Oct. 17, 1961 R. H. BLECKER 3,004,266

MATTRESS CONSTRUCTION AND SPRING

Filed Jan. 2, 1959 3 Sheets-Sheet 1

Fig 1

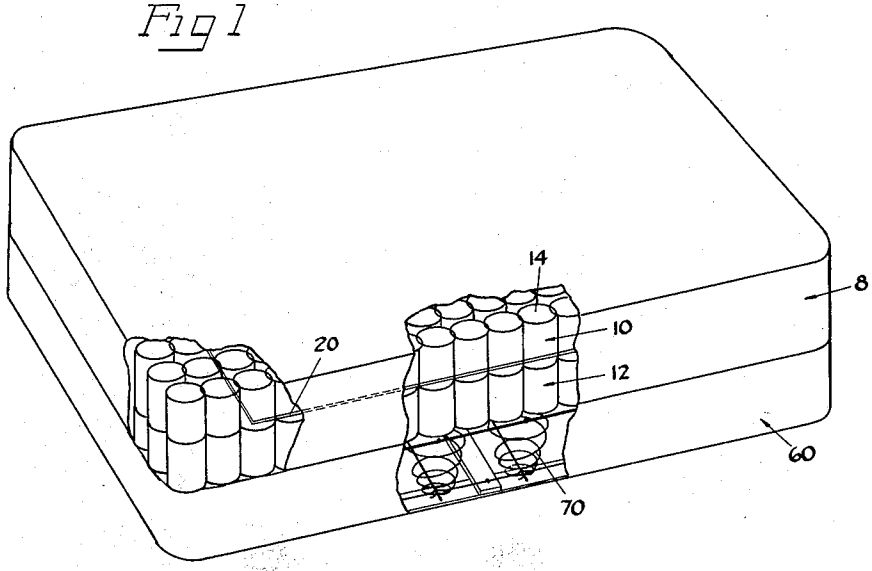
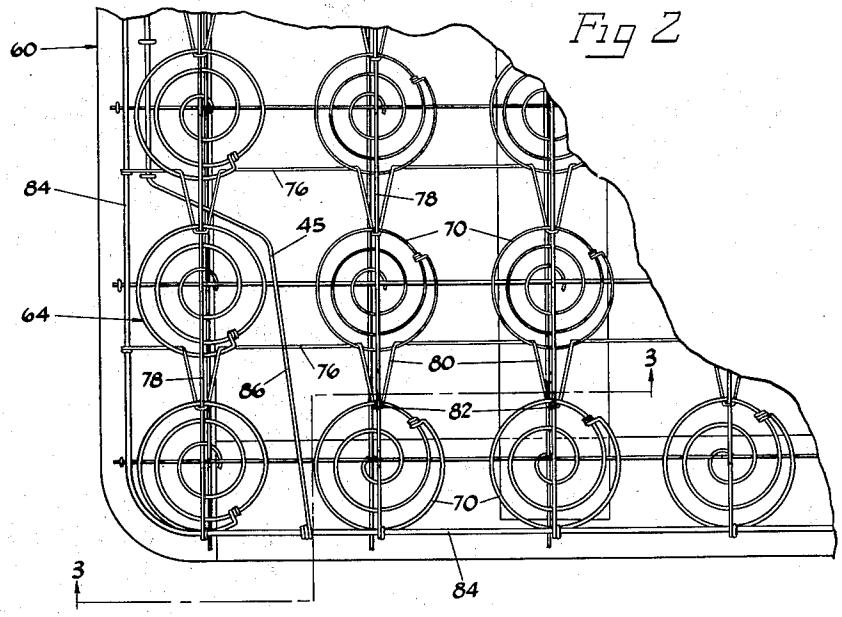



Fig 2




Inventor
Raymond H. Blecker
By Soans, Anderson, Lucdeka & Fitch
Atty

Oct. 17, 1961 R. H. BLECKER 3,004,266

MATTRESS CONSTRUCTION AND SPRING

Filed Jan. 2, 1959 3 Sheets-Sheet 2

Fig 3

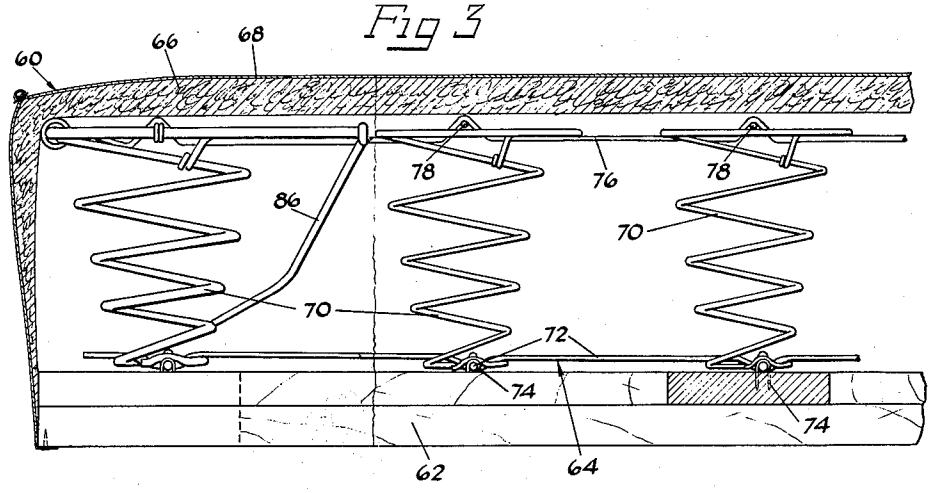
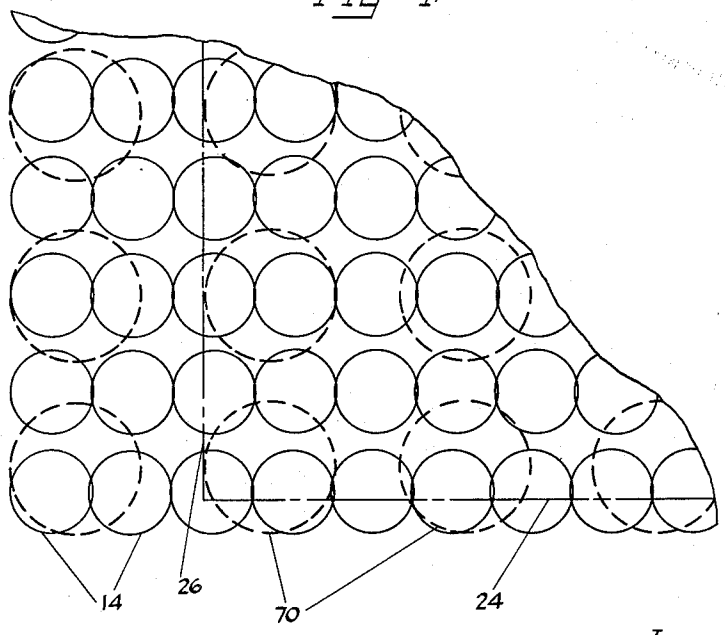



Fig 4




Inventor
Raymond H. Blecker
By Soans, Anderson, Luedeka & Fitch
Atty

Oct. 17, 1961 R. H. BLECKER 3,004,266

MATTRESS CONSTRUCTION AND SPRING

Filed Jan. 2, 1959 3 Sheets-Sheet 3

Fig 6

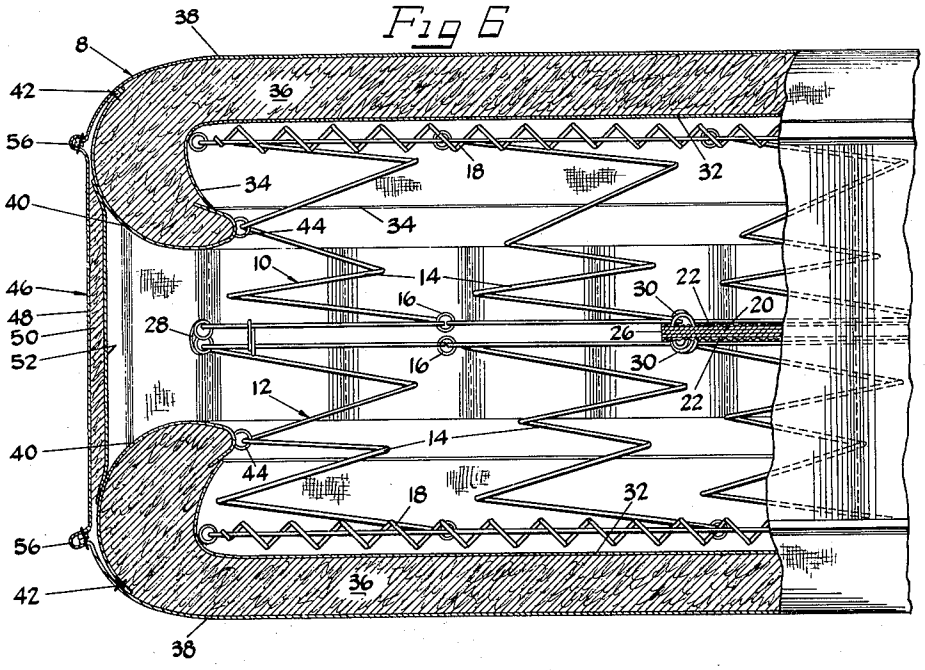
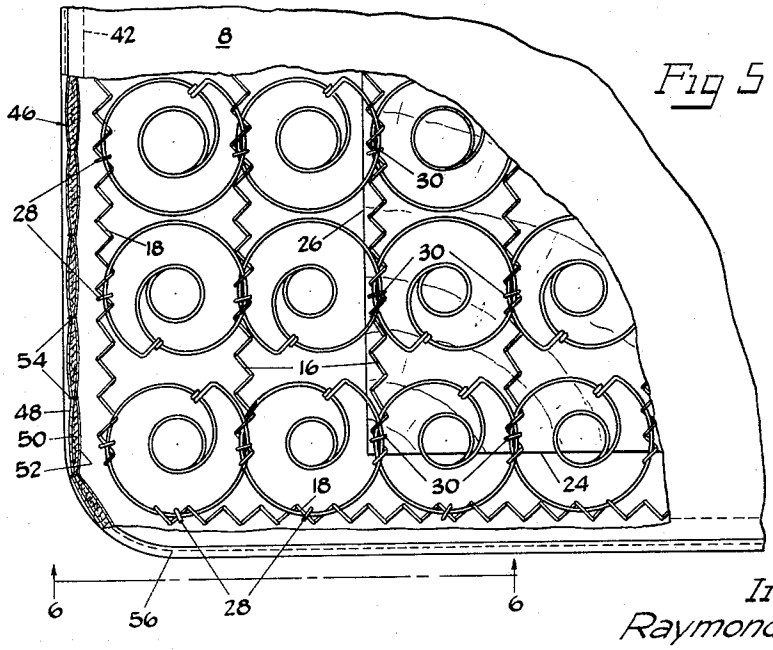



Fig 5




Inventor
Raymond H. Blecker

By Anderson, Luedeka, Fitch, Goans,
Atty

United States Patent Office 3,004,266 Patented Oct. 17, 1961



3,004,266

# MATTRESS CONSTRUCTION AND SPRING

Raymond H. Biecker, Kenosha, Wis., assignor to Simmons Company, New York, N.Y., a corporation of Delaware

Filed Jan. 2, 1959, Ser. No. 784,655
4 Claims. (Cl. 5—252)

This application is a continuation-in-part of application Serial No. 709,297, filed January 16, 1958.

The invention is concerned with mattresses, and with a cooperating mattress and spring combination, which provide firm but comfortable support to those persons who find it more conducive to proper rest to sleep on a relatively unyielding surface.

Most firm mattresses available are mattresses of otherwise ordinary construction in which the spring coils are made of materially heavier gauge wire. Mattresses of this type are not only firm in terms of overall load carrying capabilities, but they are also hard, that is, resistant to depression in local areas, and do not provide satisfactory, continuous support for reposed bodies of normal weight and stature.

Accordingly, it is an object of this invention to provide an improved mattress which is "firm" in terms of overall load carrying capabilities, but sufficiently yielding in response to local loads to provide comfortable, substantially continuous body support to persons of the ordinary stature. It is a further object of the invention to provide an improved, reversible mattress which is initially soft and ultimately firm, and which incorporates a high degree of resistance to lengthwise flexing or "hammocking." A more specific object of the invention is to provide a mattress incorporating a median board or plate in novel combination with a box spring adapted to control the flexure of the median board of the mattress in a manner which improves the firmness characteristics of the mattress.

Other objects of the invention will become apparent from the following description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a perspective view, partially broken away, illustrating a mattress in accordance with the invention in combination with a cooperating box spring;

FIGURE 2 is an enlarged fragmentary plan view of the box spring shown in FIGURE 1; with upholstery removed to show the spring assembly;

FIGURE 3 is an enlarged sectional view of the box spring taken along lines 3—3 of FIGURE 2;

FIGURE 4 is a schematic plan view of the mattress and box spring combination showing the positions of the springs in the box spring and in the mattress relative to each other and to the median board in the mattress;

FIGURE 5 is an enlarged fragmentary plan view of the mattress shown in FIGURE 1; and

FIGURE 6 is an enlarged sectional view of the mattress taken along lines 6—6 of FIGURE 5.

Briefly, a mattress in accordance with the invention includes two spring constructions connected together in superposed relation and to a rigid sheet interposed between the two constructions. The effect of this structure is to divide the effort of the two spring constructions, the springs of the uppermost construction receiving load in proportion to the distribution of weight of the person reposed thereon, and the lowermost responding, together with those of the upper group, to the overall load. The uniformity of the distribution of load to the lowermost spring construction depends upon the rigidity of the dividing sheet, and while no available practical material is perfectly rigid in the sheet form employed in this invention, commercial grades of plywood or like material are capable of distributing the unequal loads on the



upper construction fairly uniformly over the lower construction, particularly when the mattress is used with an underlying spring of carefully selected properties, thus achieving a firm mattress which retains sufficient yieldability in its upper surface so as not to be unduly hard.

Paradoxically, the rigidity of the median sheet in the long direction, most important to the performance of the mattress, is increased in the combination of mattress and underlying spring by utilizing the very tendency of the sheet to flex. That is to say, the size and characteristics of the median sheet of the mattress, and the characteristics of the cooperating box spring are selected to cause the sheet to flex selectively in the transverse direction of the mattress, thereby stiffening it in the lengthwise direction along which the body is normally reposed.

The selective flexing of the median sheet is accomplished by constructing the box spring to give preferential support to the intermediate sheet along its longitudinal or side margins so that when load is applied to the mattress, the median sheet tends to bow transversely. This has the effect of strengthening or stiffening the sheet in the longitudinal direction, an effect which may be further enhanced by the use of longitudinal ribs on the upper or lower surfaces of the sheet, or when using plywood or other grained materials, by orienting the grain to provide greater resistance to bending along the long axis of the mattress.

The desired ultimate characteristics of the mattress, i.e., initial softness with ultimate firmness, can be achieved with some degree of latitude in the selection of appropriate springs for the mattress, but it has been found that the most satisfactory result for the greatest varieties of physical stature and personal preference is a spring construction in which the diameter and shape of the coils and gauge of the wire are just slightly more than adequate to prevent "bottoming" on the median rigid sheet, i.e., springs which are soft enough to yield to local pressure but not soft enough to be completely compressed under the local loads normally encountered. Springs of such design have also been found entirely satisfactory for the lower construction of the mattress as well as the upper, the response to local loads being less significant in the lower construction since the load is distributed to a large area of the lower construction. Moreover, while a variety of effects can be achieved by varying the stiffness of the spring coils as between the upper and lower constructions of the mattress, it is believed desirable in terms of longer mattress life and satisfaction of the greatest number of personal preferences to employ the same type of coil above and below the rigid median plane so as to achieve a "reversible" mattress, i.e., one which has the same characteristics, regardless of the face which happens to be uppermost.

The mattress **8** described generally above is shown in detail in FIGURES 5 and 6. Its inner spring assembly includes upper and lower spring "constructions" **10** and **12**, i.e., pre-assembled spring units each comprising a multiplicity of individual helical spring coils **14**. The individual springs are preferably of the double cone or hourglass shape, as more fully described hereinafter, and the connected together in aligned rows, and together in each row, by helical tie wires **16** which are threaded about overlapping or juxtaposed portions of the end convolutions of springs **14** in adjacent rows. (See particularly FIGURE 5.) The constructions are preferably made with the helical tie wires extending from side-to-side of the mattress, i.e., extending in the short dimension of the mattress, so as to permit a degree of articulation of the upper surface of the spring construction in the long dimension of the mattress, thereby to increase the conformability of the mattress to the body in the direction along which the more

drastic variations of the body weight of the occupant occur.

Each pre-assembled spring construction is likewise encircled by a border frame **18** which may, as indicated in FIGURE 6, consist of similar helical tie wires threaded about the end convolutions of the peripheral springs of the upper and lower constructions.

The upper and lower spring constructions are coextensive, and are assembled one on top of the other with a substantially rigid sheet **20** sandwiched between the two constructions. As indicated, the sheet **20** may consist of a plywood board which is covered on each face by a layer **22** of silencing material, such as burlap or other textile sheeting, to provide insulation between the hard surface of the board **20** and the metal springs **14**.

The rigid median sheet **20** is located centrally between the superposed inner spring constructions **10** and **12**, with its side edges **24** (FIG. 5) spaced slightly inwardly from the side margins of the spring constructions and with its ends **26** spaced well inwardly from the ends of the spring constructions. The width and length of the median sheet **20** relative to certain structural elements of the box spring underlying the mattress are important to the performance of the combination, as will subsequently be pointed out, but for the present it is sufficient to note that the termination of the ends **26** of the median sheet well short of the ends of the mattress also permits the ends and corners of the mattress to be bent upwardly to facilitate the fitting of so-called "contour" sheets to the mattress. Very satisfactory results for both purposes have been achieved using a three-ply wooden board ¼ inch thick, which, in a 4'6" or full-width mattress, has overall dimensions of 48" x 60".

A earlier indicated, the grain of the outer plies of the sheet **20** preferably extend in the long direction of the sheet and thus in the long direction of the mattress, so that the sheet has greater resistance to flexing longitudinally than transversely. This selective orientation provides greater resistance to lengthwise "hammocking" quite independently of any particular underlying spring with which the mattress is used, and is also very helpful, as will later appear, to the cooperation between the mattress and the box spring still to be described.

The upper and lower spring constructions **10** and **12** are secured to one another about the peripheries of their inner faces by hog ring clamps **28** or other permanent fastenings, which as indicated in FIGURE 6, should preferably encircle the end convolutions of the peripheral springs as well as the border frames or wires **18**. The median sheet is held securely to the spring constructions by means of staples **30** which encompass the inner end convolutions of the springs **14** of the two constructions, and are preferably driven into the rigid median sheet **20** at places where they will encompass the juxtaposed turns of springs in adjacent rows.

While, as already indicated, the stiffening of the mattress **8** by the use of the median rigid sheet **20** permits some degree of latitude in the choice of stiffness of the individual spring coils **14**, it has been found that a very satisfactory result is obtained by the use in both upper and lower spring constructions of hour-glass type springs of 3⅜" diameter measured on the end convolution, having a height of 3⅜ inches and being formed of four convolutions of 13½ gauge spring wire, American Steel & Wire Gauge. 312 such coils are assembled in 24 rows of 13 coils in each of the superposed constructions in a standard, full width mattress, i.e., a mattress having a nominal 4' 6" width.

As shown in FIGURES 5 and 6, the diameter of the convolutions of the individual coils **14** graduates rather abruptly from its maximum to a minimum of about 1¾ inches, viz., in approximately one convolution, which, in terms of the given pitch, produces a spring which is relatively soft in its initial compression, but stiffens markedly as the compression increases slightly. The overall effect, including that of the grid median sheet, is one of greater initial softness with greater ultimate firmness than is usually found in other types of firm mattresses.

In accordance with the invention, the mattress **8** is upholstered without tufts so as to provide throughout the main body of the mattress face a smooth flat appearance. This is achieved by first overlaying each of the outer faces of the assembled spring constructions with a protective layer **32** which in the present case consists of a thin but sturdy sheet of textile fabric. This inner protective sheet preferably has overall dimensions exceeding the face dimensions of the spring constructions **10** and **12** so as to provide a peripheral flap **34** which is turned inwardly about the edges of the face of the spring assembly. The precise character of the inner protective sheet **32** is not material to the invention, other sheet-like materials with sufficient strength to support the softer upper padding materials and to prevent them from working down into the springs being suitable substitutes. In the preferred embodiment, however, a thin sheet material is preferred for purposes of controlling the thickness of the mattress.

A thick batt **36** of soft padding material, such as cotton or the like, is placed over the inner protective sheet **32**, and is then topped with the outer retaining sheet **38** of ticking. An inner peripheral flap **40** in the form of a continuous strip of woven textile material, is stitched at **42** to the inner surface of the outer ticking sheet **38** near its periphery, as indicated, particularly in FIGURE 6. The flap **40** is the means by which the padding or upholstery material is secured to the adjacent spring construction. As seen particularly in FIGURE 6, the inner peripheral flap **40**, together with a substantial portion of the batt **36** of soft padding material, is turned around the peripheral edge of the adjacent spring construction, folded to double its thickness, and secured at its folded edge by means of hog ring clamps **44** or a suitable substitute, to the inner turns of the peripheral springs **14** of the spring assembly.

After both faces of the mattress have been upholstered in the manner described, the mattress is "closed," i.e., a continuous border **46** is stitched to the upper and lower face tickings. The border is preferably of the padded type comprising an outer layer of sturdy ticking material **48**, a center layer **50** of padding material such as cotton felt or the like, and an inner layer **52** of textile sheeting, the several layers being secured together at appropriate intervals by cross-lines of stitching **54** which extend in the vertical direction of the mattress and produce in the border a fluted appearance.

The border **46** is secured to the top and bottom face tickings **38** of the mattress by stitching the edge of the outer layer **48** of the border to the edges of the face tickings **38** of the mattress in a taped seam **56** which extends continuously around the mattress at its upper and lower corners.

Referring particularly to FIGURES 2 and 3, the box spring **60** includes a wooden base frame **62** of conventional slat construction, a spring assembly **64** supported on the frame, padding material **66** covering the spring assembly, and an enclosing cover **68** which holds the padding in place and is secured by tacks or the like to the base frame **62**. The spring assembly **64** employed in the box spring is particularly adapted to supply preferential support to the side margins of the mattress median board **20** to reinforce its lengthwise resistance to flexing.

Specifically, the spring assembly **64** comprises a plurality of longitudinally and transversely extending rows of conical wire spring coils **70**, each of which is knotted at its upper end in the customary manner. The lower end of the spring wire in each of the coils **70** is crimped (see FIG. 3) for interlocking assembly with an underlying wire lattice or grid **72** formed of heavy longitudinally and transversely extending wire members. The spring assembly is secured to the base frame by stapling the undergrid **72** to the base frame **62** as indicated at **74**.

The upper ends of each of the conical spring coils **70** are interconnected by a plurality of longitudinally extending crimped wires **76**, and transversely extending key wires **78** interlocked with the top convolutions of the coils **70**. As seen particularly in FIGURE 2, each of the longitudinal wires **76** underlies the top convolutions of the coils in a longitudinal row, and is crimped to form a series of V's **80** which extend upwardly through the top convolutions and then sidewardly to the coils of the adjacent row. The apex **82** of each of the V-shaped formations projects just within the uppermost convolution of the adjacent spring coil and is bent upwardly for engagement with one of the key wires **78**.

The key wires **78** extend generally in overlying relation to the transverse rows of spring coils **70** and through the aligned upstanding apices **82** of the crimped wires **76** to interlock both sets of wires with the individual spring coils, and thereby form an integrated grid structure.

A continuous border wire **84** extends around the upper face of the spring assembly **64**, and is secured to the assembly by wrapping the ends of the crimped wires **76** around the border wire **84** at the ends of the assembly, and wrapping the ends of the key wires **78** around the juxtaposed border wire **84** and top convolutions of the spring coils **70** at the sides of the assembly. A heavy stabilizer wire **86**, wrapped at its ends about the border wire **84** and stapled intermediately to the base frame **62**, extends from side to side of the assembly at the head and foot ends to eliminate side sway or "jellying."

To increase the effectiveness of median board **20** of the mattress, the peripheral spring coils of the box spring are designed for greater stiffness than those in the interior of the assembly. In the disclosed embodiment (see FIGS. 2 and 3) the wire used in the peripheral coils is materially heavier than that of the interior coils, and, in addition, the outer spring coils are also initially formed with greater height than the interior coils so that the outer coils are pre-loaded to a greater extent than the interior coils when the assembly is compressed to uniform height in the upholstery process.

While other means of stiffening the peripheral areas of the box spring will readily suggest themselves to those skilled in the art, the use of heavier and initially higher edge coils is readily adaptable to present methods of construction. By way of specific example, very satisfactory results have been obtained in a full width box spring i.e., a spring for a 4'6" wide mattress, by using 88 coils in 8 longitudinal rows of 11 coils each. The 34 border coils were formed with 5½ turns of 10 gauge spring wire (American Steel & Wire Gauge) to a height of 4¾ inches, and with upper and lower diameters of 5⅛ inches and 1½ inches respectively. The 54 central conical coils of lesser stiffness were formed with 5½ turns of 11 gauge spring wire to a height of 4 inches and with upper and lower diameters of 4⅞ inches and 1½ inches respectively.

The use of stiffer spring coils in the periphery of the box spring **60** effectively eliminates the "crown effect" which is noticeable in the use of box springs of otherwise conventional construction, and which is particularly bothersome when a firm mattress is used with the box spring. The "crown effect" referred to results not only from an actual crown in the conventional box spring, i.e., increased height in the central area because of the fact that the peripheral coils and padding are compressed to a greater extent by the restraining effect of the side or border portion of the enclosing cover **68**, but also from the fact that when the occupant of the bed approaches the side of the bed, the greater local compression of both the mattress and the box spring places the occupant on a sideward slope which is more noticeable when a firm mattress is used.

In the box spring herein described, to the contrary, the peripheral areas of the box spring are more resistant to compression than the central area, with the result that the disturbing "crown effect" ordinarily experienced, and which gives the occupant the uncomfortable feeling that he is about to roll out of bed, is eliminated. Moreover, the relative softness of the central area, of the box spring or the relative firmness of the peripheral area, in combination with the particular mattress heretofore described, enhances the firmness properties of the mattress in a manner which may now be fully appreciated.

FIGURES 1 and 4, and more particularly FIGURE 4, show diagrammatically the relative dimensions and placement of the spring constructions **10** and **12**, the median board **20** of the mattress, and the spring assembly **64** of the box spring when the mattress and the box spring are superposed and aligned in the customary manner. In FIGURE 4, it will be seen that the side edges **24** of the median board **20** of the mattress while terminating short of the side edges of the spring constructions of the mattress, to facilitate the peripheral attachment of the spring constructions **10** and **12** to one another, nevertheless extend well over the line of peripheral springs **70** at the side edge of the box spring **60**, extending, in fact, outwardly of the center line of the last mentioned row of springs.

At the same time, and still referring to FIGURE 4, it will be noted that the end **26** of the median board terminates well short of the peripheral springs **70** at the foot or head of the box spring with the result that, relative to the supporting area of the box spring, the median board **20** of the mattress obtains firm support from the box spring **60** at its side edges only, and softer support in the central area. Thus, when a load is placed upon the mattress **8** between its side edges and in the area overlying the median board **20**, the board tends to flex or bow transversely rather than longitudinally and, as is well understood, the resulting arch or arcuate form of the board **20** stiffens it longitudinally, i.e., in the direction along which the body is normally resposed and along which rigidity of the median board is desired.

As earlier indicated, the tendency of the board **20** to flex selectively in the transverse direction may be increased when using a board of wood or other grained material by orienting the board so that the grain direction, normally the direction of greater resistance to bending, extends the long way of the mattress.

While this grain orientation is particularly useful in the illustrated combination of mattress and box spring because it works with the preferential side support provided by the box spring to cause the board to bow selectively in the transverse direction, it also is preferable when using the mattress apart from its companion box spring because it aligns the greater flexural strength of the board in the desired direction i.e., the direction along which the body of the occupant is usually reposed. Thus, all features of the mattress, in combination with the companion box spring and apart from it, are selected to provide a median plate or board which is effective to transfer to a large area of the lower mattress construction concentrated loads applied locally to the upper surface of the mattress, and which is sufficiently rigid in the longitudinal direction to reinforce the mattress against endwise "hammocking," and thus to overcome the inadequacies of the various underlying supporting springs with which such a mattress might be used.

Insofar as the cooperation of the mattress and box spring are concerned, the median board might be extended to substantially the full length of the spring constructions in the mattress, and the stiffer peripheral springs **70** at the foot and head ends of the box spring could be made comparable to the softer interior springs of the latter. However, since it is desired to allow the ends and corners of the mattress to remain relatively flexible to facilitate the fitting of contour sheets to the mattress, the stiffer coils **70** a the ends of the box spring do not interfere with the selective transverse flexing action of the median board of the mattress, and do provide desirable reinforcement at the foot end of the combination to resist concentrated loads of persons seating themselves at the foot of the bed.

Features of the invention believed new and patentable are set forth in the following claims.

I claim:

1. The combination of an innerspring mattress and a generally coextensive resilient base therefor, said resilient base having greater resistance to deflection along its side marginal areas than in the area between said marginal areas, said innerspring mattress having a pair of superposed inner spring constructions and a substantially rigid sheet secured therebetween for transferring to a large area of the lower one of said constructions concentrated loads applied to the upper constructions, said sheet having its long dimension extending in the direction of the sides of said mattress and having its side margins overlying the stiffer side marginal areas of said resilient base whereby the usual loads received by said mattress tend to flex said sheet transversely of the mattress.

2. The combination of a generally rectangular inner spring mattress and a generally coextensive, supporting box spring therefor, said box spring comprising a base frame and a coil construction secured thereto, the side edge coils of said construction having greater resistance to deflection than the inner coils, said inner spring mattress including a pair of superposed spring constructions having therebetween a substantially rigid, generally rectangular sheet for transferring to a large area of the lower one of said mattress spring constructions concentrated loads applied to the upper construction, said sheet being disposed with its long dimension extending lengthwise of said mattress and with the side margins of said sheet overlying the side edge coils of said box spring, whereby the usual loads received by said mattress tend to flex said sheet transversely of the mattress.

3. The combination of a substantially rectangular inner spring mattress and a generally coextensive, supporting box spring therefor, said box spring comprising a base frame and a coil construction secured to said base frame, said coil construction comprising a plurality of wire spring coils arranged in transverse and longitudinal rows, said spring coils forming the outer rows having greater resistance to deflection than the inner spring coils, said inner spring mattress including a pair of superposed inner



spring constructions having therebetween a substantially rigid, generally rectangular sheet for distributing to a large area of the lower one of said mattress spring constructions loads applied locally to the other, said sheet being disposed with its long dimension extending lengthwise of said mattress and with the side margins of said sheet overlying the outer longitudinal rows of spring coils of said box spring and the ends of said sheet terminating short of the outer transverse rows of spring coils of said box spring, whereby the usual loads received by said mattress tend to flex said sheet transversely of the mattress.

4. The combination of a generally rectangular inner spring mattress and a substantially coextensive, supporting box spring, said box spring comprising a base frame and a coil construction secured to said base frame, said coil construction comprising a plurality of wire spring coils arranged in longitudinal rows, said spring coils forming the outer longitudinal rows of said construction having greater resistance to deflection than the other spring coils thereof, said inner spring mattress including a pair of superposed inner spring constructions having therebetween a generally rectangular plywood sheet capable of distributing to a large area of the lower one of said constructions loads applied locally to the upper, said sheet being disposed with its long dimension extending lengthwise of said mattress and with the side margins of said sheet overlying the outer longitudinal rows of spring coils in said box spring and the grain of said sheet extending predominantly in the long direction of the mattress whereby the usual loads received by said mattress tend to flex said sheet transversely of the mattress.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,387,743 | Van Hove | Aug. 16, 1921 |
| 1,703,587 | Kraft | Feb. 26, 1929 |
| 1,903,619 | Canfield | Apr. 11, 1933 |
| 2,090,295 | Hiatt | Aug. 17, 1937 |
| 2,257,994 | Zofnass | Oct. 7, 1941 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 729,835 | Great Britain | May 11, 1955 |