Jan. 13, 1953 J. F. McCARTHY 2,624,894

MATTRESS CONSTRUCTION

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FIG. 1.

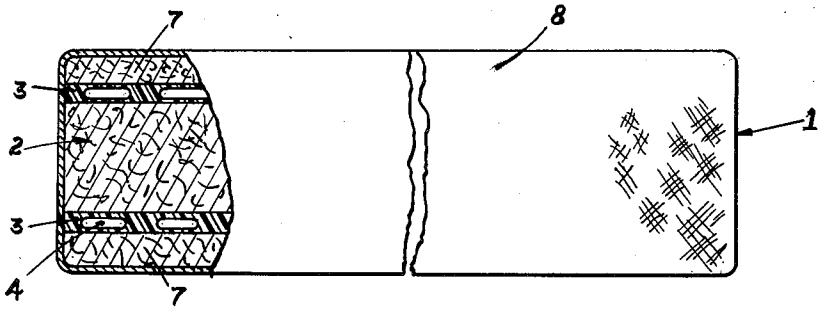
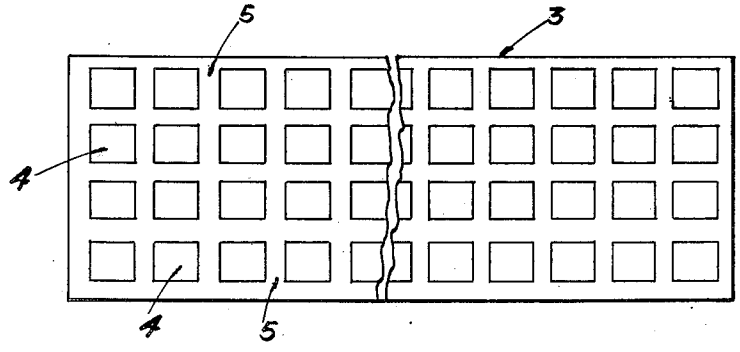


FIG. 2



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MATTRESS CONSTRUCTION

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6 Claims. (Cl. 5—361)

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The present invention relates to mattresses and more particularly to a mattress construction which exhibits improved fire resistance characteristics.

It is well known that various media, such as ammonium phosphate, sodium borate, metallic oxides, chlorinated resins and the like are available and widely used for flameproofing textile materials, cotton linters and battings which compose conventional mattresses of mass production. The treated materials, per se, are quite resistant to fire and assembled mattresses of the treated materials will not support exterior combustion. Such a mattress is, however, subject to destruction through interior combustion occasioned by localized ignition or glow within the central core of compressed cotton batting with the introduction therein of a hot piece of metal, for example a rivet, bolt, bomb or shell fragment. There is little or no possibility of dissipation of heat from the core and the glow will travel therethrough until it has been consumed. This result has been observed regardless of the nature of the flameproofing agent used to treat the cotton batting and despite the normal effectiveness thereof in preventing "after-glow." It is realized that in ordinary usage few if any mattresses would be subject to penetration by hot metal pieces but on naval vessels a hazard of this type is a real possibility and material specifications have been formulated with this in mind.

One object of my invention is to provide a mattress which embodies inwardly disposed elements designed to create barriers to or arrest the propagation of combustion therein.

A second object of the present invention is the provision in a mattress construction of centrally disposed cellular membranes carrying a liquid having a high latent heat of evaporation to quench the heat of penetrating metal fragments which would normally ignite the core section of the mattress.

These and other objects of my invention will be more readily apparent from the following detailed description of certain preferred embodiments thereof. when taken in connection with the accompanying drawing.

In the drawing:

Figure 1 is a side elevation of a mattress with a portion thereof broken away to show the interior assembly in section; and

Figure 2 is a plan view of the central membranes contained within the construction.

Referring to the drawings, a mattress 1 has a core section 2 of yieldable material such as cotton batting or cotton linters formed as an integral unit or in assembled segments. The material is flameproofed with a temporary, water-soluble or durable, resinous type treating solution in a manner well known to the art. Cellular membranes 3 of plastic film are disposed over the top and bottom surfaces of the core section 2. The membranes 3 are provided with a plurality of individual compartments 4 formed therein and spaced strips or areas 5 through which fastening elements (not shown) uniting the several elements of the mattress may be passed. Cover layers 7 of cotton linters, cotton batting, or felted material are positioned over the outer surfaces of the membranes 3. These layers, which have been flameproofed by suitable treatment, serve to protect the membranes against damage during normal handling and usage as well as to provide additional cushioning in the mattress. An outer casing or envelope 8 of conventional ticking or other suitable material, also flameproofed, covers the entire assembly and secures it into a composite unit, with the assistance of ties or tufting cords (not shown) if such are needed.

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The plastic film of which the membranes 3 are formed should be moistureproof and should also be capable of withstanding a normal amount of flexing and mechanical deterioration without rupture. It is also preferred that the film be of a material which will not support combustion, or at most burn only with difficulty. Polyvinyl chloride, vinyl chloride-vinyl acetate copolymers, polyvinylidene chloride, vinylidene chloride-vinyl chloride copolymers, chlorinated rubber, rubber hydrochlorides, polyethylene, polymerized chloroprene, and transparent regenerated cellulose are a few of the plastic materials suitable for use as an element in my invention. The plastic sheeting may contain fillers, plasticizers and/or other modifying agents to increase its flame resistance, or to improve its physical and chemical properties. For example, chlorinated plasticizers are ideally suited for inclusion in the plastics enumerated.

It is preferred that the plastic per se, or in modified form, melt in the range of 290°–450° F. in order that its function is realized at an effective temperature. This factor is not essential, however, since it is quite likely that on most occasions the membrane will be penetrated by metal fragments thus being activated immediately thereby.

It is also preferred that the plastic membranes be formed into a plurality of individual compartments in order that a single puncture will

not destroy their effectiveness for subsequent use. For this reason it is desired that the plastic be thermoplastic and heat sealing to facilitate its formation, although the use of adhesives, if necessary, is contemplated. One method of forming the cellular membrances is to unite two thin plastic films at spaced intervals, charging or filling each compartment as it is being formed. A second method consists in applying patches of desired size to the plastic film. Other methods are, of course, entirely feasible depending upon the particular materials which are being utilized.

Each cell is charged with a small amount, from 5–35 grams depending upon the cell size, of a liquid which has flame quenching properties. Water, aqueous salt solutions, and comparable aqueous solutions are preferable because of the high latent heat of evaporation of water. Carbon tetrachloride or other non-inflammable hydrocarbon halide could serve although normally the toxicity of these materials would preclude their use. In the case of water, wetting agents, freezing point depressants, and modifying salts could be added thereto as desired. Calcium chloride is a specific example of a contemplated additive. Again, in the case of water it has been determined that the cell charge should be approximately ¼ of a gram per square inch of cell area for maximum effectiveness. Obviously larger amounts could be utilized although the excessive weight would be objectionable.

In order to demonstrate my construction, a mattress was assembled from a core section of compressed, flameproofed cotton batting 4 inches in thickness; covering membranes consisting of two plies of vinylidene chloride-vinyl chloride copolymer film, 0.002'' thick, formed into individual compartments or cells 6 inches square, each of which was charged with 8 grams of water; surfacing layers, 1 inch thick, of flameproofed cotton linters; and a covering envelope of flameproofed cotton ticking. In each instance the flameproofing consisted of an antimony chloride-chlorinated resin treatment.

A metal bolt weighing approximately 150 grams and heated to 1500° F. was placed upon the upper surface of this mattress. It sank quickly through the ticking and top layer of cotton linters with charring thereof. No flame was observed and because of the flameproofing of the cellulosic material none would be expected. The bolt then contacted the upper membrane, melting or puncturing it to release the confined water. Vaporization of the water lowered the temperature of the bolt. The generated steam and excess moisture dampened the cotton in a small area around the point of penetration. There was so much dissipation of heat that there was no further charring of the cotton and the major portion of the mattress remained intact.

A similar mattress from which the cellular membranes had been omitted was completely gutted when subjected to the identical test. Penetration of the heated bolt into the core section was accompanied by charring as in the first case. The retention of heat in the compressed batting, however, propagated combustion throughout the filler, despite its flameproofing, which continued until the supply of fuel was exhausted. This inner combustion generated temperatures sufficiently high to char the cover ticking at spaced points over the entire area.

Further tests indicate that the cellular, water bearing membranes can be used successfully in combination with a core section of sponge rubber to form a mattress which falls within the scope of my inventive concept as defined in the following claims.

What I claim is:

1. A mattress comprising a yieldable core section, covering cellular membranes over the top and bottom surfaces of the core section, superposed layers of resilient material on the membranes and outer ticking covering the entire assembly, said cellular membranes containing a liquid having a high latent heat of evaporation.

2. A mattress construction as defined in claim 1 in which the liquid contained in the cellular membranes is water.

3. A mattress comprising a yieldable core section, covering membranes of moisture-proof plastic film provided with enclosed cells containing an aqueous solution over the top and bottom surfaces of the core section, superposed layers of resilient material on the membranes and outer ticking covering the entire assembly.

4. A mattress consisting of a central core section of compressed cellulosic batting, covering membranes of vinylidene chloride-vinyl chloride copolymer film provided with enclosed cells containing water over the top and bottom surfaces of the core section, superposed layers of cotton batting on the membranes and outer ticking covering the entire assembly.

5. A mattress consisting of a central core section of compressed cotton batting, membranes of vinylidene chloride-vinyl chloride copolymer film divided into a plurality of separate compartments, each of which contains approximately ¼ gram of water per square inch of area, disposed upon and covering the top and bottom surfaces of the core section, superposed layers of cotton linters on the membranes, and outer ticking covering the entire assembly and securing it into a composite unit.

6. A mattress construction as defined in claim 5, in which the cotton batting, cotton linters and ticking are treated with a flameproofing agent.

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