June 6, 1972 J. G. PLATT ET AL 3,667,749

SPRING DECK FOR FURNITURE

Filed July 23, 1970 2 Sheets-Sheet 1

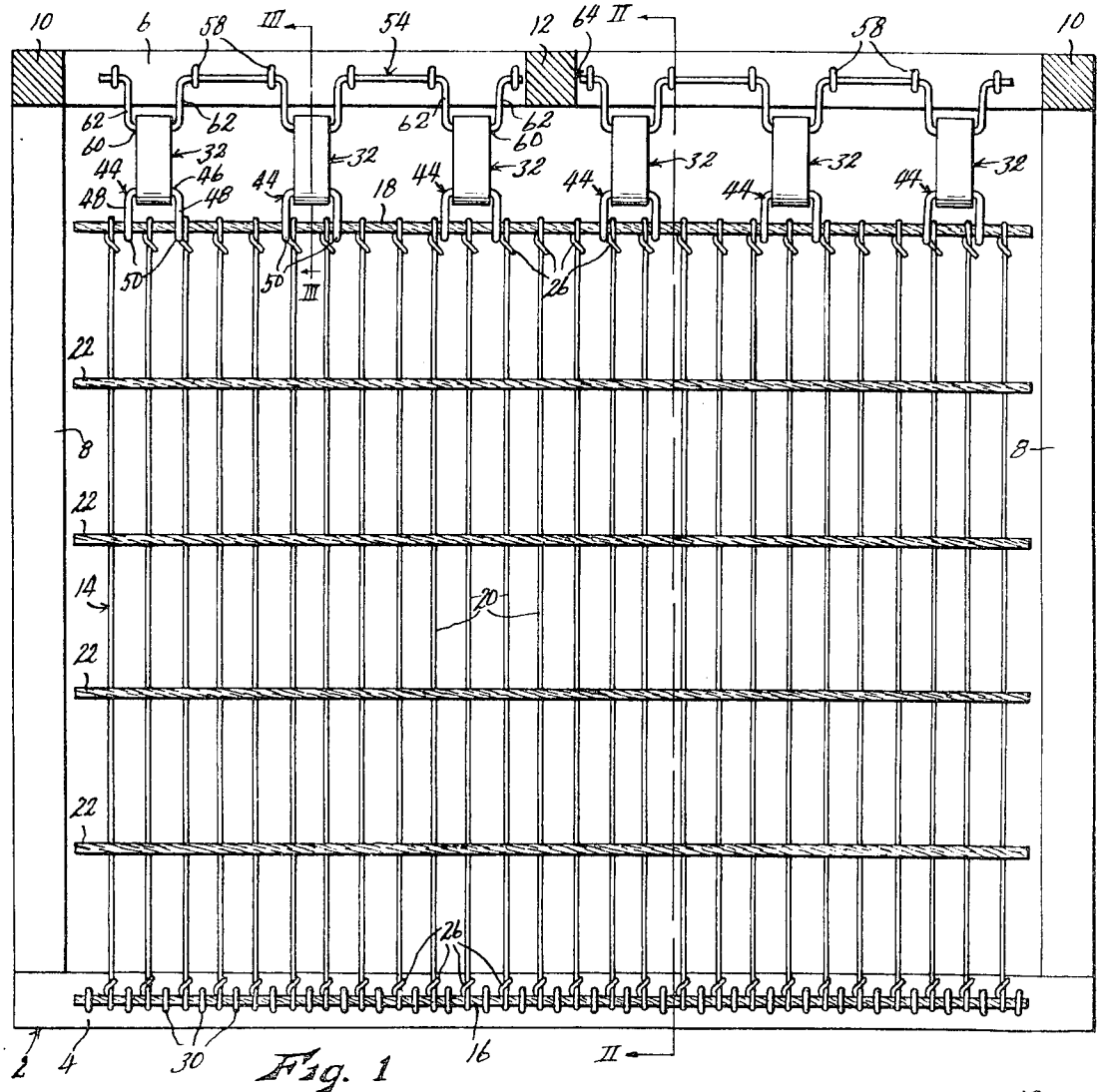


Fig. 1

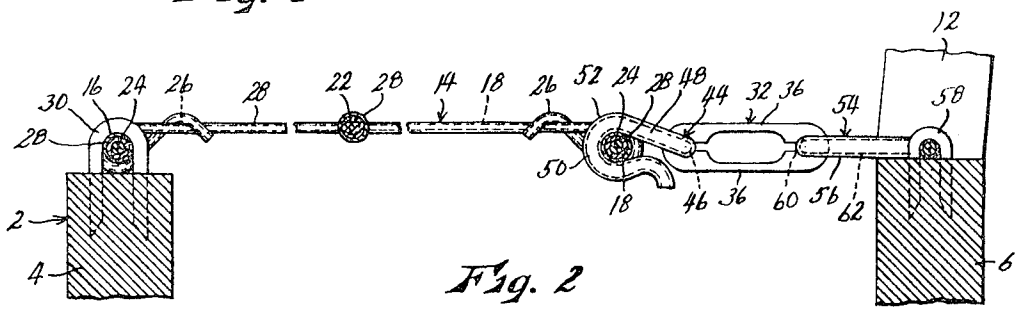


Fig. 2

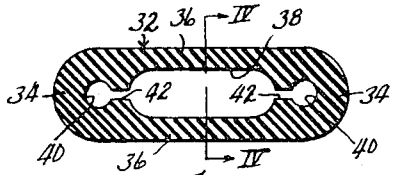


Fig. 3

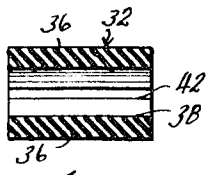


Fig. 4

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SPRING DECK FOR FURNITURE

Filed July 23, 1970 2 Sheets-Sheet 2

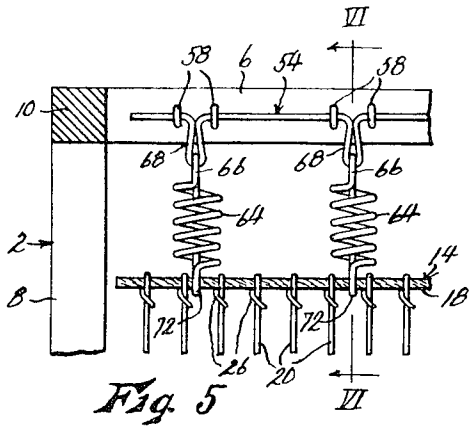


Fig. 5

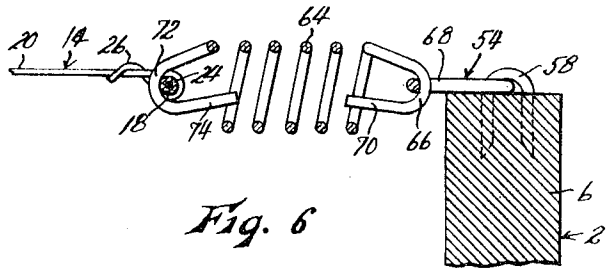


Fig. 6

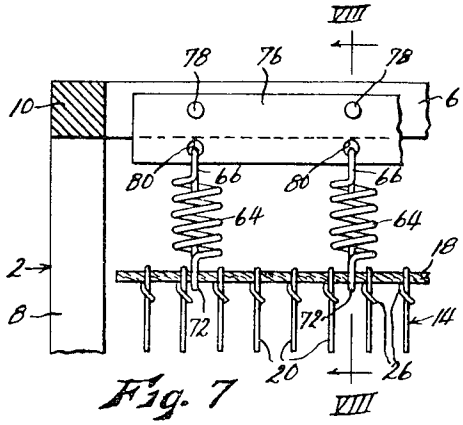


Fig. 7

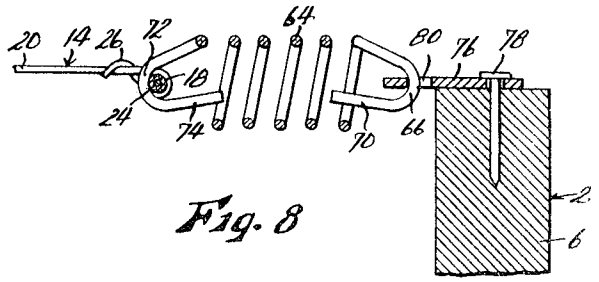


Fig. 8

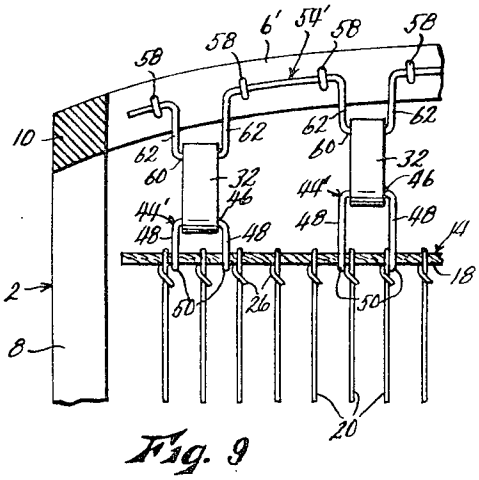


Fig. 9

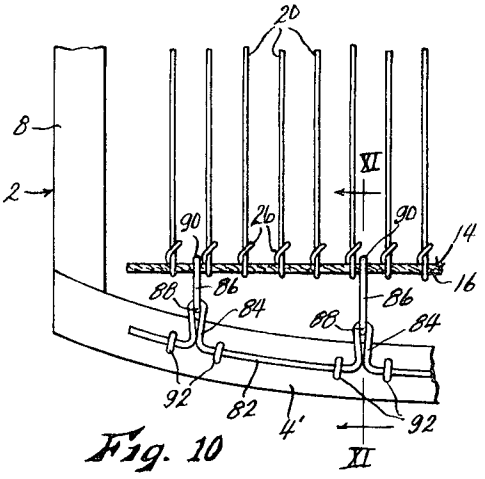


Fig. 10

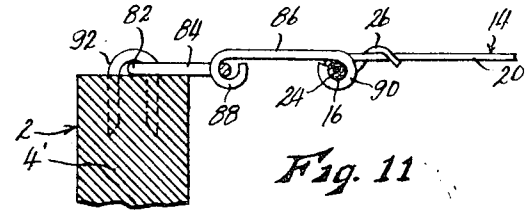


Fig. 11

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3,667,749

SPRING DECK FOR FURNITURE

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Int. Cl. F16f 3/02
U.S. Cl. 267—112 14 Claims

ABSTRACT OF THE DISCLOSURE

A spring deck for furniture having open rigid cushion frames, said deck consisting of a flexible sheet of material non-elastic in its own plane, an elongated mounting member extending generally parallel to and spaced apart from one edge of said sheet, and elastically extensible members extending between and interconnecting said mounting member with the adjacent edge of said sheet, said mounting member and the distal edge of said sheet being adapted to be firmly affixed to opposite sides of a furniture frame.

This invention relates to new and useful improvements in furniture accessories, and has particular reference to spring decks for furniture, spring decks being those elements of a furniture piece which provide resiliently yieldable support for the seat or back cushions thereof.

It is well known that furniture spring decks are often quite complicated and involved structures, which often must be purchased by furniture manufacturers in the form of individual components or sub-assemblies, and assembled as they are built into furniture frames produced by the manufacturer. This is a tedious time-consuming operation which also renders it quite expensive in view of the high cost of labor. Moreover, it often requires skilled workmen to produce consistently high quality assemblies, and this further increases the labor costs. Also, many spring decks presently in use have a substantial depth, that is, the assemblies are quite thick normally to their load-supporting surfaces, and hence are poorly adapted for use in many types of modern furniture, especially the so-called "thin-line" furniture, or "Danish Modern," wherein the styling makes no provision for the space required to house and conceal thick spring assemblies. This is particularly true in the case of nearly any spring deck utilizing helical coil springs.

Accordingly, the principal object of the present invention is the provision of a spring deck which may be manufactured and sold to furniture makers in completely and permanently assembled condition, requiring only the use of staples or other common fasteners to mount it operatively in a furniture frame. The mounting may be performed rapidly and easily, by only semi-skilled or even unskilled labor, and is therefore extremely economical.

Another object is the provision of a spring deck of the character described which is extremely thin normally to its load-supporting surface, thereby rendering it well adapted for use in "thin-line" furniture.

A further object is the provision of a spring deck of the character described which, while marketable in a completely assembled condition, can be disassembled easily and rapidly, and reassembled with easily interchangeable parts to fit furniture frames of different shapes and sizes. In this connection, only very few parts of the assembly need to be changed to adapt it for use in furniture frames of a considerable range of sizes and shapes.

Other objects are simplicity and economy of construction, efficiency and dependability of operation, and adaptability for use either to support padding applied permanently thereover, or in an exposed condition to support free or loose cushions.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawings, wherein:

FIG. 1 is a top plan view of a spring deck embodying the present invention, with the coating material omitted,

FIG. 2 is an enlarged, fragmentary, foreshortened sectional view taken on line II—II of FIG. 1, with the coating material included,

FIG. 3 is a sectional view taken on line III—III of FIG. 1, showing one of the rubber suspenders,

FIG. 4 is a sectional view taken on line IV—IV of FIG. 3,

FIG. 5 is a fragmentary view similar to FIG. 1 showing a modification of structure utilizing helical springs rather than rubber suspenders,

FIG. 6 is an enlarged fragmentary sectional view taken on line VI—VI of FIG. 5,

FIG. 7 is a view similar to FIG. 5, showing a further modification of structure,

FIG. 8 is an enlarged fragmentary sectional view taken on line VIII—VIII of FIG. 7,

FIG. 9 is a fragmentary view similar to FIG. 1, showing a modification of structure to be used when the rear frame rail is curved,

FIG. 10 is a fragmentary view similar to FIG. 1 showing a modification of structure to be used when the front frame rail is curved, and

FIG. 11 is an enlarged, fragmentary sectional view taken on line XI—XI of FIG. 10.

Like reference numerals apply to similar parts throughout the several views, and referring first to FIGS. 1–4, the numeral **2** applies generally to a furniture seat frame of rectangular form consisting of a front rail **4**, rear rail **6** and a pair of side rails **8**, all rigidly joined together to form a unitary structure. Uprights **10** may rise from the ends of back rail **6** to support a back structure, not shown, and particularly in wider seats, there may be one or more uprights **12** rising from the back rail intermediate uprights **10**.

The spring deck assembly forming the subject matter of the present invention includes a sheet **14** of wire and cord fabric, and means for mounting and supporting said sheet so as to overlie substantially all of the area of frame **2**. Said fabric sheet is substantially inelastic in its own plane, and as shown includes a front strand **16**, a rear strand **18** parallel to said front strand, cross strands **20** extending between and affixed at their respectively opposite ends to said front and rear strands, and intermediate strands **22** disposed between and parallel to said front and rear strands. Front strand **16** and rear strand **18** may be formed of paper or the like twisted around and covering a core **24** constituting a heavy spring steel wire. Cross strands **20** are also spring steel wires but are relatively light in weight as compared to core wires **24**, and are spaced sufficiently closely together to form an adequate base for fibrous, rubber, or other padding material to be supported thereby. A spacing of about one inch has been found satisfactory in most cases. The opposite end portions of each cross wire are twisted respectively about the paper coverings of front strand **16** and rear strand **18**, and then twisted or "knotted" around itself as indicated at **26** to form a secure connection not likely to pull free under loads applied to the deck. The paper covering of the front and rear strands provides a secure, non-slip purchase for the cross wires thereon, and also prevents rubbing and grating "wire noises" which might otherwise occur. Intermediate strands **22** may be formed of twisted paper only, and are pierced by each of cross wires **18** at each point of intersection therewith. Said intermediate strands are spaced regularly between the front and rear strands, and serve to maintain a generally uniform spac-

ing between the cross wires throughout the lengths of the latter, as well as providing additional support for padding layers applied over the deck. The entire assembly of sheet **2**, including all of the strands thereof, may have applied thereto, by dipping or otherwise, a thin coating **28** of flexible plastic or the like. Said coating is useful principally when the deck is to be left entirely exposed and used to support loose or free cushions simply laid thereover. Under these circumstances, the coating tends to shield and smooth any raw, sharp wire ends, prevent fraying of the paper strands, provide a much neater, more attractive appearance, the coatings being available in any desired color, and to prevent the deck strands from cutting fraying, staining, marking, or otherwise damaging the covers of the free cushions. When the deck is to be covered by padding layers permanently applied thereover and affixed to frame **2**, the coating is less essential.

FIGS. 1 and 2 show a mounting of sheet **2** when the front and rear rails **4** and **6** of frame **2** are parallel. In this case, front strand **16** of sheet **2** is laid directly over front rail **4** and secured thereto by a series of staples **30** bridging said strand and driven into said rail, or by any other suitable fasteners in the event the frame is not wooden. Rear strand **18** is disposed forwardly of but parallel to rear frame rail **6**, and is attached to said rear rail by means including a series of suspender loops **32** formed of rubber or other elastic material. Said loops are elongated and extend at right angles between strand **18** and rail **6**, and as best shown in FIG. 3, are of uniform cross-sectional contour whereby conviently to be formed by extrusion. Each loop is formed with heavy end sections **34** joined by relatively thin side reaches **36**, whereby to form an internal opening **38**, and a hole **40** is formed through each end section **34** parallel to the loop axis. Each hole **40** is connected to central opening **38** of the loop by a still narrower slit **42**.

The forward end of each loop **32** is connected to rear strand **18** of sheet **14** by a generally C-shaped wire hanger **44**. Said hanger has a straight central portion **46** engaged in forward hole **40** of the loop, and a pair of parallel legs **48** extending toward strand **18**, the free end of each leg being bent to form a hook **50** engaged about said strand. Said hooks are sufficiently flexible that they may be expanded to snap over said strand between successive cross wires **20**, or similarly disengaged from said strand, but are normally sufficiently closed to prevent accidental disengagement thereof from said strand during handling of the deck before said deck is mounted in the frame. Hanger **32** may be threaded through central opening **38** of the suspender loop, and central portion **46** of the hanger snapped into forward hole **40** of the loop through the associated slit **42**. The narrowness of slit **42** (less than the wire diameter of the hanger) thereafter retains the hanger engaged in hole **40**. Hanger **32** may also be provided with a plastic coating **52** (see FIG. 2) in the same manner as sheet **14**.

The rearward ends of suspender loops **32** are connected to rear frame rail **6** by a mounting wire **54**. Said mounting wire may also be formed of spring steel, may also have a plastic coating **56** (see FIG. 2), and extends generally parallel to rear strand **18** of sheet **2**. The major portion thereof directly overlies rear frame rail **6**, and is secured thereto by staples **58**, as shown. Portions **60** of said wire are offset forwardly, to a point not overlying rail **6**, said offset portions being connected to the general extent of the wire by right-angled leg portions **62**. Offset portions **60** are disposed in a line parallel to rear strand **18** of sheet **14**, and each is snapped into rearward hole **40** of one of suspender loops **32**. Mounting wire **54** is of course threaded through all of loops **32** before the deck is mounted in frame **2**. The length of central portion **46** of each hanger **44**, and of each offset portion **60** of the mounting wire, is only slightly greater than width of each of suspender loops **32** parallel to its axis, so as to prevent any appreciable axial movement of said loops on its associated wires. The decks may be conveniently produced for sale with mounting wires **54** in one place, extending the full width of the deck.

In the installation of the deck, mounting wire **34** is preferably secured in place first, by means of staples **58**, it being noted in this connection that where necessary, portions of said wire can be cut away with ordinary wire cutters, as indicated at **64** in FIG. 1, so as to bridge any frame upright, such as upright **12**, which may be disposed in its path. It is a reasonably simple matter to produce the deck with suspender loops **32** so spaced that no loop is aligned with any usual position of uprights **12**, so that only portions of the general extent of wire **54**, not offsets **60** thereof, ever need be cut away. Also, many seat frames, particularly single-person seats, do not have any intermediate uprights **12**, so that wires **54** may be continuous. Of course, if the deck is sold specifically for use in a particular, known frame, mounting wire **54** may be furnished in sections of the proper lengths. Then, front strand **16** of sheet **14** is drawn forwardly to apply the desired amount of pre-tensioning to suspender loops **32**, and secured to front frame rail **4** by means of staples **30**. Of course, the front to rear dimension of the deck must be such that strand **16** is disposed above rail **4** when loops **32** are pre-tensioned to the proper degree. Variations in this dimension can be provided by the use of interchangeable hanger wires **54** in which leg portions **62** are of different lengths.

FIGS. 5 and 6 show a modification of the deck in which a helical spring **64** is utilized in place of each of the rubber suspenders **32** of FIGS. 1–4. The rearward end of each spring is formed to present a hook **66** engaged in a forwardly offset bight **68** of mounting wire **54**. Said bight is preferably closed, as shown, to prevent the springs from being displaced along the mounting wire prior to assembly of the deck into the frame, and the extreme free end portion **70** of hook **66** is extended into the spring coil, as shown in FIG. 6, to hold the spring in assembly with the mounting wire. The forward end of each spring **64** is formed to present a hook **72** which is engaged directly about rear strand **18** of sheet **14**, with its extreme free end portion **74** extended into the coil of the spring to hold the parts in assembly prior to insertion of the deck into the frame. The direct attachment of the springs to strand **18** permits elimination of the wire hangers **44** of FIGS. 1–4.

FIGS. 7 and 8 show a modification of structure the same as that of FIGS. 5 and 6, except that in place of hanger wire **54**, there is utilized an elongated sheet metal strap **76** extending along the top edge of rear frame rail **6**, said strap being perforated to receive nails **78** or the like for securing it to said rail. Said strap overhangs the forward edge of rail **6**, and has perforations **80** formed in the overhanging portion thereof, each perforation having the hook **66** of one of springs **64** engaged therein.

FIGS. 9, 10, and 11 show modifications of the deck adapting it for use in seat frames wherein either or both of the front and rear frame rails **4** and **6** are not straight. Furniture in which either or both of these rails, for example, is curved in an outwardly convex form as shown, is quite common. If the rear rail **6'**, as shown in FIG. 9, is curved, a mounting wire **54'** having the general curvature of said rail is substituted for the general straight mounting wire **54** of FIGS. 1–4. The forwardly offset portions **60** of wire **54'** are all offset equally from the general extent of the wire, and rubber suspender loops **32** are all of equal size. This arrangement results in the fact that the forward ends of loops **32** are not arranged in a line parallel to strand **18** as before, but are spaced at different distances from said strand. This necessitates that the wire hangers **44'**, corresponding to hangers **44** of FIGS. 1–4, be of different lengths, i.e. have legs **48** of varying lengths, so that hooks **50** of all of the hangers will be disposed in a straight line to engage strand **18**.

If the front rail of the frame, as indicated at 4' in FIGS. 10 and 11 is curved, front strand 16 of sheet 14, instead of being stapled directly to said rail as in FIG. 1, is attached thereto by means of a mounting wire 82. Wire 82 has its general extent curved to directly overlie rail 4', and is formed at intervals along its length to present rearwardly extending bights 84, and each bight is connected to front strand 16 of fabric sheet 14 by a wire link 86. One end of said link is formed to present an eye 88 engaged in its associated bight 84, and the other end of said link is formed to present an eye 90 engaged about strand 16. Said links are of different lengths to compensate for the non-parallel relation between rail 4' and strand 16. The general extent of wire 82 is affixed to rail 4' by staples 92. Concave curvatures, or even irregular curvatures, are sometimes used, and the use of mounting wires 54' and 82 as well as hangers 44' and links 86, properly designed for each furniture piece will adapt the deck for use in a frame of virtually any configuration.

Advantages of the deck as shown are numerous. The entire deck assembly can be completely pre-assembled by the manufacturer of the deck, and sold as a complete or "drop-in" unit to the furniture manufacturer. It may then be very easily and quickly installed in a furniture frame, as described, by only semi-skilled or even unskilled labor. The parts are all permanently assembled and cannot become disarranged in any significant degree, and require only staples for mounting of the deck in a furniture frame. The deck is also very economical in its original manufacture, and since it is extremely thin normally to its plane, is particularly well-adapted for use in thin-line furniture.

Mounting wires 54 or 54', and wire 82 when required, are extremely important features of the deck. Prior to the time the deck is mounted in a furniture frame, they hold suspenders 32 or springs 64 in proper relation to sheet 14 and render the deck easier for a workman to handle, since when he positions said wire, this automatically positions all of the suspenders or springs attached thereto. The mounting wire also insures that the inner and outer ends of suspenders 32 or springs 64 will be spaced apart uniformly and equally. Particularly with rubber suspenders, any appreciable variation in this spacing results in the suspenders not being tensioned accurately in directions parallel to their longitudinal extent, but at an angle thereto, so that each suspender is tensioned more at one side than at the other. This shortens the useful life of the suspender, and has been a constant cause of trouble and failure of the suspenders in all prior decks within our knowledge using rubber edge suspenders.

An important advantage of the structure is that the interchangeability of its parts permits its use in seating of shapes and sizes. The width of sheet 14 can be reduced by cutting strands 16, 18 and 22 thereof, and its dimension between strands 16 and 18 can remain constant for seats of a considerable range of depths, by selecting hangers 44 with legs of the proper length.

This is possible since from a functional point of view it is not necessary that sheet 14 cover the entire frame area, but only the principal load area. Therefore, sheet 14 could be proportionately shallower with respect to the frame, than the sheet actually shown, without affecting its functional utility to any appreciable degree. When using springs 64 in place of rubber suspenders, as in FIGS. 5–8, this adjustment may be made even more simply merely by selecting springs of the proper length. The deck may be adapted for use in seating frames having curved rear rails, as in FIG. 8, by inserting mounting wire 54' and hangers 44' having legs 48 of different lengths, leaving suspender loops 32 all of identical lengths, or in frames having curved front rails by inserting mounting wire 82 and links 86.

The design of suspender loops 32 is of some importance. The heavy end sections 34 of each loop confine the elastic deformation of the loop largely to the relatively thin side reaches 36 thereof. This reduces the abrasive rubbing of the loop against the wires supporting it, and hence increases the useful life of the suspender. The retention of the supporting wires in holes 40 formed in the heavy end sections of the loop not only holds the parts in correct relative position to promote easy handling and mounting of the deck, as already mentioned, but also prevents the loop from "creeping" around its supporting wires peripherally of itself, which could bring the thin side reaches of the loop into engagement with the wires. The smooth, uninterrupted external surface of each suspender loop prevents said loop, as it stretches and contracts in use, from scratching, cutting, or otherwise marking or damaging any padding material, or finished loose cushion, which may be supported thereby.

The deck as shown also possesses certain functional advantages when in actual use. The yieldability of the deck under load is of course provided both by the flexibility of cross wires 18, and by the yieldable support provided at least one edge of sheet 14 by suspenders 32 or springs 64. Cross wires 18 may, conjointly, be sufficiently stiff, and provide sheet 14 with sufficient resistance to flexure, to prevent, in some degree, the front-to-rear sagging or "hammocking" which would otherwise occur under load if sheet 14 were more nearly pliable. This causes the deck to yield more as a resiliently supported "platform" rather than as a hammock, and this is considered a more desirable and comfortable type of cushion action. The desired depth and softness of the action is still provided by suspenders 32. Moreover, if the deck has suspenders 32 or springs 64 only at its rearward edge, the anti-hammocking stiffness of sheet 14 causes it to tilt downwardly to the rear when loaded. This tends to keep the hips of a user well to the rear of the seat, so that his lower back is better supported by the seat back cushion (not shown), or in other words to discourage "slouching," promote better posture and reduce fatigue.

Finally, while the deck has been shown and described in one specific usage thereof in a seat frame, it is nevertheless extremely adaptable in various other applications and modifications. For example, sheet 14 could be supported at its front edge by suspenders or springs rather than at its rear edge, or have suspenders or springs at both its front and rear edges. Cross wires 18 of sheet 14 could extend from side to side of the seat, in which case suspenders or springs would probably be desired at both sides. The deck could also be used to support the back cushion of the chair, in which case suspenders or springs would probably be desired at either the top or bottom edges, or both, or at both of the vertically extending side edges of sheet 14.

While we have shown and described certain specific embodiments of our invention, it will be readily apparent that many minor changes of structure and operation could be made without departing from the spirit of the invention.

What we claim as new and desire to protect by Letters Patent is:

1. A spring deck for use in connection with a furniture frame which is generally rectangular, being formed of rigidly associated rails and being open intermediate said rails, said dack comprising:

(a) a sheet of flexible material inelastic in its own plane, said sheet being generally rectangular and adapted to overlie said frame,

(b) means for attaching one edge of said sheet to the adjacent rail of said frame,

(c) an elongated mounting member extending generally parallel to but spaced apart from the opposite edge of said sheet,

(d) means for attaching said mounting member to adjacent rail of said frame,

(e) a series of elongated, elastically extensible suspenders extending generally at right angles between said mounting member and the adjacent edge of said sheet at spaced intervals along the length thereof, one

end of each of said suspenders being attached to said mounting member, and

(f) means attaching the opposite end of each of said suspenders to the adjacent edge of said sheet.

2. A spring deck as recited in claim 1 wherein the edge of said sheet supported by said suspenders is disposed in non-parallel relation to its associated frame rail, all of said suspenders being of equal length and extending equally from said rail, and wherein said means for attaching the opposite ends of said suspenders to said sheet are of unequal lengths, whereby to support the edge of said sheet in the desired non-parallel relation to said rail.

3. A spring deck as recited in claim 1 wherein each of said suspenders constitute an elongated endless loop of elastic material, said mounting member being threaded through said suspender loops.

4. A spring deck as recited in claim 3 wherein said mounting member constitutes a length of wire having portions thereof offset toward the adjacent edge of said sheet a sufficient distance to overlie the open interior of said frame, and wherein each of said suspenders is looped about one of said offset portions of said mounting wire, whereby said suspender loops are maintained out of engagement with said frame and whereby the ends of said suspender loops engaged by said mounting wire are maintained at a spacing, transversely of said loops, equal to the spacing of the ends thereof attached to said sheet.

5. A spring deck as recited in claim 4 wherein said means for attaching one end of each of said suspender loop to the adjacent edge of said sheet constitutes a C-shaped wire hanger having a central portion engaged in said hanger loop and leg portions the free ends of which are secured to said sheet.

6. A spring deck as recited in claim 5 wherein the portions of said hanger and said mounting wire engaged in each of said suspender loops are rotatable about their axes with respect to said loop.

7. A spring deck as recited in claim 6 wherein said sheet includes reinforced edge strands defining the edges thereof to be secured to said frame, the extended ends of the leg portions of each of said hangers being formed to present hooks engaged pivotally about the adjacent edge strand of said sheet.

8. A spring deck as recited in claim 7 wherein said hooks are normally sufficiently closed to secure said hanger in assembly with said sheet strand, but are resiliently expandable to permit disengagement thereof from said strand.

9. A spring deck as recited in claim 5 wherein each of said suspender loops includes end sections having relatively thick walls engaged respectively by said mounting wire and said hanger, and side reaches having relatively thin walls connecting said end sections.

10. A spring deck as recited in claim 5 wherein the frame rail to which said sheet is attached by said suspenders is disposed in non-parallel relation to the associated edge of said sheet, all of said suspender loops extending equally from said rail, and wherein the leg portions of said C-shaped wire hangers are of unequal lengths whereby to support said associated sheet edge in the desired non-parallel relation to said rail.

11. A spring deck as recited in claim 5 in which the edge of said sheet opposite to that supported by said suspenders is disposed in non-parallel relation to its adjacent frame rail, and wherein said means for attaching said opposite sheet edge to said adjacent frame rail comprises a second elongated mounting member having a general extent adapted to be disposed in abutting relation to said rail and transversely offset portions, said offsets being of equal lengths whereby the free ends thereof are disposed in a line which is non-parallel to said opposite sheet edge, and links interconnecting each of said offsets to said opposite sheet edge, said links being of unequal lengths whereby to support said opposite sheet edge linearly in the desired non-parallel relation to said rail.

12. A spring deck as recited in claim 1 wherein each of said suspenders constitutes a helical spring having its ends portions formed to present hooks which are engaged respectively with said mounting member and said sheet.

13. A spring deck as recited in claim 1 wherein said mounting member constitutes a narrow strip of sheet metal affixable to the associated frame rail and having an edge portion thereof overlying the open interior of said frame for engagement by said suspenders.

14. A spring deck as recited in claim 13 wherein each of said suspenders constitutes a helical spring having its end portions formed to present hooks, one of said hooks being engaged in a perforation formed therefor in the overhanging portion of said strip and the other of said hooks constituting said means for attaching the other end of said spring to said sheet, the free end portions of both of said hooks being extended into the interior of the helical spring coil whereby to lock the parts in assembly.

References Cited

UNITED STATES PATENTS

3,539,172	11/1970	Arnold et al.	267—112
1,531,672	3/1925	McLean	267—74

JAMES B. MARBERT, Primary Examiner

U.S. Cl. X.R.

267—74