y hacia el aire en el entorno circundante. La disipación del calor corporal mediante el panel corporal

posterior 104 es la misma. Por consiguiente, el portador balístico 100 proporciona un efecto refrigerante y alivia la acumulación de calor en el cuerpo dentro del portador 100 transfiriendo el calor hacia afuera desde el interior del portador balístico 100 y disipando el calor en el exterior del portador 100 y hacia el medioambiente.

[0042] Si bien se han mostrado y descripto realizaciones particulares, se ha de entender que no se considera que la descripción precedente es un límite al alcance de estas realizaciones. Si bien se han divulgado y descripto en la presente realizaciones y variaciones de los numerosos aspectos de la invención, tal divulgación se proporciona únicamente a los fines de explicar e ilustrar la invención. Por lo tanto, se pueden realizar diversos cambios y modificaciones sin apartarse del alcance de las reivindicaciones. Por ejemplo, no todos los componentes descriptos en las realizaciones son necesarios, y la invención puede incluir cualquier combinación adecuada de los componentes descriptos, y las formas generales y los tamaños relativos de los componentes de la invención se pueden modificar. Por consiguiente, las realizaciones están destinadas a ejemplificar alternativas, modificaciones y equivalentes que pueden estar dentro del alcance de las reivindicaciones. Por lo tanto, no se deberá limitar la invención, excepto a las reivindicaciones a continuación, y sus equivalentes.

Lo que se reivindica es:

1. Un portador balístico que tiene un sistema de dispersión de calor, el portador balístico comprende:

un portador configurado para ser vestido por el cuerpo de un usuario, el portador tiene un primer panel corporal para cubrir una parte del cuerpo, el primer panel corporal comprende:

un panel interior configurado para apoyarse contra el cuerpo y un panel exterior que es externo y opuesto al panel interior, el panel exterior unido con el panel interior por lo cual forman un bolsillo entre el panel interior y el panel exterior para sostener un panel balístico, el panel interior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo, el panel exterior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo;

un panel térmico unido al primer panel corporal dentro del bolsillo, el panel térmico tiene un primer térmico *[sic]* que se une y cubre al menos una parte de la superficie interna del panel interior y posicionado de forma tal que está orientado hacia un interior de un panel balístico cuando se inserta en el bolsillo, el panel térmico se curva próximo a un borde del bolsillo hacia una segunda porción de panel térmico, la segunda porción de panel térmico se extiende a lo largo de una porción de la superficie interna del panel exterior de forma tal que la segunda porción de panel térmico está hacia un exterior de un panel balístico cuando se inserta en el bolsillo; y

donde el panel térmico es un material con capas múltiples que tiene alta conductividad térmica.

2. El portador balístico de la reivindicación 1, donde el panel térmico comprende una primera capa de material textil que absorbe el calor que comprende moléculas de cambio de fase (PCM), y una segunda capa que se aplica y cubre un primer lado de la primera capa, la segunda capa comprende una película de transferencia de calor que comprende grafito orientado.

3. El portador balístico de la reivindicación 2, donde el panel térmico además comprende una capa de soporte que se aplica y cubre un segundo lado de la película de transferencia de calor opuesto al primer lado.

4. El portador balístico de la reivindicación 1, donde la primera porción de panel térmico cubre al menos 75% o más de la superficie externa del panel interior.

5. El portador balístico de la reivindicación 1, donde la primera porción de panel térmico cubre al menos 55% o más de la superficie externa del panel interior.

6. El portador balístico de la reivindicación 1, donde la segunda porción de panel térmico se extiende a lo largo de al menos 25% de una longitud total del bolsillo.

7. El portador balístico de la reivindicación 1, donde el panel interior comprende un tejido de malla, y el panel exterior comprende un tejido de malla.

8. El portador balístico de la reivindicación 7, donde el panel interior además comprende una capa interna difusora de calor unida con una superficie

interna del tejido de malla, y el panel exterior además comprende una capa externa difusora de calor unida con una superficie externa del tejido de malla.

9. El portador balístico de la reivindicación 8, donde cada una de la capa interna difusora de calor y la capa externa difusora de calor comprenden una tela que tiene una malla de moléculas de cambio de fase (PCM) y material metálico aplicado a la tela.

10. El portador balístico de la reivindicación 1, donde el bolsillo tiene una abertura para insertar el panel balístico y un cierre desmontable para abrir y cerrar la abertura.

11. El portador balístico de la reivindicación 10, donde la abertura está en un borde lateral del panel corporal anterior y está formado por una porción de bordes laterales opuestos del panel interior y el panel exterior los cuales están sujetos entre sí de forma desmontable por el cierre.

12. El portador balístico de la reivindicación 1, donde el portador balístico es una prenda que se usa en el torso seleccionada del grupo que comprende: un chaleco y una chaqueta.

13. El portador balístico de la reivindicación 1, que además comprende un panel balístico insertado en el bolsillo.

14. El portador balístico de la reivindicación 1, donde el portador es un

chaleco, el primer panel corporal es una porción anterior del chaleco configurada para cubrir la parte anterior del torso del usuario, y el portador además comprende:

un segundo panel corporal el cual es una porción posterior del chaleco y está configurado para cubrir la parte posterior del torso del usuario, el segundo panel corporal unido con el primer panel corporal mediante tiras sobre los hombros, el segundo panel corporal comprende:

un panel interior configurado para apoyarse contra el cuerpo y un panel exterior que es externo y opuesto al panel interior, el panel exterior unido con el panel interior por lo cual forman un bolsillo entre el panel interior y el panel exterior para sostener un panel balístico, el panel interior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo, el panel exterior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo;

un panel térmico unido al primer panel corporal dentro del bolsillo, el panel térmico tiene un primer térmico *[sic]* que se une y cubre al menos una parte de la superficie interna del panel interior y posicionado de forma tal que está orientado hacia un interior de un panel balístico cuando se inserta en el bolsillo, el panel térmico se curva próximo a un borde del bolsillo hacia una segunda porción de panel térmico, la segunda porción de panel térmico se extiende a lo largo de una porción de la superficie interna del panel exterior de forma tal que la segunda porción de panel térmico está hacia un exterior de un panel balístico cuando se inserta en el bolsillo; y

donde el panel térmico es un material con capas múltiples que tiene alta conductividad térmica.

15. Un portador balístico que tiene un sistema de dispersión de calor, el portador balístico comprende:

un portador en la forma de un chaleco configurado para ser usado sobre un torso de un cuerpo de un usuario, el portador tiene un primer panel corporal que forma una porción anterior del chaleco y configurado para cubrir la parte anterior del torso del usuario, y un segundo panel corporal que forma una porción posterior del chaleco y configurado para cubrir la parte posterior del torso del usuario, el segundo panel corporal unido con el primer panel corporal mediante tiras sobre los hombros; el primer panel corporal comprende:

un panel interior configurado para apoyarse contra el cuerpo y un panel exterior que es externo y opuesto al panel interior, el panel exterior unido con el panel interior por lo cual forman un bolsillo entre el panel interior y el panel exterior para sostener un panel balístico, el panel interior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo, el panel exterior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo;

un panel térmico unido al primer panel corporal dentro del bolsillo, el panel térmico tiene un primer térmico *[sic]* que se une y cubre al menos una parte de la superficie interna del panel interior y posicionado de forma tal que está orientado hacia un interior de un panel balístico cuando se inserta en el bolsillo, el panel térmico se curva próximo a un borde del bolsillo hacia una segunda porción de panel térmico, la segunda porción de panel térmico se extiende a lo largo de una porción de la superficie interna del panel exterior de forma tal que la segunda porción de panel térmico está hacia un exterior de un panel balístico cuando se inserta en el bolsillo; y

donde el panel térmico es un material con capas múltiples que tiene alta conductividad térmica;

el segundo panel corporal comprende:

un panel interior configurado para apoyarse contra el cuerpo y un panel exterior que es externo y opuesto al panel interior, el panel exterior unido con el panel interior por lo cual forman un bolsillo entre el panel interior y el panel exterior para sostener un panel balístico, el panel interior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo, el panel exterior tiene una superficie interna de cara al cuerpo y una superficie externa en sentido opuesto al cuerpo;

un panel térmico unido al primer panel corporal dentro del bolsillo, el panel térmico tiene un primer térmico *[sic]* que se une y cubre al menos una parte de la superficie interna del panel interior y posicionado de forma tal que está orientado hacia un interior de un panel balístico cuando se inserta en el bolsillo, el panel térmico se curva próximo a un borde del bolsillo hacia una segunda porción de panel térmico, la segunda porción de panel térmico se extiende a lo largo de una porción de la superficie interna del panel exterior de forma tal que la segunda porción de panel térmico está hacia un exterior de un panel balístico cuando se inserta en el bolsillo; y

donde el panel térmico es un material con capas múltiples que tiene alta conductividad térmica.

16. El portador balístico de la reivindicación 15, donde el panel térmico de cada uno del primer panel corporal y el segundo panel corporal comprende una primera capa de material textil que absorbe el calor que comprende moléculas de

cambio de fase (PCM), y una segunda capa que se aplica y cubre un primer lado de la primera capa, la segunda capa comprende una película de transferencia de calor que comprende grafito orientado.

17. El portador balístico de la reivindicación 15, donde el panel térmico de cada uno del primer panel corporal y el segundo panel corporal además comprende una capa de soporte que se aplica y cubre un segundo lado de la película de transferencia de calor opuesto al primer lado.

18. El portador balístico de la reivindicación 15, donde la primera porción de panel térmico de cada uno del primer panel corporal y el segundo panel corporal cubre al menos 75% o más de la respectiva superficie externa del panel interior.

19. El portador balístico de la reivindicación 15, donde la primera porción de panel térmico de cada uno del primer panel corporal y el segundo panel corporal cubre al menos 55% o más de la respectiva superficie externa del panel interior.

20. El portador balístico de la reivindicación 15, donde la segunda porción de panel térmico de cada uno del primer panel corporal y el segundo panel corporal se extiende a lo largo de al menos 25% de una longitud total del bolsillo.

Resumen

Un portador de blindaje balístico que tiene un sistema de dispersión de calor para que el calor entre el portador balístico y el cuerpo de un usuario migre hacia afuera. El portador balístico incluye un portador que tiene un bolsillo para sostener un panel balístico y un panel térmico que tiene una alta conductividad térmica dispuestos dentro del bolsillo. El panel térmico se envuelve alrededor del bolsillo de forma tal que el panel térmico tiene una primera porción de panel térmico configurada para ser posicionada en el interior del panel balístico y una segunda porción de panel térmico configurada para ser posicionada en el exterior del panel balístico. El panel térmico hace migrar el calor del cuerpo del usuario que se encuentra entre el portador y el cuerpo hacia afuera del portador y disipa el calor hacia el medioambiente.

[Aparecen a continuación siete (7) láminas de figuras sin leyendas.]

[En la página siguiente.]

Información acerca del inventor:

Inventor(es)

Inventor 1 Eliminar

Nombre Legal:

Prefijo: *[En blanco.]*

Nombre: Jakub. **Segundo nombre:** *[En blanco.]* **Apellido:** Dabrowka. **Sufijo:** *[En blanco.]*

Información acerca de la residencia (seleccionar una opción) ☒ Residente de los EE.UU. ☐ No residente de los EE.UU. ☐ Servicio Militar activo de los EE.UU.

Ciudad: Irvine. **Estado/Provincia:** CA. **País de residencia ⁱ:** EE.UU.

Dirección postal del inventor:

Dirección 1: 111 Sculpture

Dirección 2: *[En blanco.]*

Ciudad: Irvine.

Estado/Provincia: CA

Código postal: 92618.

País ⁱ: EE.UU.

Se deben mencionar todos los inventores. Se pueden generar bloques para información de inventores adicionales dentro de este formulario seleccionando el botón Agregar. Agregar

Información acerca del solicitante:

El proporcionar información acerca de la cesión en esta sección no sustituye el cumplimiento de cualquiera de los requisitos establecidos en la parte 3 del Título 37 del CFR que exige el registro de una cesión por parte de la Oficina.

Solicitante 1

[Eliminar](#)

No deberá completarse esta sección si el solicitante es el inventor (o el/los inventor/es conjunto/s restante/s en virtud del art. 1.45 del Título 37 del CFR).→ La información que se ha de suministrar en esta sección es el nombre y el domicilio del representante legal que es el solicitante en virtud del art. 1.43 del Título 37 del CFR; o el nombre y el domicilio del cesionario, la persona a quien el inventor está obligado a efectuar una cesión de la invención, o la persona que de otro modo demuestra el derecho de propiedad suficiente en la materia que es la solicitante en virtud del art. 1.46 del Título 37 del CFR. Si el solicitante es un solicitante en virtud del art. 1.46 del Título 37 del CFR (cesionario, persona a quien el inventor está obligado a efectuar una cesión, o la persona que demuestra el derecho de propiedad suficiente) conjuntamente con uno o varios inventores conjuntos, entonces el/los inventor/es conjunto/s quienes también son el solicitante deberán identificarse en esta sección.

[Borrar](#)

☐ Cesionario. ☐ Representante legal en virtud del Art. 117, Título 35 del USC.

☐ Inventor conjunto. ☐ Persona a la cual el inventor está obligado a efectuar una cesión. ☐ Persona que demuestra el derecho de propiedad suficiente.

Si el solicitante es el representante legal, indicar en qué carácter efectúa la presentación, el inventor está: *[En blanco.]*

Nombre del inventor fallecido o legalmente incapacitado: *[En blanco.]*

Si el solicitante es una Organización marcar este casillero: ☐

Prefijo: *[En blanco.]* **Nombre:** *[En blanco.]* Segundo nombre: *[En blanco.]* **Apellido:** *[En blanco.]* Sufijo: *[En blanco.]*

Información acerca del domicilio postal del solicitante:

Domicilio 1. *[En blanco.]*

Domicilio 2. *[En blanco.]*

Ciudad: *[En blanco.]* **Estado/Provincia:** *[En blanco.]* **País** ⁱ. *[En blanco.]* Código postal: *[En blanco.]*

Número de teléfono: *[En blanco.]* Número de fax: *[En blanco.]*

Dirección de correo electrónico: *[En blanco.]*

Dentro de este formulario se pueden generar datos adicionales sobre el solicitante seleccionando el botón Agregar.