May 19, 1970 G. SIMON 3,512,192

FIRE RESISTANT MATTRESS

Filed June 3, 1968

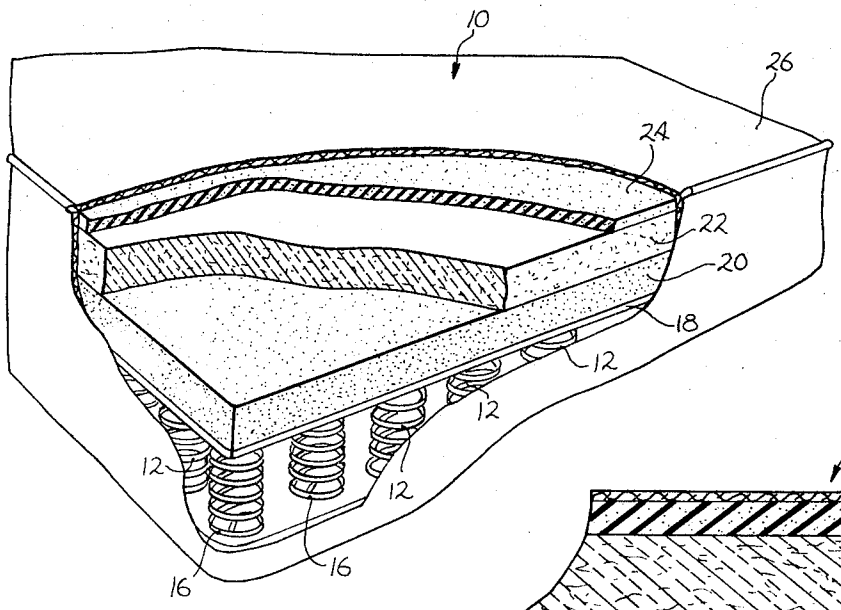

Fig. 1

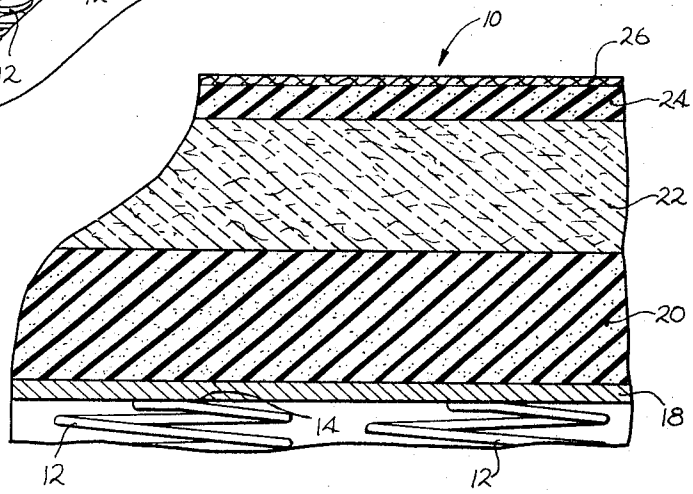

Fig. 2

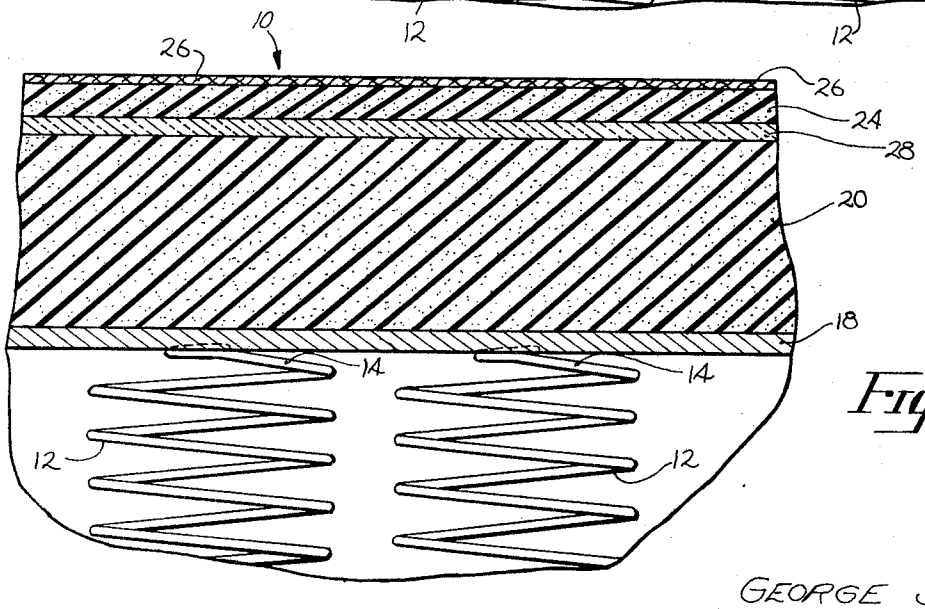

Fig. 3

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FIRE RESISTANT MATTRESS

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ABSTRACT OF THE DISCLOSURE

A mattress constructed so as to render it resistant to ignition by a glowing source as well as ignition by a flaming source.

BACKGROUND OF THE INVENTION

(1) Field of the invention

The present invention relates to the construction of a fire-resistant mattress which minimizes the potential for destructive and injurious fires that often start in a mattress.

(2) Description of the prior art

Some attempts have been made in the past to produce a "fireproof mattress." The approaches taken by the prior art have been to chemically treat the cotton batting, or other materials used as a filler, with a resinous material and/or to provide a treated ticking in an attempt to make the normal mattress materials more resistant to flame. Another approach is described in U.S. Pat. No. 2,624,894 where cellular membranes containing a liquid were inserted in a mattress along with flame-proofed cotton linters and a covering of treated cotton ticking.

None of the prior attempts have successfully solved the problem of providing a mattress which will after prolonged use maintain its ability to withstand ignition from a glowing source and/or a flaming source. Although some of the above constructions, when new, were able to prevent ignition from a small glowing source, there was not sufficient protection to prevent ignition and continued combustion on exposure to sources larger than a cigarete. Further, the prior art devices generally utilized chemically treated fiber battings which after prolonged use became less effective because the chemical coatings tended to dry up, flake off and then separate from the battings.

Summary of the invention

The present invention makes possible a mattress which exhibits better resistance to fire than has been heretofore obtainable. The materials and construction utilized not only make the mattress more fireproof but enable the mattress to exhibit those features that are necessary for a commercially successful product. For example, the present mattress is comfortable, firm but not too hard, does not crinkle and will withstand long and continuous use while still retaining its fire-resistant properties. Mattresses made in accordance with the teachings of the present invention have withstood fires with temperatures up to 1200° F.

By utilizing a multilayer structure (see FIG. 1) comprising layers of polyurethane foam (preferably per specification of ASTM D–1564–62T) along with a heat

resistant layer of Fiberglas or asbestos and a chemically threated ticking; a mattress is obtained which exhibits excellent resistance to fires as well as the comfort features desired.

It is an object of this invention to provide a "fireproof" mattress which has the ability to protect the mattress from ignition from both glowing sources and flaming sources of heat.

It is another object of this invention to provide a fireproof mattress which will maintain its fire resistant properties even after prolonged use.

It is another object of this invention to provide a fireproof mattress that has in addition to its fire resistant properties excellent properties with respect to comfort and long use.

Brief description of the drawings

FIG. 1 is a perspective view of the mattress of the present invention showing the multilayer structure;

FIG. 2 is a cross-sectional side elevational view of a mattress embodying the invention; and

FIG. 3 is a cross-sectional side elevational view of another embodiment of the invention.

Description of the preferred embodiments

A better understanding of the invention will be obtained by reference to the drawings.

Referring to FIG. 2, there is shown a mattress **10** constructed with standard helical innersprings **12** for support. The springs have a top side **14** and bottom side **16**. The construction on each side of the springs is identical so for the sake of simplicity only the construction commencing at the top side **14** of the centrally located springs **12** will be described. Although not a necessary part of the invention, a standard type flexilator **18** is positioned adjacent the springs **12**. The flexilator is usually made of wires, with hemp or paper joined on the wires to provide a grid arrangement which prevents "cupping" of the filler layers into the spring coils. The utilization of a flexilator is generally preferred for better grade mattresses.

Immediately adjacent to the flexilator is a layer **20** of polyurethane foam. Layer **20** is ideally between ½ to 1½ inches thick and is made from polyurethane foam having a density of about 1.5 lbs. per cubic foot. Excellent results have been obtained with a 1 inch thick layer.

Immediately adjacent to the top of layer **20** is a layer **22** of Fiberglas matting. Ideally, the layer **22** is between about ½ to 1½ inches thick and is made from Fiberglas matting having a density of 0.75 lbs./ft.^{3}. A preferred thickness of 1 inch has yielded excellent results.

Immediately adjacent to the top of layer **22** is a layer **24** of polyurethane foam. The desired thickness of layer **24** is in the order of ¼ inch (±1/16 inch). Layer **24** is made from polyurethane foam having a density of about 1.5 lbs. per cubic foot.

Immediately adjacent to the top of the polyurethane layer **24** is an outer covering **26** generally called "ticking". Three types of tickings may be used. The first is a plasticized ticking which is used mainly for institutional purposes. This plasticized ticking is generally a polymerized poly vinyl chloride such as Fasslon 180 manufactured by Fassler, Inc. of New York. A second type of ticking which is used is an ordinary fabric ticking which has been chemically treated and complies with Type II

Interior Specification of the California State Fire Marshal's Office. The latter type ticking would most likely be favored by the ordinary consumer or motel owner. A third type of ticking which may be used is a non-flammable Fiberglas fabric.

Although certain preferred dimensions for the layers **20**, **22** and **24** have been recited good results in fire-proofing and comfort have been obtained with other dimensions keeping the overall thickness of layers **20** and **22** between ¾ and 2¼ inches. However, layer **24** should not be varied beyond the ¼ inch dimension recited previously, for reasons that will be explained below.

The polyurethane foam has excellent cushioning properties lending itself to mattress application. It does not support flameless combustion or glowing, and therefore is not subject to ignition by burning cigarettes or even substantially larger glowing sources of ignition. In general, however, polyurethane foam can be ignited by direct exposure to a flame.

In the construction described above it has been found that not only will the finished mattress resist ignition from a glowing source but also from a flaming source. The polyurethane layer **24** acts as a heat absorber. Also, it requires oxygen for ignition. Sufficient oxygen from the atmosphere cannot usually get through the treated ticking **26**. However, it has been found that even if air does get through the ticking **26**, the ¼ inch thickness of layer **24** is too thin for the layer to be exposed to sufficient oxygen to permit it to burn. Further, the ¼ inch thickness is sufficient to prevent glass fibers from layer **22** from working upwards through the ticking. Thinner layers do not appear able to contain the glass fibers which may constitute an irritant to the sleeper from passing through the top layer. The thickness of layer **24** has been found to be quite critical in making a fireproof mattress with a top layer of polyurethane foam. At ¼ inch $\pm\frac{1}{16}$ inch the layer **24** will not support and maintain a flame. The layer **24** will merely melt and become a heat dissipator. At thicknesses of about ½ inch polyurethane foam has been found to support a flame.

The Fiberglas layer **22** acts as a heat barrier or shield and substantially prevents the heat generated above the layer from penetrating into the polyurethane layer **20** The Fiberglas layer which has a normal melting point of 400° F., withstands heat as high as 1200° F. under the multilayer construction principle and shows no physical property change whatsoever.

The outer covering **26** if plasticized (e.g., with Fasslon 180) is substantially non-porous thereby cutting off air from the inside of the mattress and lowering any possibility for combustion. Also, when vinyl plastic is used, the covering does not support either glowing or flamming ignition and is basically self-extinguishing. The chemically treated converings generally supplied to consumers also have a self-extinguishing feature since they are treated for fire resistance, as previously described.

The polyurethane layer **20** serves to dampen spring vibrations and to provide a cushioned support and generally performs the same functions as any ordinary mattress stuffing.

FIG. 3 illustrates another embodiment of the invention which is essentially the same as that of FIG. 1 except that the Fiberglas layer **22** has been replaced by an asbestos pad **28**. The pad **28** has a thickness in the order of ⅛ inch and weighs about 10 ounces per square yard. The thickness for the polyurethane layer **20** is preferably in the order of 1½ inches thick. The asbestos pad **28** performs the same functions previously described for Fiberglas layer **22**, namely a heat shield. The Fiberglas, however, also serves as a filler and provides an air chamber since it has more thickness and a lower density. It is believed that the air chamber in the Fiberglas matting **22** provides some additional insulation and tends to resist heat somewhat better than the asbestos pad **28**, however, the asbestos pad has performed quite successfully and

may be used in place of the Fiberglas layer **22** if desired.

Other foams, such as neoprene, have similar principal properties to polyurethane foam but will smolder and produce noxious gases. Polyurethane will not smolder and produce noxious gases thereby making it an extremely suitable material for fire-resistant mattresses.

Both of the embodiments (FIG. 2 and FIG. 3) have passed the following tests to illustrate their fireproof characteristics:

Test 1.—Glowing source of ignition is a two inch square by one inch high piece of cotton batting typical of that used for mattress filling weighing from 1.9 to 2.1 grams. This is laid on top of the mattress sample and ignited at each of the exposed four corners with a match flame. There shall be no sustained glowing or filamming combustion of the mattress extending beyond the exposed area;

Test 2.—Flaming source of ignition is one ounce of shredded newspaper (strips one-fourth to one-half inch wide) arranged in a pile to cover a circular area approximately nine inches in diameter and three inches high at the center. This is ignited near the center with a match flame. There shall be no sustained flaming or glowing combustion of the mattress extending substantially beyond the area directly exposed to the burning newspaper.

Although certain preferred embodiments have been described, it should be understood that various modifications within the spirit and scope of the invention are possible.

What is claimed is:

1. A mattress comprising:
- (a) central means for support having top and bottom sides;
- (b) first layers of polyurethane foam adjacent said top and bottom sides;
- (c) fire resistant heat shields adjacent said first layers of polyurethane foam;
- (d) second layers of polyurethane foam adjacent said shields; and,
- (e) a fire resistant outer covering which encloses the mattress.

2. The mattress of claim **1** in which said fire resistant shields are made of fiberglas.

3. The mattress of claim **1** in which said fire resistant shields are made of asbestos.

4. The mattress of claim **1** in which said second layers of polyurethane foam have a thickness in the order of ¼ inch.

5. The mattress of claim **4** in which said fire resistant outer coating is a vinyl plastic coated ticking.

6. The mattress of claim **4** in which said fire resistant outer coating is a Fiberglas ticking.

7. The mattress of claim **2** in which said first layers of polyurethane and said heat shields have an overall thickness in the order of ¾ to 2¼ inches on each side of said support means.

8. A fire resistant mattress comprising:
- (a) a central means for support having top and bottom sides;
- (b) first layers of polyurethane foam adjacent said top and bottom sides;
- (c) fire resistant heat shields adjacent said top and bottom sides;
- (d) second layers of polyurethane foam adjacent said shields, said second layers having a thickness in the order of ¼ inch; and,
- (e) a fire resistant outer covering which encloses the mattress.

9. The mattress of claim **8** in which said shields are Fiberglas matting having a thickness in the order of 1 inch and a density of 0.75 lbs./ft.^{3}.

10. The mattress of claim **9** in which said first polyurethane layers have a thickness in the order ½ to 1½ inches.

11. The mattress of claim **9** in which said outer covering is a vinyl plastic coated ticking.

12. The mattress of claim 9 in which said outer covering is a Fiberglas ticking.

13. The mattress of claim 8 in which said shields are asbestos pads having a thickness in the order of ⅛ inch and weighing about 10 ounces per square yard.

14. The mattress of claim 13 in which said first polyurethane layers have a thickness in the order ½ to 1½ inches.

15. The mattress of claim 14 in which said outer covering is a vinyl plastic coated ticking.

16. The mattress of claim 14 in which said outer covering is a Fiberglas ticking.

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