

Description

This invention relates to fire retardant composites and fire-resistant mattresses. In particular, it relates to fire retardant composites capable of withstanding significant tensile forces and to fire resistant mattresses made using such composites.

Each year thousands of people die in home and institutional fires that started in or were fueled by mattresses. The traditional mattresses contain highly flammable materials that are necessary to provide the required comfort for the users. Most mattresses include a layer of ticking material which is generally flammable. Once the bedding on the mattress catches on fire, the flames ignite the ticking. Within a few minutes, the surface of the mattress is ablaze. The fire then spreads to the cushion layer which is generally made of either polyurethane foam or cotton. Such cushion layers are readily ignitable and an excellent fuel for the fire.

The springs of the traditional mattresses are in normal use held under compression by the materials that enclose them. Once the fire begins consuming these materials, the springs burst the mattress open thereby fully exposing the flammable materials inside the mattress to the fire. This accelerates the fire. The heat from the fire and combustion of flammable materials produce toxic gases which accumulate in the room. As the temperature in the room rises, these gases ignite producing a phenomenon called "flashover". During "flashover" the entire space of the room becomes engulfed in flames. The temperature of the room in which the mattress is located can reach 1000° to 1300°F. If the door to the room in which the mattress is located is open, the flames follow the exiting gases creating a moving wall of fire.

Since traditional mattresses are generally one of the chief sources of fuel for a fire and since once ignited they burn rapidly and emit toxic and flammable gases, the damages, injuries and loss of life resulting from fires could be significantly reduced if mattresses were substantially fire proofed.

Attempts have been made to produce commercially acceptable fireproofed mattresses and to use fire retardant materials in their construction to prevent the spread of fire. None of these attempts have been entirely satisfactory.

For example, U.S. Patent 3,512,192 (Simon) discloses a mattress of a multilayer structure comprising a cover, a plurality of flammable components and a plurality of layers substantially enclosing the flammable components. On the outside, the mattress is covered with a chemically treated ticking with no insulating value. Adjacent to the ticking is a layer of polyurethane foam, and to the inside of the polyurethane foam is a layer of fiberglass matting. The fiberglass matting can be replaced by an asbestos pad. To the inside of the fiberglass matting or asbestos pad is another layer of polyurethane foam. See also Column 2,

lines 41-45. The problem with the approach disclosed in the *Simon* patent is that the chemically treated ticking has practically no insulating value and therefore it cannot adequately protect the materials it encloses from the fire. Once the fire spreads to the polyurethane layer, it is fueled just like in the traditional mattresses causing a conflagration.

Additionally, the use of the fiberglass matting is impractical even under the polyurethane foam because the fiberglass fibers gradually break off and eventually penetrate the surface of the mattress causing serious discomfort and irritation to the user. The minute fiberglass fibers can also become embedded in the linen. Since they cannot be removed from the line by laundering, the contaminated linen has to be replaced in order to avoid irritation or even allergic reaction of the user.

U.S. Patent No. 3,670,348 (Irwin) discloses the use of a fiberglass pad inside the ticking to enclose the combustible portion of the mattress. The problem with this approach is that the fiberglass pad is not a durable and resilient surface. Therefore, such mattresses lack the soft feel of traditional mattresses. Moreover, during use, the minute fibers of the fiberglass pad break off and penetrate the surface of the mattress causing discomfort and irritation to the user as described in connection with the *Simon* patent. This problem is more serious in mattresses disclosed by the *Irvine* patent than in those disclosed by the *Simon* patent because the fiberglass pad is adjacent to the thin outside ticking layer which is easily penetrated.

U.S. Patent No. 3,818,521 (Richards) discloses the use of a heat conducting metallic foil between the ticking and the padding layers. The foil carries away heat that is applied to a small area of the mattress and thereby prevents the ticking from bursting into flames. This approach suffers from several disadvantages. It works only if the heat source is small in intensity and localized. For example, the *Richards* mattress will help prevent fire if a burning cigarette or a match is placed thereon. This approach does not work, however, in situations where the source of fire is not highly localized. If other parts of the room are on fire, the metallic foil is ineffective to prevent mattress fire.

U.S. Patent No. 4,092,752 (Dougan) discloses the use of a layer of flame retarded flexible polyurethane foam and optionally an outer layer of flexible polyimide foam to enclose the flammable parts of the mattress. Similarly, the paper entitled *Flammability Characteristics of Healthcare Mattresses* by Anolick et al, presented at the August 1977 American Hospital Association's Annual Convention, discloses mattresses that include VONAR® interliners, inside the ticking layer, completely enclosing polyurethane foam. Such mattresses are reported to significantly improve the controllability of fires. However, once charred, VONAR® lacks the strength to keep the mattress intact. Accordingly, at elevated temperatures, such mattresses burst open thereby expos-

ing to the fire the flammable parts. The entire mattress then explodes into flames. The ticking used in the mattresses disclosed by the *Anolich* cycle has no insulating value and therefore does not provide a barrier to fires.

More recently, Golding Industries, Inc. proposed mattresses having flame-resistant ticking marketed under the trademark SANDEL. This approach suffers from several disadvantages. The first disadvantage is its cost. The SANDEL ticking includes fiberglass fibers. But in order to make the ticking soft and flexible enough to be acceptable to the user, very fine fibers must be used. Such ticking is significantly more expensive than the conventional ticking.

Secondly, the fiberglass fibers break off during use and cause irritation and allergic reactions to at least some users. The fibers are so minute that they cannot be removed from the linen by laundering. Accordingly, once the ticking starts breaking, the linen then on the mattress has to be replaced.

Finally, since the SANDEL ticking does not create a heat shield, the heat from the fire can lead to outgassing, i.e. the release of toxic and flammable gasses from the materials inside the mattress.

There is, therefore, a long felt and still unsatisfied need for a mattress that does not ignite and burst into flames either immediately upon exposure to a fire or upon exposure to elevated temperatures normally encountered in household or institutional room fires but which offers all the comfort properties of a traditional mattress, including softness and conformance to the body contours of the user.

Thus one object of the present invention is to provide an improved mattress that satisfies the above stated need.

The present invention now provides a mattress of a multilayered structure comprising a cover, a plurality of flammable components and a plurality of layers substantially enclosing the flammable components characterised in that the layers are bonded together to form a composite, comprising a first layer of a fire-retardant composition disposed adjacent the cover, and a second layer of a material having a high tensile strength, the first and second layers being bonded together such that the second layer has a high tensile strength in the directions along its surface.

Preferably said first layer of said composite chars upon being exposed to fire to protect the inside of said mattress from heat and fire and said second layer prevents the mattress from bursting open upon being exposed to fire.

The first layer of said composite may comprise a fire-retardant neoprene foam and said second layer may comprise a fiberglass fabric, the first layer charring upon being exposed to fire thereby protecting the flammable materials of the mattress from heat and fire, said second layer preventing the mattress from bursting open.

Preferably the second layer is made of fiberglass fabric comprising at least one retaining

layer of material bonded to a mesh to fiberglass fibers so as to prevent said fibers from breaking off.

The composite further may comprise a third layer composed of a fire-retardant composition bonded to said second layer on the opposite side from said first layer, the third layer preferably being composed of fire-retardant neoprene foam.

The invention further provides a process for making a mattress which includes a cover overlying a plurality of flammable components, characterised by the steps of providing a first layer of a fire-retardant composition, bonding to said first layer a second layer of a material having a high-tensile strength such that said second layer has a high tensile strength in directions along its surface, and substantially enclosing the flammable components of the mattress with said bonded first and second layers, with said second layer disposed adjacent at least one of the flammable components and said first layer adjacent the cover.

Preferably the invention provides a process for making a mattress characterised in that said first layer is of fire-retardant neoprene foam and said second layer of a fiberglass fabric comprising at least one retaining layer of material bonded to a mesh of fiberglass fibers so as to prevent said fibers from breaking off.

The second layer is preferably bonded to a third layer of the fire-retardant composition, preferably a neoprene foam, on the opposite side from the first layer.

The mattress is preferably produced by the said process.

The present invention will be illustrated by the following description of preferred embodiments thereof with reference to the accompanying drawings in which:—

FIG. 1 is a cross-sectional view of one composite layer constructed in accordance with the present invention.

FIG. 2 is a cross-sectional view of another composite layer constructed in accordance with the present invention.

FIG. 3 is a schematic representation of the process for making the composite of the present invention.

FIG. 4 is a perspective view, partially in cross-section, of a mattress constructed in accordance with the present invention.

FIG. 5 is a cross-sectional view of the mattress of FIG. 4 taken along lines 5—5 thereof.

FIG. 6 is a perspective view of a fiberglass fabric of FIG. 6 taken along line 7—7 thereof.

FIG. 7 is a cross-sectional view of the fiberglass fabric useful in the composite of the present invention.

FIG. 8 is a cross-sectional view of another fiberglass fabric useful in the composite of the present invention.

There will now be described an improved fire resistant mattress that does not burst into flames when exposed to fire even after being exposed to high temperatures normally reached in house-

hold or institutional room fires. The improved mattress described is relatively inexpensive to construct, does not irritate the user's skin and its fire resistant properties last for the duration of its useful life, the mattress lasting at least as long as a conventional mattress.

The mattress constructed in accordance with the present invention described below includes a layer comprising a composite made of a layer of a fire retardant material capable of providing a heat barrier bonded to a layer of high tensile strength material, such as fiberglass fabric. The composite encloses at least most and generally practically all of the flammable ingredients of the mattress. When exposed to a fire, the fire retardant material chars, thereby creating a heat shield that protects the inside of the mattress while the high tensile strength material holds the mattress together and prevents the mattress from bursting open to expose the flammable ingredients thereof to the fire.

The composite of the present invention may be made by bonding a fire-retardant material capable of providing a heat barrier to a high tensile strength material. If neoprene foam such as VONAR® is used, the foam may be directly deposited on a high tensile strength material such as a fiberglass fabric. Then the neoprene foam is cured which also causes it to become bonded to the fiberglass fabric.

The fire resistant mattress described below substantially does not fuel room fires and when exposed to flames provides a heat barrier between the fire and the parts of the mattress that emit toxic and flammable gases upon exposure to heat. Unless the fire is already a conflagration, the mattresses to be described do not burst open when exposed to flames. They therefore eliminate a significant fire hazard.

In addition, the mattress to be described can be easily and inexpensively manufactured with a minimal departure from the conventional, presently used methods of manufacture. The mattress described below also has a good surface feel and softness, does not irritate the user's skin and its fire retarding properties extend for the duration of its useful life.

Referring now to FIG. 1, the composite made in accordance with the present invention is designated generally by a numeral 10. The composite 10 includes a layer 12 of a fire retardant composition which provides a protective insulating heat barrier when exposed to fire. The presently preferred fire retardant composition is a neoprene foam disclosed in U.S. Patents Nos. 4,174,420 and 4,294,489, and the most preferred fire retardant composition is VONAR®. The disclosures of U.S. Patent Nos. 4,174,420 and 4,294,489 are incorporated herein by reference.

The composite 10 also includes a layer 14 of material that possesses a high tensile strength along its surface. The preferred material for the layer 14 is a woven or nonwoven fiberglass fabric, scrim or cloth (hereinafter collectively referred to as "fabric"). The most preferred is synthetic fiber-

fiberglass composite fabric, such as spun bonded polyester-fiberglass fabric. An example of such fabric is Remy®-fiberglass fabric composite and in particular Style 1659 FIBERGLAS fabric manufactured and sold by Burlington Glass Fabrics Company, Link Drive, Rockleigh, New Jersey 07647, U.S.A.

In the preferred embodiment of the invention depicted in the drawings, the neoprene foam is directly, chemically bonded to the fiberglass fabric without any adhesives. Adhesives can, however, be used for making the composites of the present invention.

When exposed to a fire, the fire retardant layer 12 chars forming a protective heat barrier. The charred layer 12 acts as a thermally insulative barrier to the fire. Once it chars, the layer 12 has a minimal tensile strength to resist stresses in the directions along its surface; however, the layer 14 possesses high tensile strength and prevents breaking of the composite 10 that is under tension.

Another embodiment of the composite of the present invention is shown in FIG. 2. Referring now to FIG. 2, a composite, designated generally by a numeral 20, includes a fire-retardant layer 22, a layer of high tensile strength material 24 and another fire-retardant layer 26. The layers 22, 24 and 26 are directly, chemically bonded to each other, as shown, preferably without any adhesives. The layers 22 and 26 can be made of the same compounds as the layer 12 including a fire-retardant neoprene foam, such as VONAR®. The layer 26 provides an additional heat barrier which is especially useful when the layer 24 is made of a loosely woven material. When the composite 20 is exposed to a fire, the charred layer 20 may become displaced in places, the fire penetrating through the layer 24 then encounters the layer 26 which chars, preventing the materials enclosed by the composite from being exposed to high temperatures or from being ignited.

The presently preferred process for making the composite 10 of the present invention will now be described with reference to FIG. 3. As shown in FIG. 3, the fiberglass fabric 28 stored on a spool 30 is continuously placed onto an endless belt 32 driven by rollers 34 and 36.

A layer of uncured fire-retardant neoprene foam 38, such as VONAR®, is then deposited on the fiberglass fabric 28 from the holding container (hopper) 40 via a nozzle 42. The layer 38 is transported on the fiberglass fabric 28 by the endless belt 32 toward a plough 45 which pushes off the excess of neoprene foam and produces a layer of neoprene foam 38 of uniform predetermined thickness. The desired thickness of the neoprene foam layer 38 can be varied by moving the plough 45 toward or away from the endless belt 32.

The adjacent layers 28 and 38 are then transported to a curing station, such as a heater 47, which is maintained at such conditions, including temperature, to effect the curing of the neoprene foam. Upon curing the neoprene foam 38 be-

comes firmly bonded to the fiberglass fabric 28. The resulting composite is then wound onto a spool 50.

The composite 20 can be made by the process of making composite 10 merely by repeating the procedures so as to deposit the fire-retardant composition on both sides of the fiberglass fabric. In the alternative, if the fiberglass fabric is loosely woven, the uncured fire-retardant can merely be allowed to go through the openings in the fiberglass fabric to achieve the composite 20.

The improved mattress of the present invention will now be described in connection with the embodiment depicted in FIGURES 4 and 5. Referring now to FIG. 4, the mattress constructed in accordance with the present invention is generally designated by a numeral 60. As shown in FIGURES 4 and 5, on the outside, the mattress 60 includes a conventional ticking (cover) 62 which is provided to give a soft comfortable feel for the user. Underneath the ticking 62 there is a composite layer 64 of the present invention. Either composite 10 or composite 20 can be used to form layer 64. The layer 64 includes a layer of fire retardant composition, such as VONAR®, bonded to a layer of high tensile strength material such as a fiberglass fabric. Since the fiberglass fabric is inside of the cover and inside the layer of VONAR®, the fiberglass fabric has little effect on the "feel" of the mattress. Additionally, as described below, the fiberglass fabric is preferably a composite in which fiberglass fibers are enclosed by a material that prevents fiberglass fibers from breaking off. Most preferably, the fabric is a relatively inexpensive loosely woven fiberglass fabric composite made of polyester and fiberglass fibers such as style 1659 FIBERGLAS fabric manufactured and sold by Burlington Glass Fabrics Company, Link Drive, Rockleigh, New Jersey 07647, U.S.A.

Although FIG. 4 depicts a mattress that includes a two component composite of the present invention, it should be understood that three component composites such as that shown in FIG. 2 can also be used. The higher cost composite 20 of FIG. 2 when compared to composite 10 of FIG. 1 must be weighed against additional fire protection offered by the extra layer of a fire retardant 26.

Beneath the composite layer of the present invention is a layer of standard padding such as cotton felt of polyurethane foam 68 and beneath the layer of standard polyurethane 68 is a layer of standard backing 69 or other standard insulating material. The ticking 62, composite layer 64, layer 68 and standard backing 69 are preferably quilted together as shown in FIG. 5.

Beneath the backing 69, there is a layer 72 of precompressed cotton felt which cushions and resists body impressions. Beneath the layer 72 is a firmness insulator layer 73 which further controls the firmness of the mattress. The layer 73 is supported on a wire mesh 74 which, in turn, rests on coil springs 75.

The composite layer 64 of the present invention

is under each exposed surface of the mattress 60. The side surfaces of the mattress 60 are connected to the material at the top surface, as shown in FIG. 5, by a high-strength fire-resistant thread such as a fiberglass thread 80 that has a melting point above temperatures generally encountered in room fires. The fire-resistant thread assures that the mattress does not split open by burning of the thread.

If fire reaches the mattress, the fire can ignite the cover 62 even though it is preferably treated to make it fire retardant. The cover 62 is relatively thin therefore it does not provide much fuel for the fire but it also does not provide a heat barrier. After the cover 62 is consumed the fire reaches the composite 64 chars protecting the inside of the mattress 60 from the fire. The inside layer of the composite layer 64 provides a sufficient strength to the composite layer 64 to maintain it intact even after the fire retardant layer is charred.

The mattress generates significantly less smoke and toxic gases than traditional mattresses when exposed to a fire.

If the composite layer 64 is composed of three layers as that shown in FIG. 2, the additional layer of fire retardant composition 26, provides additional protection against heat and against flames entering inside the mattress and igniting the flammable parts thereof.

It should, of course, be understood that although the present invention is shown in the drawings with a particular mattress, its use is not limited to that particular mattress and the invention can be used in connection with any other mattress.

The preferred tensile strength material is a fiberglass fabric composite in which the fiberglass fibers are prevented from breaking off and separating from the composite by another material such as a layer of polyester bonded thereto. The preferred fiberglass fabric composite is depicted in FIGURES 6-8.

Referring now to FIG. 6, there is shown there a fabric composite 80 which includes a mesh 81 composed of intersecting rows of strands of fiberglass fibers 82 and 85. Each of the strands 82 and 85 includes a plurality of long fiberglass fibers. Bonded to one side of the fiberglass fiber strands 82 and 85 is a layer 87 of polyester such as Remy®. The composite 80 offers good tensile strength in the direction along its surface and prevents the fiberglass fibers within it from breaking off and separating therefrom.

FIG. 8 depicts another fiberglass composite 90 useful in connection with the present invention. The composite 90 has two layers of materials 92 and 93 for keeping the fiberglass fibers from breaking off and separating on either side of the fiberglass fiber mesh 95. The cost of the additional layer of material to enclose fiberglass fiber mesh 95 has to be weighed against the additional protection which such layer provides.

At present, the composite 80 is preferred because when the fire retardant layer is bonded to the composite 80 on the fiberglass mesh side of

said composite, the fiberglass fibers are sandwiched between the polyester and the fire retardant layer and have been found not to break off and separate from the composite 80.

Claims

1. A mattress (60) of a multilayered structure comprising a cover (62), a plurality of flammable components and a plurality of layers substantially enclosing the flammable components, characterised in that the layers are bonded together to form a composite (10) comprising a first layer (12) of a fire-retardant composition disposed adjacent the cover, and a second layer (14) of a material having a high tensile strength, the first and second layers being bonded together such that the second layer has a high tensile strength in the directions along its surface.

2. A mattress (60) as claimed in Claim 1, characterised in that said first layer (12) of said composite (64) chars upon being exposed to fire to protect the inside of said mattress from heat and fire and said second layer (14) prevents the mattress from bursting open upon being exposed to fire.

3. A mattress (60) as claimed in Claims 1 or 2 characterised in that said first layer (12) of said composite (64) comprises a fire-retardant neoprene foam and said second layer (14) comprises a fiberglass fabric.

4. A mattress (60) as claimed in any one of the preceding claims characterised in that said first layer (12) of said composite (64) comprises a fire retardant neoprene foam and said second layer (14) is made of fiberglass fabric comprising at least one retaining layer of material bonded to a mesh of fiberglass fibers so as to prevent said fiberglass fibers from breaking off.

5. A mattress (60) as claimed in any one of the preceding claims wherein said composite (20) further comprises a third layer (26) composed of a fire retardant composition, characterised in that said third layer is bonded to said second layer (24) on the opposite side from said first layer.

6. A mattress (60) as claimed in Claim 5 characterised in that said third layer (26) of said composite (20) is made of fire-retardant neoprene foam.

7. A process for making a mattress (60) which includes a cover (62) overlying a plurality of flammable components, characterised by the steps of providing a first layer (12) of a fire-retardant composition, bonding to said first layer a second layer (14) of a material having a high-tensile strength such that said second layer has a high tensile strength in directions along its surface, and substantially enclosing the flammable components of the mattress with said bonded first and second layers, with said second layer disposed adjacent at least one of the flammable components and said first layer adjacent the cover.

8. A process for making a mattress (60) as claimed in Claim 7, characterised in that said first

layer (12) is made of fire-retardant neoprene foam and said second layer (14) is made of a fiberglass fabric.

9. A process for making a mattress (60) as claimed in Claim 8 characterised in that said second layer (14) of a fiberglass fabric comprises at least one retaining layer of material bonded to a mesh of fiberglass fibers so as to prevent said fibers from breaking off.

10. A process for making a mattress (60) as claimed in any one of Claims 7 to 9 characterised by the further steps of bonding to said second layer (24) a third layer (26) made of a fire retardant composition on the opposite side from said first layer (22).

11. A process for making a mattress (60) as claimed in Claim 10 characterised by the further step of bonding to said second layer (24) a third layer (26) made of a fire-retardant neoprene foam on the opposite side from said first layer (22).

12. A mattress (60) as claimed in Claims 1 or 2 characterised in that the composite material (64) is produced by a process as claimed in any one of Claims 7 to 11.

Patentansprüche

1. Mehrschichtige Matratze (60) mit einer Hülle (62), mehreren brennbaren Bestandteilen und mehreren Schichten, die im wesentlichen die brennbaren Bestandteile umschließen, dadurch gekennzeichnet, daß die Schichten miteinander verbunden sind und einen Verbundwerkstoff (10) bilden, bestehend aus einer ersten Schicht (12) aus feuerhemmendem Material, das an der Hülle anliegt, und einer zweiten Schicht (14) aus einem Material mit hoher Zugfestigkeit, wobei die erste und zweite Schicht so miteinander verbunden sind, daß die zweite Schicht längs ihrer Oberfläche eine hohe Zugfestigkeit aufweist.

2. Matratze (60) nach Anspruch 1, dadurch gekennzeichnet, daß die erste Schicht (12) des Verbundwerkstoffes (64) bei Brand verkohlt, um das Innere der Matratze vor Hitze und Feuer zu schützen, und daß die zweite Schicht (14) ein Aufreißen der Matratze bei Brand verhindert.

3. Matratze (60) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die erste Schicht (12) des Verbundwerkstoffes (64) aus einem feuerhemmenden Neoprenschaum besteht und die zweite Schicht (14) ein Glasfasergewebe aufweist.

4. Matratze (60) nach jedem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die erste Schicht (12) des Verbundwerkstoffes (64) aus einem feuerhemmenden Neoprenschaum besteht und die zweite Schicht (14) aus einem Glasfasergewebe hergestellt ist, das wenigstens eine Befestigungsschicht aus einem Material aufweist, das mit einem Glasfasergewebe verbunden ist, um ein Abbrechen der Glasfasern zu verhindern.

5. Matratze (60) nach jedem der vorstehenden Ansprüche, deren Verbundwerkstoff (20) weiterhin eine dritte Schicht (26) aus feuerhemmendem Material aufweist, dadurch gekennzeichnet, daß

said composite, the fiberglass fibers are sandwiched between the polyester and the fire retardant layer and have been found not to break off and separate from the composite 80.

Claims

1. A mattress (60) of a multilayered structure comprising a cover (62), a plurality of flammable components and a plurality of layers substantially enclosing the flammable components, characterised in that the layers are bonded together to form a composite (10) comprising a first layer (12) of a fire-retardant composition disposed adjacent the cover, and a second layer (14) of a material having a high tensile strength, the first and second layers being bonded together such that the second layer has a high tensile strength in the directions along its surface.

2. A mattress (60) as claimed in Claim 1, characterised in that said first layer (12) of said composite (64) chars upon being exposed to fire to protect the inside of said mattress from heat and fire and said second layer (14) prevents the mattress from bursting open upon being exposed to fire.

3. A mattress (60) as claimed in Claims 1 or 2 characterised in that said first layer (12) of said composite (64) comprises a fire-retardant neoprene foam and said second layer (14) comprises a fiberglass fabric.

4. A mattress (60) as claimed in any one of the preceding claims characterised in that said first layer (12) of said composite (64) comprises a fire retardant neoprene foam and said second layer (14) is made of fiberglass fabric comprising at least one retaining layer of material bonded to a mesh of fiberglass fibers so as to prevent said fiberglass fibers from breaking off.

5. A mattress (60) as claimed in any one of the preceding claims wherein said composite (20) further comprises a third layer (26) composed of a fire retardant composition, characterised in that said third layer is bonded to said second layer (24) on the opposite side from said first layer.

6. A mattress (60) as claimed in Claim 5 characterised in that said third layer (26) of said composite (20) is made of fire-retardant neoprene foam.

7. A process for making a mattress (60) which includes a cover (62) overlying a plurality of flammable components, characterised by the steps of providing a first layer (12) of a fire-retardant composition, bonding to said first layer a second layer (14) of a material having a high-tensile strength such that said second layer has a high tensile strength in directions along its surface, and substantially enclosing the flammable components of the mattress with said bonded first and second layers, with said second layer disposed adjacent at least one of the flammable components and said first layer adjacent the cover.

8. A process for making a mattress (60) as claimed in Claim 7, characterised in that said first

layer (12) is made of fire-retardant neoprene foam and said second layer (14) is made of a fiberglass fabric.

9. A process for making a mattress (60) as claimed in Claim 8 characterised in that said second layer (14) of a fiberglass fabric comprises at least one retaining layer of material bonded to a mesh of fiberglass fibers so as to prevent said fibers from breaking off.

10. A process for making a mattress (60) as claimed in any one of Claims 7 to 9 characterised by the further steps of bonding to said second layer (24) a third layer (26) made of a fire retardant composition on the opposite side from said first layer (22).

11. A process for making a mattress (60) as claimed in Claim 10 characterised by the further step of bonding to said second layer (24) a third layer (26) made of a fire-retardant neoprene foam on the opposite side from said first layer (22).

12. A mattress (60) as claimed in Claims 1 or 2 characterised in that the composite material (64) is produced by a process as claimed in any one of Claims 7 to 11.

Patentansprüche

1. Mehrschichtige Matratze (60) mit einer Hülle (62), mehreren brennbaren Bestandteilen und mehreren Schichten, die im wesentlichen die brennbaren Bestandteile umschließen, dadurch gekennzeichnet, daß die Schichten miteinander verbunden sind und einen Verbundwerkstoff (10) bilden, bestehend aus einer ersten Schicht (12) aus feuerhemmendem Material, das an der Hülle anliegt, und einer zweiten Schicht (14) aus einem Material mit hoher Zugfestigkeit, wobei die erste und zweite Schicht so miteinander verbunden sind, daß die zweite Schicht längs ihrer Oberfläche eine hohe Zugfestigkeit aufweist.

2. Matratze (60) nach Anspruch 1, dadurch gekennzeichnet, daß die erste Schicht (12) des Verbundwerkstoffes (64) bei Brand verkohlt, um das Innere der Matratze vor Hitze und Feuer zu schützen, und daß die zweite Schicht (14) ein Aufreißen der Matratze bei Brand verhindert.

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4. Matratze (60) nach jedem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die erste Schicht (12) des Verbundwerkstoffes (64) aus einem feuerhemmenden Neoprenschaum besteht und die zweite Schicht (14) aus einem Glasfasergewebe hergestellt ist, das wenigstens eine Befestigungsschicht aus einem Material aufweist, das mit einem Glasfasergewebe verbunden ist, um ein Abbrechen der Glasfasern zu verhindern.

5. Matratze (60) nach jedem der vorstehenden Ansprüche, deren Verbundwerkstoff (20) weiterhin eine dritte Schicht (26) aus feuerhemmendem Material aufweist, dadurch gekennzeichnet, daß



die dritte Schicht (26) mit der zweiten Schicht an der der ersten Schicht gegenüberliegenden Seite verbunden ist.

3. Matratze (60) nach Anspruch 5, dadurch gekennzeichnet, daß die dritte Schicht (26) des Verbundwerkstoffes (20) aus einem feuerhemmenden Neoprenschaum besteht.

7. Verfahren zum Herstellen einer Matratze (60) mit einer Hülle (62) über mehreren brennbaren Bestandteilen, gekennzeichnet durch die Arbeitsschritte Herstellen einer ersten Schicht (12) aus feuerhemmendem Material, Verbinden der ersten Schicht (12) mit einer zweiten Schicht (14) aus einem Material mit hoher Zugfestigkeit in Richtung längs der Oberfläche und Umschließen der brennbaren Teile der Matratze mit dem Verbundwerkstoff aus erster und zweiter Schicht, wobei die zweite Schicht an wenigstens einem der brennbaren Teile anliegt und die erste Schicht an der Hülle anliegt.

8. Verfahren zum Herstellung einer Matratze (60) nach Anspruch 7, dadurch gekennzeichnet, daß die erste Schicht (12) aus feuerhemmendem Neoprenschaum besteht und die zweite Schicht (14) aus einem Glasfasergewebe hergestellt wird.

9. Verfahren zum Herstellung einer Matratze (60) nach Anspruch 8, dadurch gekennzeichnet, daß die zweite Schicht (14) aus Glasfasergewebe wenigstens eine Befestigungsschicht aus einem Material aufweist, das mit einer Masche der Glasfasern verbunden ist, um ein Abbrechen der Glasfasern zu verhindern.

10. Verfahren zum Herstellen einer Matratze (60) nach jedem der Ansprüche 7 bis 9, dadurch gekennzeichnet, daß weiterhin an der zweiten Schicht (24) eine dritte Schicht (26) aus feuerhemmendem Material an der der ersten Schicht (22) gegenüberliegenden Seite befestigt wird.

11. Verfahren zum Herstellen einer Matratze (60) nach Anspruch 10, dadurch gekennzeichnet, daß weiterhin an der zweiten Schicht (24) eine dritte Schicht (26) aus einem feuerhemmendem Neoprenschaum an der der ersten Schicht (22) gegenüberliegenden Seite befestigt ist.

12. Matratze (60) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Verbundwerkstoff (64) durch ein Verfahren gemäß jedem der Ansprüche 7 bis 11 hergestellt wird.

Revendications

1. Matelas (60) à structure multicouches, comprenant un revêtement (62), une pluralité de composants inflammables et une pluralité de couches qui enferment sensiblement les composants inflammables, caractérisé en ce que les couches sont assemblées pour former un composite (10) comprenant une première couche (12) faite d'une composition retardatrice du feu disposée adjacente au revêtement, et une deuxième couche (14) faite d'une matière résistante à la traction, la première couche et la deuxième couche étant assemblées de telle manière que la deuxième couche présente une

haute résistance à la traction dans les directions parallèles à sa surface.

2. Matelas (60) selon la revendication 1, caractérisé en ce que ladite première couche (12) dudit composite (64) se carbonise lorsqu'elle est exposée au feu, pour protéger l'intérieur dudit matelas de la chaleur et du feu, et que ladite deuxième couche (14) empêche le matelas de s'ouvrir en éclatant lorsqu'il est exposé au feu.

3. Matelas (60) selon les revendications 1 et 2, caractérisé en ce que ladite première couche (12) dudit composite (64) comprend de la mousse de néoprène retardatrice du feu et ladite deuxième couche (14) comprend un tissu de fibres de verre.

4. Matelas (60) selon l'une quelconque des revendications précédentes, caractérisé en ce que ladite première couche (12) dudit composite (64) comprend de la mousse de néoprène retardatrice de feu et ladite deuxième couche (14) est faite d'un tissu de fibres de verre comprenant au moins une couche de retenue de matière liée à un grillage de fibres de verre de manière à empêcher lesdites fibres de verre de se briser.

5. Matelas (60) selon l'une quelconque des revendications précédentes, dans lequel ledit composite (20) comprend en outre une troisième couche (26) composée d'une composition retardatrice de feu, caractérisé en ce que ladite troisième couche est liée à ladite deuxième couche (24) sur la face que est à l'opposé de ladite première couche.

6. Matelas (60) selon la revendication 5, caractérisé en ce que ladite troisième couche (26) dudit composite (20) est faite d'une mousse de néoprène retardatrice du feu.

7. Procédé pour fabriquer un matelas (60) qui comprend une enveloppe (62) qui recouvre une pluralité de composants inflammables, caractérisé par les phases consistant à préparer une première couche (12) de composition retardatrice de feu, à fixer à ladite première couche, une deuxième couche (14) d'une matière ayant une haute résistance à la traction, de telle manière que ladite deuxième couche possède une haute résistance à la traction dans les directions parallèles à sa surface, et à enfermer sensiblement les composants inflammables du matelas dans lesdites première et deuxième couches assemblées, en disposant ladite deuxième couche adjacente à au moins l'un des composants inflammables et ladite première couche adjacente à l'enveloppe.

8. Procédé pour fabriquer un matelas (60) selon la revendication 7, caractérisé en ce que ladite première couche (10) est faite d'une mousse de néoprène résistante au feu et ladite deuxième couche est faite d'un tissu de fibres de verre.

9. Procédé pour fabriquer un matelas (60) selon la revendication 8, caractérisé en ce que ladite deuxième couche (14) de tissu de fibres de verre comprend au moins une couche de retenue de matière liée à un grillage de fibres



de verre de façon à empêcher les fibres de verre de se briser.

10. Procédé pour fabriquer un matelas (60) selon l'une quelconque des revendications 7 à 9, caractérisé par la phase additionnelle consistant à assembler à ladite deuxième couche (24) une troisième couche (26) faite d'une composition retardatrice de feu, placée sur la face qui est à l'opposé de ladite première couche (22).

11. Procédé pour fabriquer un matelas (60)

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selon la revendication 10, caractérisé par la phase additionnelle consistant à assembler à ladite deuxième couche (24) une troisième couche (26) faite d'une mousse de néoprène retardatrice du feu placée sur la face qui est à l'opposé de ladite première couche (22).

12. Matelas (60) selon les revendications 1 et 2, caractérisé en ce que la matière composite (64) est produite par un procédé selon l'une quelconque des revendications 8 à 13.

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