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(54) **LIGHTWEIGHT FIREFIGHTER GARMENT WITH DURABLE COLLAR AND WRISTLET MATERIAL**

LEICHTE FEUERWEHRBEKLEIDUNG MIT DAUERHAFTEM MATERIAL FÜR KRAGEN UND MANSCHETTEN

VETEMENT LEGER POUR POMPIERS COMPORTANT UN MATERIAU RESISTANT POUR LE COL ET LES POIGNETS

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Remarks:

The file contains technical information submitted after the application was filed and not included in this specification

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. Patent Application, Ser. No. 09/015,184, filed January 29, 1998.

BACKGROUND

[0002] The present invention relates to hazardous duty garments and, more particularly, to lightweight firefighter garments which protect a wearer from extreme ambient conditions.

[0003] Protective garments are designed to shield a wearer from a variety of environmental hazards, and firefighter garments are representative of such garments. A conventional firefighting ensemble comprises a turnout coat and pant, each of which includes an outer shell, a moisture barrier located within the outer shell, a thermal liner located within the moisture barrier and an innermost face cloth layer. The outer shell typically is constructed of an abrasion-, flame- and heat-resistant material such as a woven aramid material, typically NOMEX or KEVLAR (both are trademarks of E. I. DuPont de Nemours & Co., Inc.) or a polybenzamidazole such a PBI (a trademark of Celanese Corp.) fiber material. The moisture barrier typically includes a semipermeable membrane layer which is moisture vapor permeable but impermeable to liquid moisture, such as CROSSTECH (a trademark of W.L. Gore & Associates, Inc.). The membrane layer is bonded to a substrate of flame- and heat-resistant material, such as an aramid or PBI material.

[0004] The thermal liner is typically positioned within the moisture barrier in order to prevent the thermal liner from soaking up liquid moisture flowing through the outer shell from the ambient. The thermal liner typically comprises a relatively thick layer of aramid fiber batting or needlepunch, often quilted to a lightweight aramid face cloth. The batting of the thermal barrier traps air and possesses sufficient loft to provide the necessary thermal resistance, and the face cloth protects the batting of the thermal liner from abrasion from the wearer.

[0005] The aforementioned components typically are arranged within the garment so that the moisture barrier layer is positioned between the thermal liner and the outer shell. This is necessary to prevent the batting material of the thermal liner from absorbing an excessive amount of liquid moisture from the ambient, which increases the overall weight of the garment and reduces breathability of the thermal liner, thereby increasing the stress imposed by the garment on the wearer, and reduces its loft and thermal resistance characteristics. However, one disadvantage with such an arrangement is that the laminated membrane of the moisture barrier is relatively delicate and can be damaged by heat, abrasion or puncture. Such damage results in increased exposure of the thermal liner to liquid moisture, which increases liquid moisture absorption.

[0006] Another disadvantage inherent in such an arrangement is that the moisture barrier layer adds to the bulk and weight of the garment and inhibits freedom of movement of the wearer, producing a "hobbling effect," increasing the stress imposed on the wearer in situations requiring high activity, and accelerates the onset of fatigue. Furthermore, with such an ensemble some perspiration moisture vapor from the wearer is absorbed by the thermal liner. Moreover, the combination of a discrete moisture barrier and thermal liner limits breathability, especially if the thermal liner is positioned within the moisture barrier.

[0007] Accordingly, there is a need for a protective garment in which the susceptibility of the thermal liner to absorption of perspiration moisture vapor and other moisture vapor is minimized; a protective garment which is relatively thin and lightweight, yet provides adequate thermal protection; a protective garment which is inherently able to withstand a temperature of 260°C (500°F) for at least five minutes without igniting, melting or dripping, making it suitable for use as a firefighting garment; and a protective garment which minimizes the restriction of movement and hobbling effect characteristic of conventional firefighting garments.

[0008] US 4,034,417 describes a protective garment, jacket and/or pants, made of a fabric unit which includes an outer shell and an inner shell with a liner therebetween, these being secured together at edges thereof. However, the novel and inventive features of the present invention are not disclosed.

SUMMARY

[0009] According to the invention there is provided a hazardous duty jacket for use in a firefithting environment and a firefighting turnout coat as set out in the accompanying claims.

[0010] The invention involves treatment with a durable, water-repellant finish. In this context, the word "durable" indicates the ability to withstand at least five launderings without appreciable diminution of water repellancy.

[0011] Other objects and advantages of the present invention will be apparent from the following description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a somewhat schematic, perspective view of a firefighter garment incorporating a preferred embodiment of the present invention;

Fig. 2 is an exploded, perspective view of a section of a detail of the garment of Fig. 1;

Fig. 3 is an exploded, perspective view of a detail

of an alternate embodiment of the present invention;

Fig. 4 is an exploded, perspective view of a detail of a second alternate embodiment of the invention;

Fig. 5 is an exploded, perspective view of an embodiment of the garment of Fig. 1, where the thermal liner and inner face-cloth layer comprise an inner liner that is removable from the outer shell; and

Fig. 6 is a perspective view of a firefighting hood incorporating an embodiment of the present invention.

DETAILED DESCRIPTION

[0013] As shown in Fig. 1, the present invention is a protective garment in the form of a firefighter garment, generally designated 10. It is to be understood that the present invention is not limited to firefighter garments, but can be incorporated in work garments and other hazardous duty garments, such as brushfire and EMS garments, in both coat and pant combinations and "jumpsuit" styles, without departing from the scope of the invention. The garment 10 is a firefighter turnout coat having a body portion 12, sleeves 14, 16, a neck opening 18, a collar 20 surrounding the neck opening, and a front closure, generally designated 22. Front closure 22 is of conventional design and includes a storm flap 23. The closure 22 is secured by snaps, or alternatively, strips of hook and loop fastener material (not shown) in combination with mechanical locking means such as hook and "D" combinations 24 extending between the flap 23 and body portion 12, or a slide fastener (not shown).

[0014] As shown in Figs. 1 and 2 the garment 10 includes an abrasion, heat and flame resistant outer shell, generally designated 26, which covers substantially the entire outer surface garment. The outer shell is compact weave of an aramid material such as NOMEX or KEVLAR, a blend of such aramid materials, a PBI material, or a blend of aramid and PBI materials. The thermal liner, generally designated 28, extends substantially throughout the garment 10 and includes layer 30 of insulative material quilted to a layer 32 of aramid face cloth material. The insulation material can be a batting, needlepunch, or multi-layer nonwoven aramid material. A second layer 34 of aramid face cloth material is positioned within the thermal liner 28 and protects the thermal liner from abrasion from the clothing of the wearer. Additionally, it is within the scope of the invention that the foregoing materials may be readily substituted with other materials having similar protective properties, or alternative protective properties corresponding to other specialized hazardous use garments. As shown in Fig. 5, the thermal liner 28 and face cloth layer 34, in one embodiment, may be attached to each other to form an inner liner 35 that is removable from the outer shell 26.

[0015] The outer shell 26, thermal liner 28 and face cloth layer 34 each are treated with a durable, water-repellant finish prior to assembling these components to form the garment 10. A preferred finish is a perfluorohydrocarbon finish such as TEFLON Fabric Protector. Preferably, a loading of at least 2.5% on weight of fabric of TEFLON is used. A commercially available method for finishing the above components with TEFLON Fabric Protector is provided by E. I. DuPont de Nemours & Co., Inc. of Wilmington, Delaware, 19898.

[0016] It is within the scope of the invention that other suitable water repellant finishes, coatings or treatments may also be used, such as treating the components with a perfluorohydrocarbon finish such as SCOTCHGUARD, or by applying resin, wax or plastic finish. In the preferred embodiment of the invention, each component of the garment 10 possesses certain characteristics which makes it particularly suitable for use in a hazardous duty garment, particularly a firefighter garment. The ensemble of the outer shell 26, thermal liner 28 and face cloth layer 34, each treated with a durable, water-repellant finish according to the invention, meets certain requirements of the N.F.P.A. (National Fire Protection Association) 1971 Standard. Specifically, the ensemble resists igniting, melting or dripping when exposed to 260 °C (600 °F) for at least five minutes. Furthermore, the water-repellant finishes applied to the components of the ensemble are durable in that they withstand at least 25 launderings without appreciable diminution in water repellancy.

[0017] However, a durability of withstanding at least 5 launderings without appreciable diminution in water repellancy is within the scope of the invention.

[0018] Consequently, the firefighting garment 10 does not require a discrete moisture barrier because the water-repellant finish of the outer shell 26 and face cloth layer 34 substantially prevent liquid moisture from reaching and being absorbed by the thermal liner 28. Furthermore, because the thermal liner 28 is also preferably treated with a water-repellant finish, it will be much less susceptible to absorbing and retaining liquid moisture that penetrates through the outer shell 26, face cloth layer 34, or enters through a seam or opening. Additionally, by eliminating a discrete moisture barrier component, the breathability of the garment is increased, and the weight and "hobbling" effect of the garment is substantially decreased.

[0019] Referring to Figs. 1 and 5, the thermal liner 28 includes a pair of knitted wristlets 42 and a knitted collar 44 stitched or otherwise attached thereto. The wristlets 42 and collar 44 are preferably knitted from an aramid material such as NOMEX or KEVLAR, a blend of such aramid materials, a PBI material, or a blend of aramid and PBI materials. Preferably, the wristlets 42 and/or collar 44 are also treated with a durable, water-repellant finish as described above so as to substantially prevent the absorption or penetration of liquid moisture therethrough. Of course, it is within the scope of the invention that the treated wristlets 42 and collar 44 be separate from the thermal liner 28 and/or attached to another component of the garment, such as the outer shell 26.

[0020] It is also within the scope of the present invention to use a thermal liner that includes a layer of apertured, closed-cell foam as described in co-pending U.S. Ser. No. 08/596,702 filed February 5, 1996 or U.S. Ser. No. 08/857,092 filed May 15, 1997. Such thermal liners do not absorb significant amounts of liquid moisture and can be made thinner than conventional thermal liners, yet still meet the overall thermal requirements for firefighting garments.

[0021] The method of constructing the garment of the present invention is as follows. A relatively lightweight, low volume protective garment is constructed by treating an outer shell of abrasion, flame and heat resistant material with a durable, water-repellant finish; treating a thermal liner with a durable, water-repellant finish; treating a face cloth layer of material with a durable, water-repellant finish; and assembling the garment by positioning the thermal liner within the outer shell and the face cloth layer within the thermal liner. The means for cutting and attaching the various layers together to form the garment will be apparent to those skilled in the art.

[0022] As shown in Fig. 3, an alternate embodiment 10' of a firefighter garment of the present invention includes a thermal liner 28 adjacent to the outer shell 26 as with the embodiment of Figs. 1 and 2, but includes a discrete moisture barrier layer 36 between the thermal liner 28 and the face cloth layer 34. The moisture barrier 36 includes a semipermeable membrane layer 38, which is moisture vapor permeable but impermeable to liquid moisture, such as CROSSTECH, bonded to a substrate 40 of flame- and heat-resistant material, such as an aramid or PBI material. By providing such a moisture barrier 36, the penetration of blood-borne pathogens from the environment to the wearer is minimized. Furthermore, the positioning of the thermal liner 28 between the outer shell 26 and the moisture barrier 36 protects the moisture barrier from damage from excessive thermal heat and from abrasion caused by the outer shell. With the embodiment of Fig. 3, the addition of a discrete moisture barrier 36 (as opposed to the water-repellent thermal liner 28 acting also as a moisture barrier for the ensemble) to the ensemble of the outer shell 26, thermal liner and face cloth layer 34, the entire ensemble 10' meets the N.F.P.A. 1971 Standard. Not only does the garment 10' resist burning, melting or dripping when exposed to 500°F for at least five minutes, as does the garment 10 of Figs. 1 and 2, but the garment passes the liquid penetration test (ASTM test F1359), as well as all other tests comprising the Standard. The treatments applied to the components of the garment 10' of Fig. 3 are also sufficiently durable to withstand at least 5 launderings, and preferably at least 25 launderings.

[0023] As shown in Fig. 4, in another alternate embodiment 10" of the garment of the present invention, the moisture barrier 36 is positioned adjacent to the outer shell 26, and the thermal liner 28 is positioned in between the moisture barrier and the face cloth layer 34. With this embodiment, the moisture barrier 36 protects the durable, moisture-resistant thermal liner 28 from liquid moisture penetrating the outer shell 26. The advantage of utilizing the moisture resistant thermal liner 28 of the present invention in this embodiment is that the moisture resistance of the thermal liner minimizes its absorption of liquid perspiration from a wearer, as well as absorption of liquid moisture from wicking from sleeve and neck openings or from a small tear in the moisture barrier.

[0024] Furthermore, the garment 10" of Fig. 4 meets the N.F.P.A. 1971 Standard. In particular, the garment 10" resists igniting, melting or dripping when exposed to 260 °C (500°F) for at least five minutes, passes the liquid penetration test, and passes all other tests comprising the Standard. While in the preferred form of the embodiment of the garment 10" the outer shell 26, thermal liner 28 and face cloth layer 24 are each treated to have the durable, water-repellent finish described with respect to the garment 10, the garment 10" can be modified such that the face cloth layer 34 is not treated with the durable finish.

[0025] Fig. 6 shows a firefighting hood 48 treated with a durable, water-repellant finish as described above as an illustrative example which is not scope of the claimed invention. The hood 48 is preferably constructed from two layers of knitted or woven flame and heat resistant aramid material (such as NOMEX or KEVLAR, a blend of such aramid materials, a PBI material, or a blend of aramid and PBI materials) to protect the firefighter against bums in the regions covered by the hood. The hood 48 includes a head portion 50 shaped to cover the forehead, ears and chin of the wearer and an optional bib portion 52 shaped to cover the neck and an area of the wearer's chest and shoulders, The head portion 50 includes a substantially oval front opening 54 for exposure of the wearer's eyes, nose and mouth. While all layers of the hood 48 are preferably treated with the durable, water-repellant finish, only one, or less than all, of the layers may be treated with the durable, water-repellant finish. Because the treatment substantially prevents the absorption or penetration of liquid moisture through the hood 48, the treatment also substantially prevents the penetration of blood-bome pathogens through the hood.

[0026] While the forms of apparatus herein described constitute preferred embodiments of this invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention as defined in the appended claims.

Claims

1. A hazardous duty jacket (10) for use in a firefighting environment comprising:

   a body portion (12);

a pair of arm portions (14, 16) attached to the body portion (12); and
a pair of knitted wristlets (42) each being attached to a corresponding arm portion (14, 16),

characterized in that each of the wristlets (42) is treated with a durable, water-repellant finish.

2. The hazardous duty jacket of claim 1, further comprising a collar attached to the body portion and treated with a durable, water-repellant finish.

3. The hazardous duty jacket of claim 2, wherein the collar is knitted from a flame and heat resistant material selected from a group consisting of an aramid material, a blend of aramid materials, a polybenzamidazole material, and a blend of aramid and polybenzamidazole materials.

4. The hazardous duty jacket of any preceding claim, wherein the water-repellant finish includes a perfluorohydrocarbon finish.

5. The hazardous duty jacket of any preceding claim, wherein the wristlets are knitted from a flame and heat resistant material selected from a group consisting of an aramid material, a blend of aramid materials, a polybenzamidazole material, and a blend of aramid and polybenzamidazole materials.

6. A firefighting turnout coat (10) comprising:

an outer shell (26) having a body portion (12) and a pair of sleeve portions (14, 16) attached to the body portion (12), the body (12) and sleeve (14, 16) portions being constructed from a layer of abrasion, flame and heat resistant material;
a thermal liner (28) positioned within the outer shell (26) and having a body portion and a pair of sleeve portions attached to the body portion, the body and sleeve portions being constructed from a needlepunch, batting or nonwoven aramid material, or a blend of aramid materials (30), stitched to a face cloth layer (32) of aramid material;
a second face cloth layer (34) positioned within the thermal liner (28) and having a body portion and a pair of sleeve portions attached to the body portion; and
a pair of wristlets (42), each being attached to a corresponding one of the arm portions of one of the outer shell (26), thermal liner (28), and second face cloth layer (34), the wristlets (42) being knitted from a flame and heat resistant material;

characterized in that the material of the wristlets is treated with a durable, water-repellant finish.

7. A firefighting turnout coat comprising:

an outer shell (26) having a body portion (12) and a pair of sleeve portions (14, 16) attached to the body portion (12), the body (12) and sleeve portions (14, 16) being constructed from a layer of abrasion, flame and heat resistant material;
a thermal liner (28) positioned within the outer shell (26) and having a body portion and a pair of sleeve portions attached to the body portion, the body and sleeve portions being constructed from a needlepunch, batting or nonwoven aramid material, or a blend of aramid materials (30), stitched to a face cloth layer (32) of aramid material;
a second face cloth layer (34) positioned within the thermal liner (28) and having a body portion and a pair of sleeve portions attached to the body portion; and
a collar (20) attached to the body portion of one of the outer shell, thermal liner, and second face cloth layer, the collar being knitted from a flame and heat resistant material;

characterised in that the material of the collar (20) is treated with a durable, water-repellant finish.

Patentansprüche

1. Jacke für den Gefahreneinsatz (10) zur Verwendung in einer Feuerlöschumgebung, aufweisend:

einen Hauptteil (12);
ein Paar von Ärmelteilen (14,16), die an dem Hauptteil (12) angebracht sind und
ein Paar gewirkter Manschetten (42), die jeweils an dem entsprechenden Ärmelteil (14,16) angebracht sind,

dadurch gekennzeichnet, dass jede dieser Manschetten (42) mit einer dauerhaften, wasserabweisenden Appretur behandelt ist.

2. Jacke für den Gefahreneinsatz nach Anspruch 1, ferner aufweisend einen Kragen, der an dem Hauptteil angebracht ist und mit einer dauerhaften, wasserabweisenden Appretur behandelt ist.

3. Jacke für den Gefahreneinsatz nach Anspruch 2, wobei der Kragen aus einem flammfesten und hitzebeständigen Material gewirkt ist, das ausgewählt ist aus der Gruppe, bestehend aus einem Aramid-

Material, einem Blend von Aramid-Materialien, einem Polybenzamidazol-Material und einem Blend von Aramid- und Polybenzamidazol-Materialien.

4. Jacke für den Gefahreneinsatz nach einem der vorgenannten Ansprüche, wobei die wasserabweisende Appretur eine Perfluorkohlenwasserstoff-Appretur einschließt.

5. Jacke für den Gefahreneinsatz nach einem der vorgenannten Ansprüche, wobei die Manschetten aus einem flammfesten und hitzebeständigen Material gewirkt sind, das ausgewählt ist aus der Gruppe, bestehend aus einem Aramid-Material, einem Blend von Aramid-Materialien, einem Polybenzamidazol-Material und einem Blend von Aramid- und Polybenzamidazol-Materialien.

6. Feuerwehr-Einsatzjacke (10), aufweisend:

einen Oberstoff (26) mit einem Hauptteil (12) und einem Paar von Ärmelteilen (14,16), die an dem Hauptteil (12) angebracht sind, wobei der Hauptteil (12) und die Manschettenteile (14,16) aus einer Lage von abriebfestem, flammfestem und hitzebeständigem Material aufgebaut sind;
eine Thermoeinlage (28), die sich im Inneren des Oberstoffes (26) befindet und einen Hauptteil hat und ein Paar Ärmelteile, die an dem Hauptteil angebracht sind, wobei der Hauptteil und die Ärmelteile aufgebaut sind aus Nadelvlies, Wattierung oder Vliesstoff aus Aramid-Material oder einem Blend von Aramid-Materialien (30), die auf einer Besatztuchlage (32) aus Aramid-Material geheftet sind;
eine zweite Besatztuchlage (34), die sich im Inneren der Thermoeinlage (28) befindet und einen Hauptteil hat sowie ein Paar Ärmelteile, die an dem Hauptteil angebracht sind; und
ein Paar Manschetten (42), die jeweils an dem entsprechenden der Ärmelteile aus einem der Außenstoffe (26), Thermoeinlage (28) und zweiten Besatztuchlage (34) angebracht sind, wobei die Manschetten (42) aus einem flammfesten und hitzebeständigen Material gewirkt sind;

dadurch gekennzeichnet, dass das Material der Manschetten mit einer dauerhaften, wasserabweisenden Appretur behandelt ist.

7. Feuerwehr-Einsatzjacke, aufweisend:

einen Oberstoff (26) mit einem Hauptteil (12) und einem Paar von Ärmelteilen (14,16), die an dem Hauptteil (12) angebracht sind, wobei der Hauptteil (12) und die Manschettenteile (14,16) aus einer Lage von abriebfestem, flammfestem und hitzebeständigem Material aufgebaut sind;
eine Thermoeinlage (28), die sich im Inneren des Oberstoffes (26) befindet und einen Hauptteil hat und ein Paar Ärmelteile, die an dem Hauptteil angebracht sind, wobei der Hauptteil und die Ärmelteile aufgebaut sind aus Nadelvlies, Wattierung oder Vliesstoff aus Aramid-Material oder einem Blend von Aramid-Materialien (30), die auf einer Besatztuchlage (32) aus Aramid-Material geheftet sind;
eine zweite Besatztuchlage (34), die sich im Inneren der Thermoeinlage (28) befindet und einen Hauptteil hat sowie ein Paar Ärmelteile, die an dem Hauptteil angebracht sind; und
einen Kragen (20), der an dem Hauptteil von einer der Lagen des Oberstoffes, der Thermoeinlage und der zweiten Besatztuchlage angebracht ist, wobei der Kragen aus einem flammfesten und hitzebeständigen Material gewirkt ist;

dadurch gekennzeichnet, dass das Material des Kragens (20) mit einer dauerhaften, wasserabweisenden Appretur behandelt ist.

Revendications

1. Veste pour mission dangereuse (10) pour une utilisation dans un environnement de lutte contre le feu comprenant:

une partie de corps (12);
une paire de parties de bras (14, 16) attachées à la partie de corps (12); et
une paire de poignets tricotés (42), chacun étant attaché à une partie de bras correspondante (14, 16),

caractérisée en ce que chacun des poignets (42) est traité avec une finition durable, hydrofuge.

2. Veste pour mission dangereuse suivant la revendication 1, comprenant en outre un col attaché à la partie de corps et traité avec un finition durable, hydrofuge.

3. Veste pour mission dangereuse suivant la revendication 2, dans laquelle le col est tricoté à partir d'un matériau résistant à la flamme et à la chaleur choisi dans le groupe constitué d'un matériau d'aramide, d'un mélange de matériaux d'aramide, d'un matériau de polybenzamidazole et d'un mélange de matériaux d'aramide et de polybenzamidazole.

4. Veste pour mission dangereuse suivant l'une quelconque des revendications précédentes, dans laquelle la finition hydrofuge inclut une finition de per-

fluorohydrocarbure.

5. Veste pour mission dangereuse suivant l'une quelconque des revendications précédentes, dans laquelle les poignets sont tricotés à partir d'un matériau résistant à la flamme et à la chaleur choisi dans le groupe constitué d'un matériau d'aramide, d'un mélange de matériaux d'aramide, d'un matériau de polybenzamidazole et d'un mélange de matériaux d'aramide et de polybenzamidazole.

6. Veste d'intervention de lutte contre le feu (10) comprenant:

une enveloppe externe (26) possédant une partie de corps (12) et une paire de parties de manche (14, 16) attachées à la partie de corps (12), les parties de corps (12) et de manche (14, 16) étant construites à partir d'une couche d'un matériau résistant à l'abrasion, à la flamme et à la chaleur;
une doublure thermique (28) positionnée dans l'enveloppe externe (26) et possédant une partie de corps et une paire de parties de manche attachées à la partie de corps, les parties de corps et de manche étant construites à partir d'un matériau d'aramide aiguilleté, de battage ou non tissé, ou d'un mélange de matériaux d'aramide (30), cousue à une couche d'étoffe de face (32) d'un matériau d'aramide;
une deuxième couche d'étoffe de face (34) positionnée dans la doublure thermique (28) et possédant une partie de corps et une paire de parties de manche attachées à la partie de corps; et
une paire de poignets (42), chacun étant attaché à une partie correspondant des parties de bras d'une parmi l'enveloppe externe (26), la doublure thermique (28) et la deuxième couche d'étoffe de face (34), les poignets (42) étant tricotés à partir d'un matériau résistant à la flamme et à la chaleur;

caractérisée en ce que le matériau des poignets est traité avec une finition durable, hydrofuge.

7. Veste d'intervention de lutte contre le feu comprenant:

une enveloppe externe (26) possédant une partie de corps (12) et une paire de parties de manche (14, 16) attachées à la partie de corps (12), les parties de corps (12) et de manche (14, 16) étant construites à partir d'une couche d'un matériau résistant à l'abrasion, à la flamme et à la chaleur;
une doublure thermique (28) positionnée dans l'enveloppe externe (26) et possédant une partie de corps et une paire de parties de manche attachées à la partie de corps, les parties de corps et de manche étant construites à partir d'un matériau d'aramide aiguilleté, de battage ou non tissé, ou d'un mélange de matériaux d'aramide (30), cousue à une couche d'étoffe de face (32) d'un matériau d'aramide;
une deuxième couche d'étoffe de face (34) positionnée dans la doublure thermique (28) et possédant une partie de corps et une paire de parties de manche attachées à la partie de corps; et
un col (20) attaché à la partie de corps d'une parmi l'enveloppe externe, la doublure thermique et la deuxième couche d'étoffe de face, le col étant tricoté à partir d'un matériau résistant à la flamme et à la chaleur;

caractérisée en ce que le matériau du col (20) est traité avec une finition durable, hydrofuge.

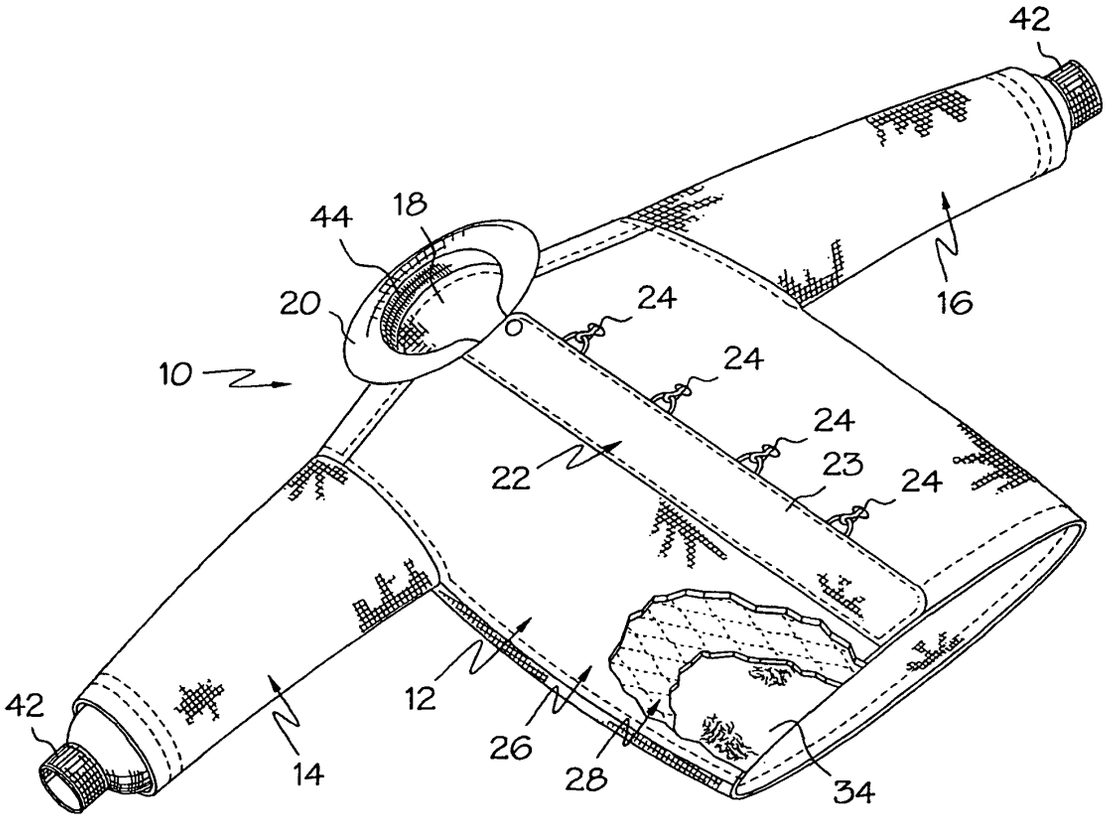


FIG. 1

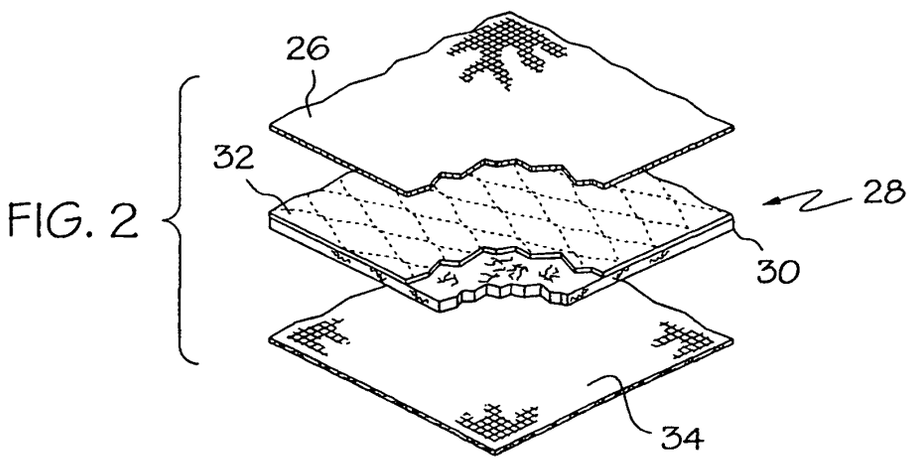


FIG. 2

FIG. 3

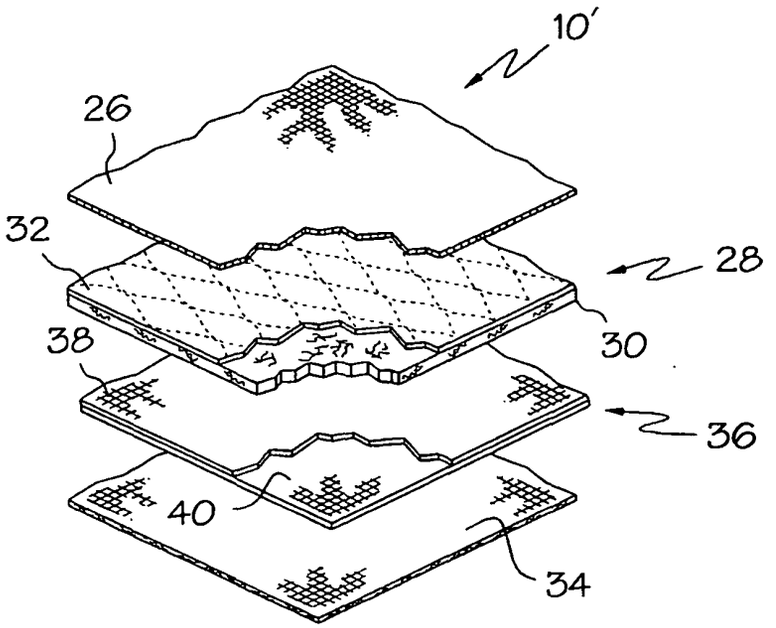
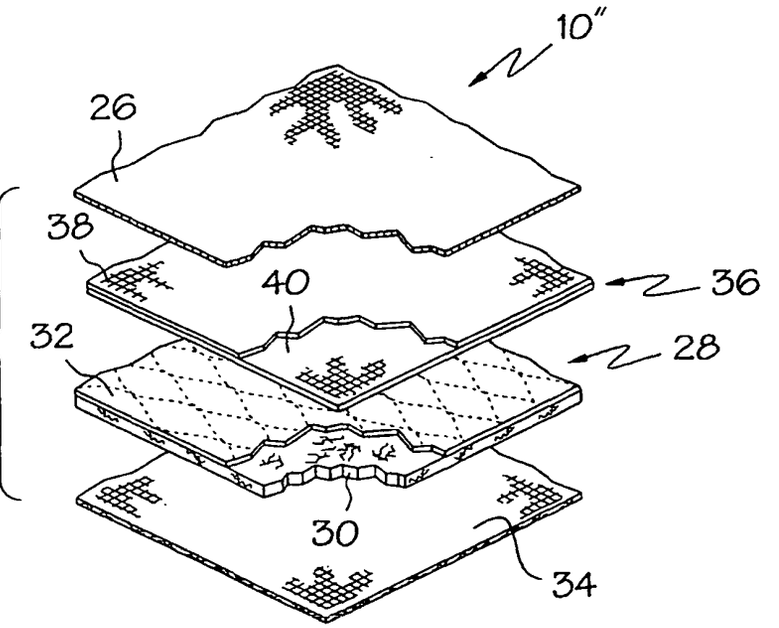


FIG. 4



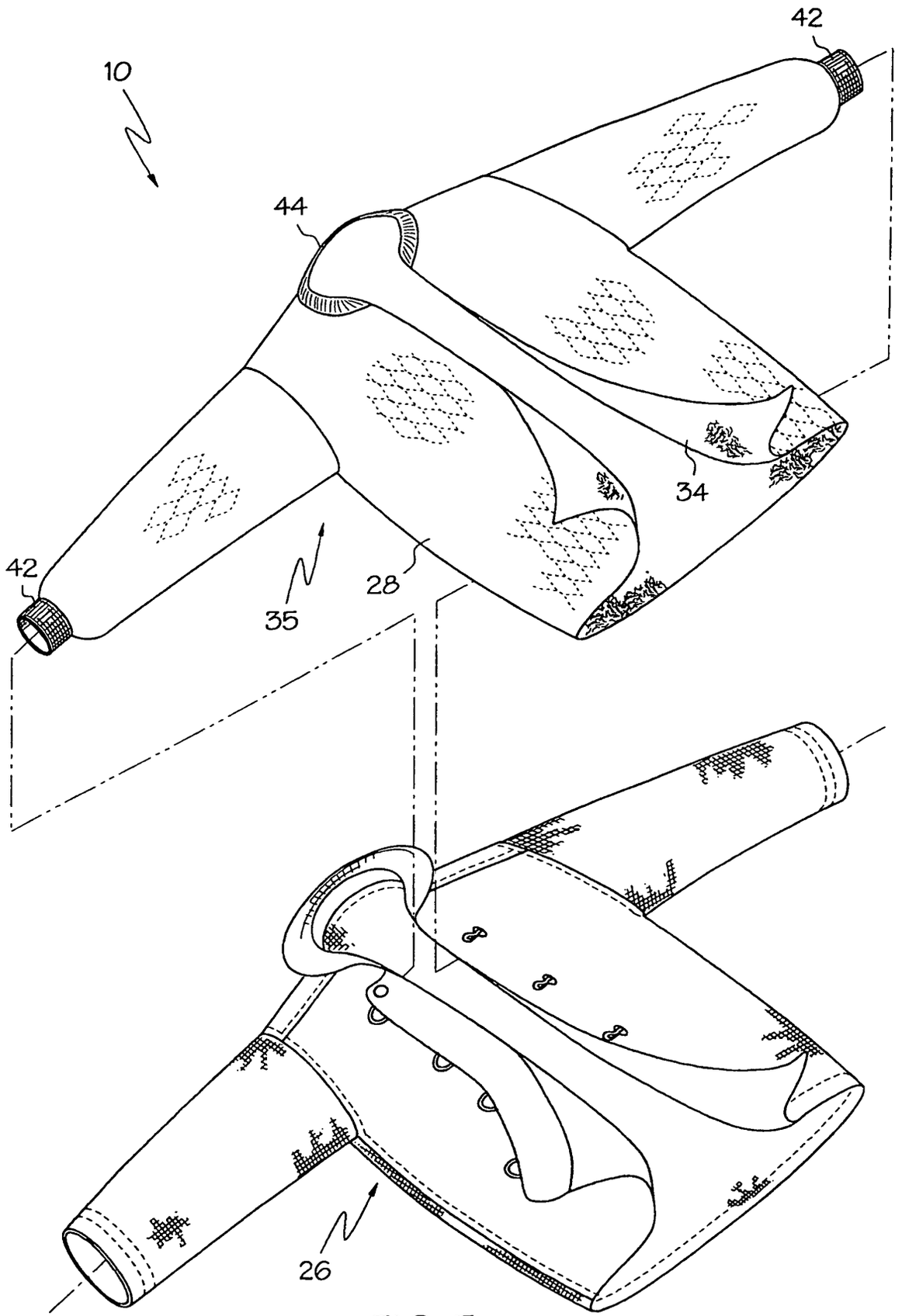


FIG. 5

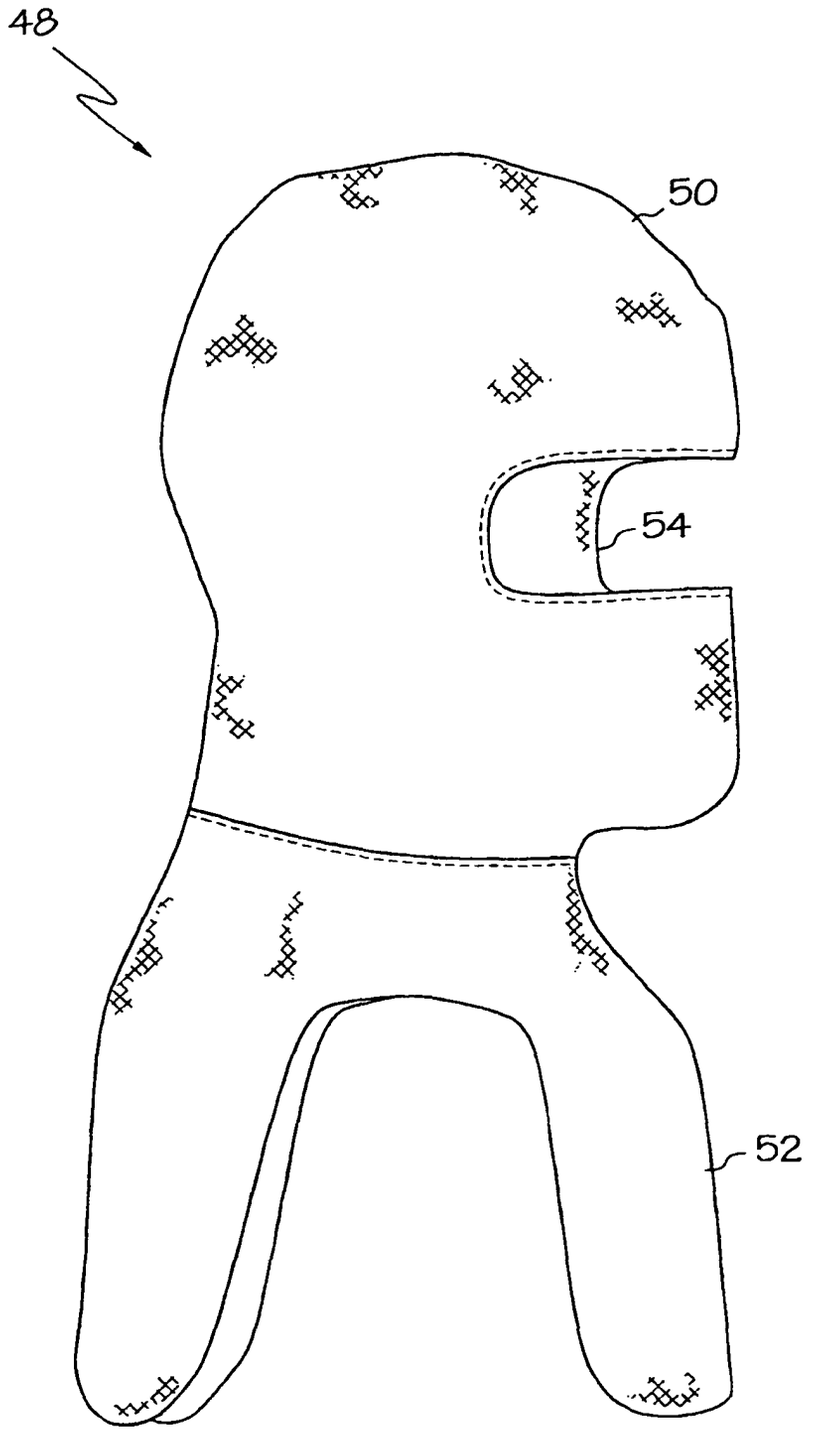


FIG. 6