United States Patent

[11] **3,579,774**

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[21] Appl. No. **808,232**
[22] Filed **Mar. 18, 1969**
[45] Patented **May 25, 1971**
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[54] **METHOD OF CONSTRUCTING A MATTRESS**
14 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **29/91.1, 112/3**
[51] **Int. Cl.** **B68g 7/00**
[50] **Field of Search** 29/91, 91.1, 91.5; 5/345; 112/3

[56] **References Cited**
UNITED STATES PATENTS

3,168,228	2/1965	Lewis	112/3X
3,170,222	2/1965	Doerer	29/91.1
3,266,122	8/1966	O'Kane et al.	29/91.1
3,274,625	9/1966	Metzger	5/345

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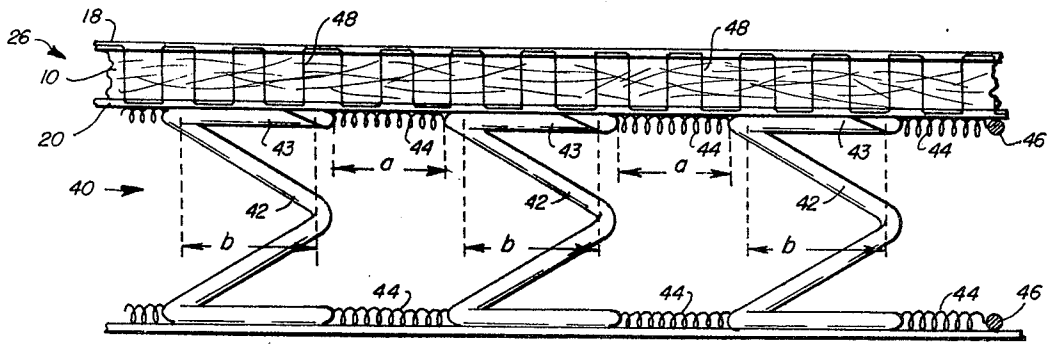
ABSTRACT: An extruded plastic net, having heavy strands in one direction and lighter strands in the other direction, is used to replace the two previous elements i.e. (1) a wirerope spring-bridging unit, and (2) a cotton scrim in a mattress construction thus permitting sewing of the spring-bridging unit to the cushioning material.



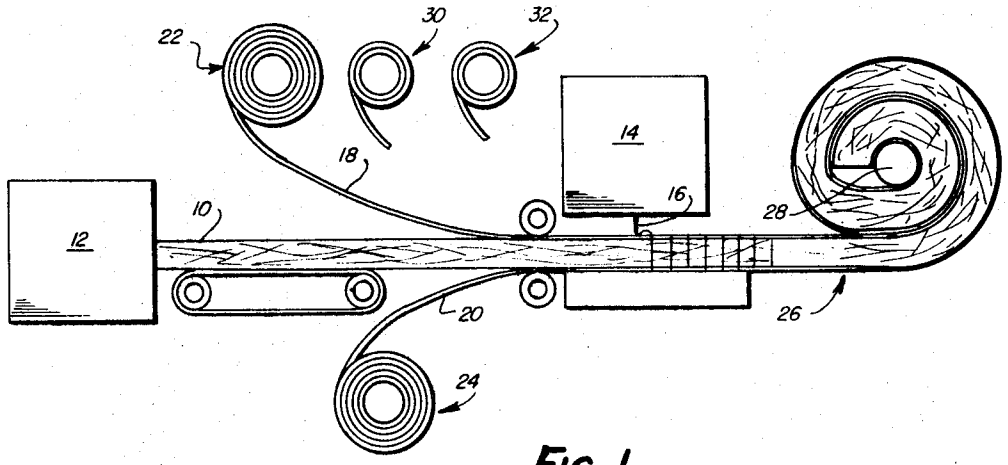


FIG. 1

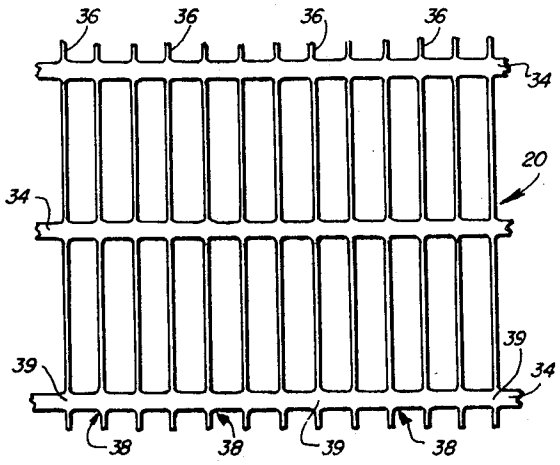


FIG. 2

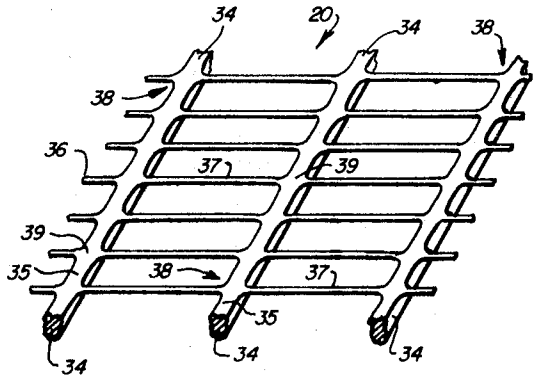


FIG. 3

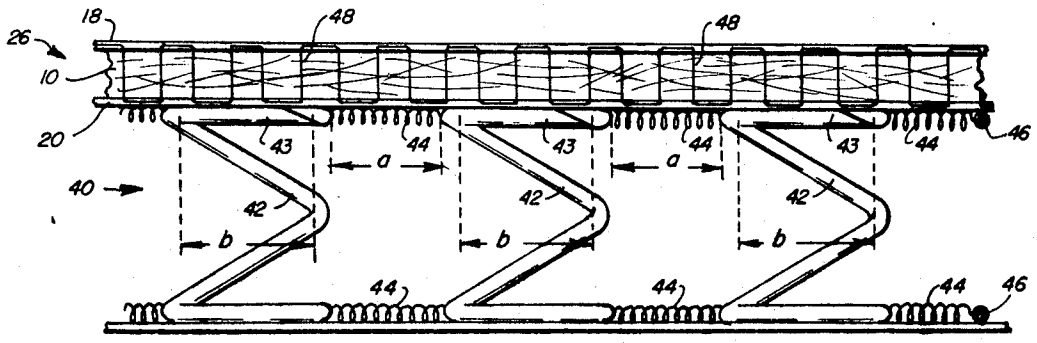


FIG. 4

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METHOD OF CONSTRUCTING A MATTRESS

In present industrial practice it is common to provide a mattress with a spring foundation in which the springs are considerably spaced from each other and then to provide a cushioning material thereover. In order to adequately support the cushioning material and to distribute the weight of the sleeping occupant over the springs it is also common to use a spring-bridging unit comprising a wire and rope unit between the spring foundation and the cushioning material.

In such constructions it is common to provide the cushioning material (commonly a cotton batt) with a cotton scrim sewed to each face thereof to permit handling during manufacture and for other purposes.

It is not possible to stitch the wire and rope spring bridging element to the cotton batt since the wire breaks the needles used in stitching. Accordingly, it is necessary to apply the wire and rope spring-bridging element separately to the spring foundation.

One object of the invention is to reduce the number of parts in a mattress construction by utilizing a single plastic net spring-bridging element stitched to the cotton batt thus eliminating one of the two cotton scrims and the former wire and rope spring-bridging element.

Another object of this invention is to simplify mattress construction by utilizing fewer materials.

Another object of this invention is to simplify the method of manufacturing mattresses by eliminating one of the steps required in manufacture.

These and other objects of the invention will be apparent to those skilled in the art from the following specification and drawings in which:

FIG. **1** is a schematic showing of the assembly of a pad for mattresses,

FIG. **2** shows the plastic net spring-bridging element of this invention,

FIG. **3** is a perspective view of the plastic net of FIG. **2**, and

FIG. **4** is a cross section of a portion of a mattress construction utilizing the spring-bridging element of FIG. **2**.

In the mattress construction industry one of the more common means of constructing a mattress is to first build a spring foundation of coil springs tied together by wires ties of various kinds including, particularly long coil springs wound across the outer coils of the main springs and attached at their ends to the wire border of the mattress. A wire and rope spring-bridging element is then laid over the spring foundation. This wire and rope spring-bridging element may be of the "open" or of the "woven" variety. In the so-called "open" variety a plurality of strands of twisted paper rope or other like cord are arranged parallel on various spacings varying, for example, from 1 inch to 5 inches or more on center. A plurality of wire strands are arranged in the opposite direction and passing through the twisted paper rope which wire strands may vary similarly from 1 inch to 5 inches or more on center. In the "woven" variety of wire and rope spring-bridging element the wire is "shot through" a layer of burlap. In either of these varieties the wire element or strands are typically a **19** gauge tempered steel wire.

Many manufacturers of such mattresses have their own equipment for constructing cotton batts such as a carding machine, one variety of which is referred to as a garnett machine. Such machines comb the cotton fibers into a loose batt which is then further provided with a cotton scrim on each side by sewing the scrim to the batt thus providing a more handleable batt. In some manufacturing operations a topper comprising a cushioning material to provide "feel," such as a polyurethane foam, and the outer ticking are also applied to one surface of the cotton batt over the cotton scrim and sewed to the cotton batt as a unit at the same time the two cotton scrims are provided. This latter method is commonly done when a "scroll" pattern is desired on a deep quilted mattress. When the upper layer of cushioning material and the ticking (frequently called the topper) is not sewn as a unit to the cotton batt the same will be separately sewed and applied.

The cotton batt, sewn together as above described, is then applied over the wire and rope spring-bridging unit and the topper (if not incorporated in the pad) is then applied and the mattress finished at the borders.

The wire and rope spring-bridging element is provided to distribute the weight of sleeping occupants and bridge the spaces within and between springs and to provide a stiffness to the mattress. In some instances this wire and rope spring-bridging element is used only at the center of the mattress due to its cost; however, it frequently covers the entire mattress, particularly in the better quality of mattress. In any event, it is necessary to cut the wire and rope spring-bridging element from a roll to the appropriate size and to apply the same to the spring foundation and secure the same thereto as by hog rings or other known mechanisms.

This invention is directed to a specific plastic net spring-bridging element which not only replaces the wire- and rope-bridging element but also replaces the sewable cotton scrim on one side of the cotton batt when the mattress pad is formed. Thus one element of the previous construction is eliminated together with one of the steps of manufacture.

As shown in FIG. **1** the cotton batt portion **10** of the mattress pad is first formed in any suitable conventional forming means such as a garnett, indicated at **12**. The cotton batt **10** is then conveyed to a suitable conventional stitching machine **14** which stitches through the batt **10** by means of a gang of needles generally indicated at **16**.

Also fed to the stitching machine **14** is a light cotton scrim **18** on the top surface of the batt **10** and the sheet of plastic net **20**. The cotton scrim **18** and the plastic net **20** may be fed from suitable rolls such as indicated at **22** and **24** respectively. The stitching machine **14** will then stitch the cotton scrim **18** and the plastic net **20** to opposite faces of the cotton batt **10** thus forming the mattress pad **26** which is rolled onto a mandrel **28**. If it is desired to combine the mattress pad **26** with the topper in one operation suitable materials such as sheet polyurethane foam may be fed from another roll **30** and the ticking or other covering may be fed from still an additional roll **32**. Under such an arrangement the topper materials including the ticking would be stitched to the mattress pad in a single operation.

The mattress pad **26** is then taken from the roll, cut to appropriate size, and applied to the spring base. If the mattress pad **26** includes the topper the entire construction is applied to the spring base or foundation in one step whereas otherwise the topper must be separately applied.

The plastic net **20** of this invention is preferably an extruded plastic net having two sets of parallel strands with the strands of one set crossing the strands of the other set at substantially a right angle. Such a net may be readily extruded by use of the method and apparatus disclosed in U.S. Pat. No. 3,252,181. By use of the method and apparatus of said patent considerable variation in the strand count, diameter of strands, and the like may be achieved. The particular construction of the net **20** of this invention, as shown in FIGS. **2** and **3**, comprises a plurality of parallel strands **34** forming one set of strands and a plurality of strands **36** forming a second set of strands. The strands **36** cross the strands **34** at substantially right angles thereto and integral joints **38** are formed at the intersection of the strands **36** and **34** during manufacture. Preferably, the plastic net is oriented after extrusion by heating the same and stretching the same along the strands in one direction while heated and then heating the same and stretching the other strands in their longitudinal direction and then cooling the net while so stretched. This tends to orient the molecular structure of the net and provide a stronger net per unit of weight. In the specific net **20** as shown in FIGS. **2** and **3**, which is preferred, one set of strands **34** are either not oriented or only oriented slightly while the strands **36** are more highly oriented. With a proper combination of extrusion and orientation the strands **34** are provided having a considerably larger size in cross section than the strands **36**. As seen in FIG. **3** strands **34** are considerably larger than the strands **36**. In one preferred

embodiment the heavy strands **34** have a diameter of 0.066 inch while the lighter strands **36** have a diameter of 0.016 inch. It must be understood, however, that considerable variation in strand size may be tolerated by the construction and process of this invention and, additionally, the strands do not necessarily have a circular cross section but may be somewhat elongated in cross section as shown for the strands **34** in FIG. **3**. The strands of greater orientation will tend to be more nearly circular in cross section. In the preferred embodiment of the net **20** and after orienting the extruded net the larger strands **34** are on 1½-inch centers and the smaller strands **36** are on ¼-inch centers. Such a construction is excellent for use as a spring-bridging element to firm the mattress and to bridge the space within and between coils in a construction such as that shown in FIG. **4**.

As shown in FIG. **4** the spring foundation **40** is made up from a plurality of coil springs **42** tied together by long small coil springs **44** in known manner. The coil springs **44** are then fixed at their ends to the mattress border **46**, also in known manner. Over the spring foundation **40** the mattress pad **26** is placed. As indicated above, the mattress pad **26** comprises the central cotton batt **10**, the scrim **18** and the net **20**. The three elements (the cotton batt **10**, the scrim **18** and the plastic net **20**) are stitched together by stitches **48**. Any topper (not shown) is then applied over the mattress pad **26** if the same is not incorporated therewith during the stitching operation at the stitching machine **14**. The mattress pad **26** is then fastened to the spring foundation **40** in any conventional manner.

A spring-bridging element such as the previously used wire and rope must be capable of distributing the weight forces over the various springs across the distances "*a*" between springs and across the spaces "*b*" within the top circular coil **43** of the coil springs **42**. Previously, only the wire- and rope-bridging element adequately bridged between the springs and gave the adequate firmness to the mattress. Stiffness is required to adequately bridge the spaces "*a*," "*b*," Accordingly, the stiffer strands **34** are arranged usually in the longer direction of the mattress to provide bridging over more springs. It has been found, surprisingly, that the plastic net of the invention may be utilized in place of the extremely strong wire- and rope-bridging element previously used, even though the plastic net of the invention is considerably less stiff and has considerably less tensile strength as indicated by tests referred to below.

A sample of wire and rope having wires 0.95 inch on center and made up from wires of 19 gauge tempered steel wire was tested for tensile strength both along the wire strand direction and transverse thereto. A plastic net sample of this invention having a heavy strand 0.066 inch in diameter and a light strand 0.016 inch in diameter with the heavy strands on 1½ -inches centers and the smaller strands on ¼ -inch centers was also tested for tensile strength in each direction with the following results:

TABLE I.—TENSILE STRENGTH

Sample	Pounds per inch width
Wire and rope (along length of wire strand)	280.0
Plastic net (along length of heavy strand)	16.0
Wire and rope (transverse to length of wire strand)	20.0
Plastic net (along length of light strand)	21.5

Samples of the same two materials were then assembled over a spring foundation and use tested by a bouncing weight with the cycles of bounce reported for each sample tested. The two constructions gave the following results:

TABLE II.—USE TEST

Sample	Cycles
Wire and rope assembly	1,800 cycles (wire broke).
Plastic net assembly	20,000 cycles (test stopped at 20,000 cycles; no visible deterioration).

It will be seen from the above table that the wire and rope and the plastic net have approximately the same tensile strength transverse to the heavy strand (the wire strand of the wire and rope), and the wire and rope has a tensile strength 17½ times as great as the plastic net along the bridging strands (the wire of the wire and rope and the heavy strand **34** of the plastic net). However, surprisingly, in actual use the plastic net gave 11 times the use.

Since stiffness is an important criterion in a spring-bridging element since it relates to the ability to distribute the load and to the firmness of the ultimate mattress, two samples like those used in Tables I and II were tested by a deflection test to determine the flexibility along the length of the bridging strand and transverse thereto. The test involved placing a 12 inch by 12 inch sample flat on a table with 6 inches overhanging the edge of the table. The distance from the outer edge of the material to the floor was then measured. Weights were added to the samples to achieve a deflection downwardly of at least 1 inch. The distance from the floor was then again measured. The difference between the two distances was then divided into the load used to obtain a figure representing pounds per inch deflection. The results:

TABLE III.—STIFFNESS

Sample	Deflection
Wire and rope (wire direction)	0.469 lbs./in.
Plastic net (heavy strand direction)	0.082 lbs./in.
Wire and rope (transverse to wire direction)	Deflected under its own weight.
Plastic net (light strand direction)	Deflected under its own weight.

Two samples of the same wire and rope and plastic net were constructed into mattresses and found to have substantially equivalent firmness even though the wire and rope was from 5 to 6 times as stiff as the plastic net as shown in Table III.

The preferred polymeric material for the plastic is a polypropylene although other extrudable plastic materials may be used.

It is not known exactly why the plastic net, which has considerably less tensile strength and less stiffness should perform superior to the wire and rope when actually put together in the final construction as evidenced by the test results of Table II. Similarly, it is not known exactly why the mattress should be equally as firm with either the wire and rope or with the plastic net even though the plastic net is much less stiff than the wire and rope as indicated in Table III. While the reasons for these results are not known it is theorized that it is in part due to the nature of the polymeric plastic of the net i.e. polypropylene which has a tendency to increase in strength when flexed. Also, the plastic net **20** as shown in FIG. **3** as the upper surfaces **35** of the strands **34** substantially flat and substantially coplanar with the upper substantially flat surfaces **37** of the strands **36**. When the plastic net **20** is stitched to the cotton batt **10** the net **20** is arranged with the relatively flat coplanar surfaces **35, 37** of the strands **34, 36** respectively adjacent to the cotton batt **10**; it is believed, but not known, that the substantially flat and substantially coplanar surfaces **35, 37** provide a smoother and flatter support for the cotton batt **10** than was previously the case with the wire and rope construction in which the wire and rope were of different diameters and in which the wire passed through the rope substantially centrally thereof. With the wire and rope the upper surfaces of the wire and the rope were at different levels and as such tended to abrade the adjacent surface of the cotton batt **10**.

In prior art constructions it was common to provide an insulator material between the spring foundation and the wire and rope construction in order to insulate against the clocking noise that occurred when the wire of the wire and rope-bridging element clicked against the wires of the springs. Such insulating elements comprised thin cotton batts or burlap or the like interposed between the wire and rope spring-bridging element and the spring foundation. It has been found with the construction of this invention that not only does the plastic net

eliminate the wire and rope spring-bridging element and the cotton scrim previously sewed to the cotton batt, but also, the noise insulating element may be eliminated.

I claim:

1. The method of constructing a cushion comprising stitching a cushioning batt to an open mesh plastic net to form a pad, said net having a plurality of sets of polymeric plastic strands with one of said sets having the strands thereof crossing the strands of another set, and applying said pad to a spring foundation with the net side thereof facing toward the springs of said foundation.

2. The method of claim 1 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

3. The method of claim 1 in which during said stitching operation a scrim is stitched to said cushioning batt on the opposite side thereof from said plastic net.

4. The method of claim 3 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

5. The method of claim 1 in which during said stitching operation a scrim and a topper are stitched to said cushioning batt on the opposite side thereof from said plastic net.

6. The method of claim 5 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

7. The method of claim 1 in which during said stitching operation a scrim, a topper and a ticking are stitched to said cushioning batt on the opposite side thereof from said plastic net.

8. The method of claim 7 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

9. The method of claim 1 in which the crossings of the strands of one set with the strands of another set are integral joints.

10. The method of claim 9 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

11. The method of claim 1 in which said crossing sets of strands cross each other at substantially a right angle.

12. The method of claim 11 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.

13. The method of claim 1 in which said crossing sets of strands cross each other at substantially a right angle, the crossings of said sets of strands being integral joints, and the strands of one of said crossing sets being heavier than the strands of another crossing set of strands.

14. The method of claim 13 in which said stitching is performed substantially continuously, and in which said pad is cut to size to fit said spring foundation.