April 17, 1962 J. E. KINNEBREW 3,030,147

SPRING SEAT

Filed Feb. 12, 1958 3 Sheets-Sheet 1

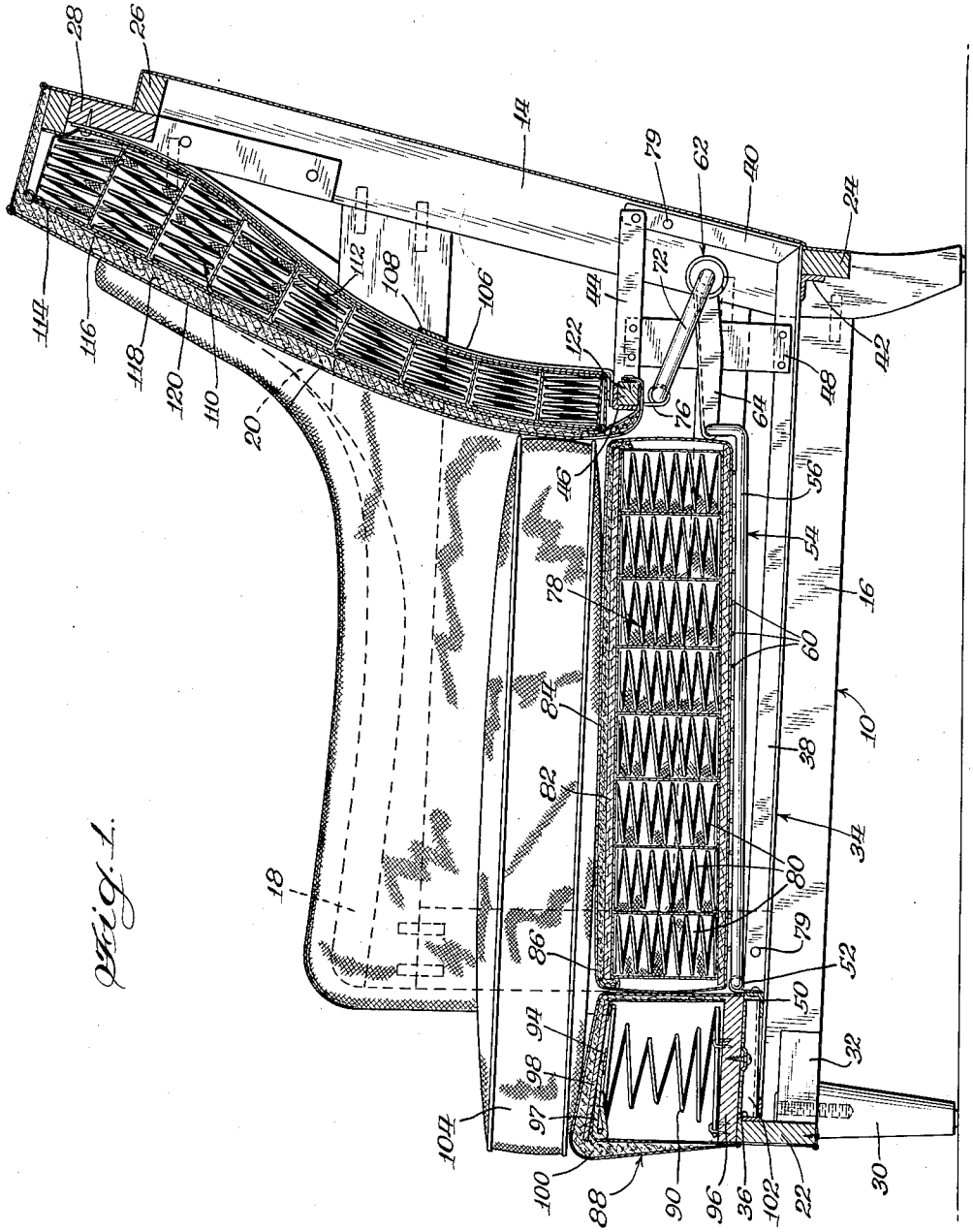


Fig. 1.

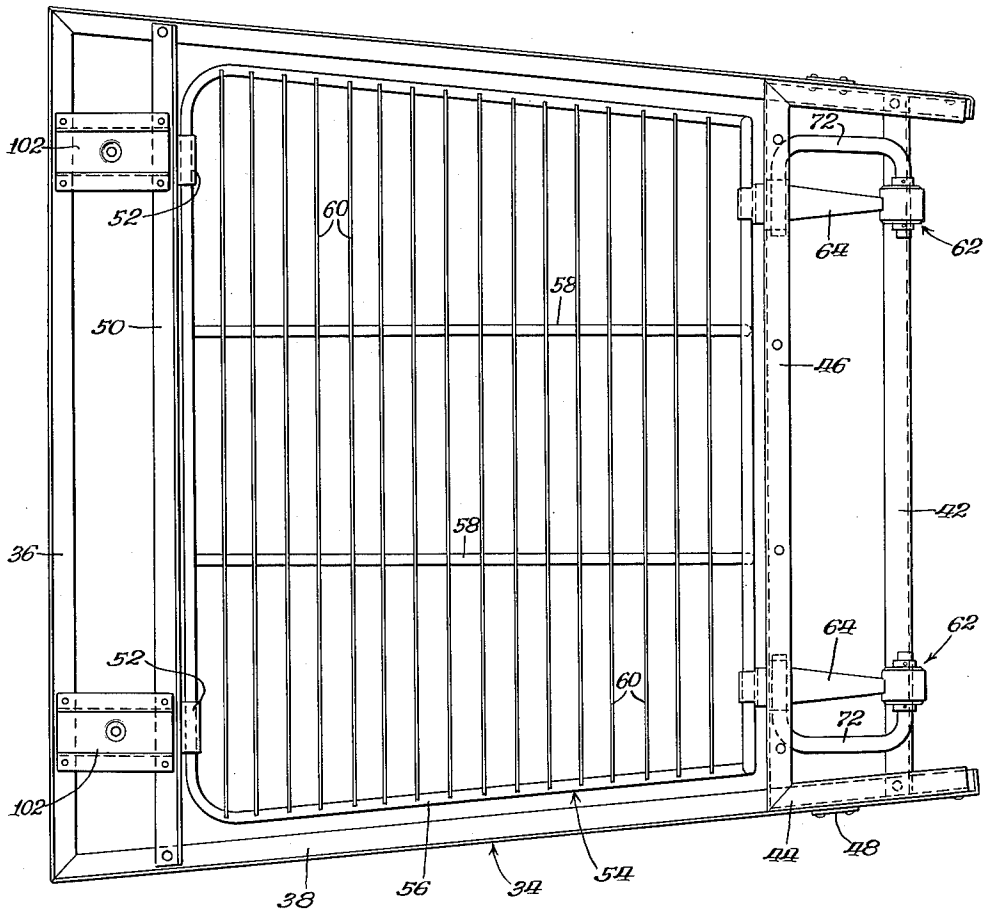
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Fig. 2.



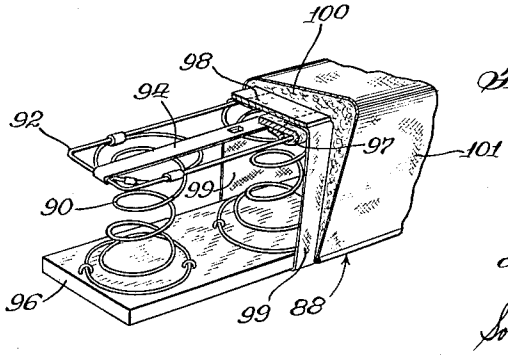


Fig. 3.

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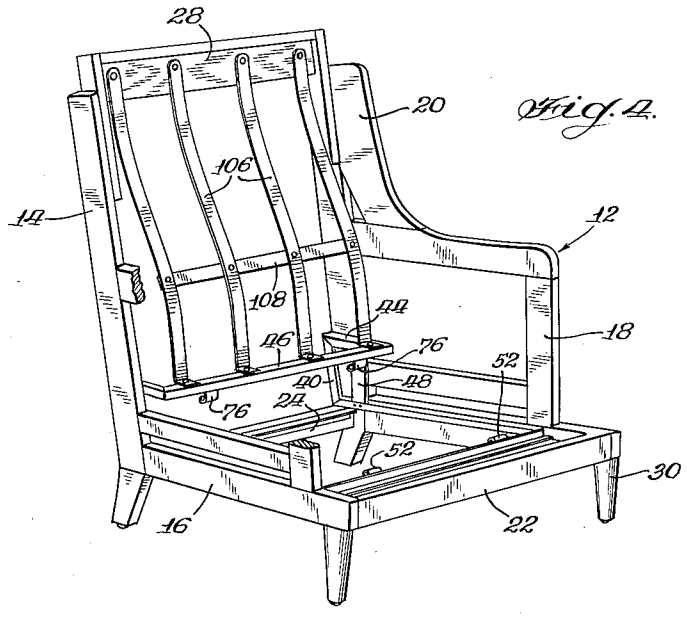


Fig. 4.

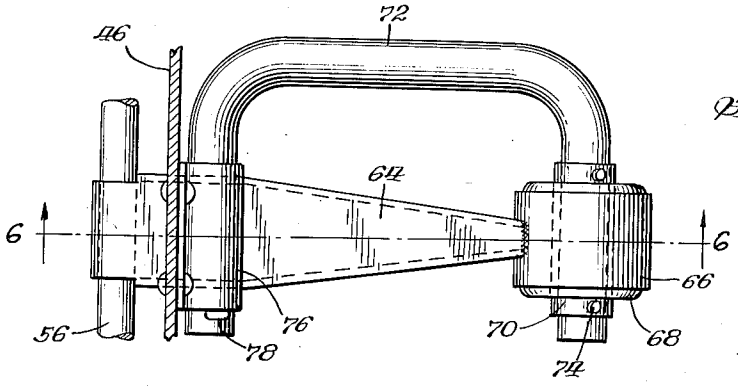


Fig. 5.

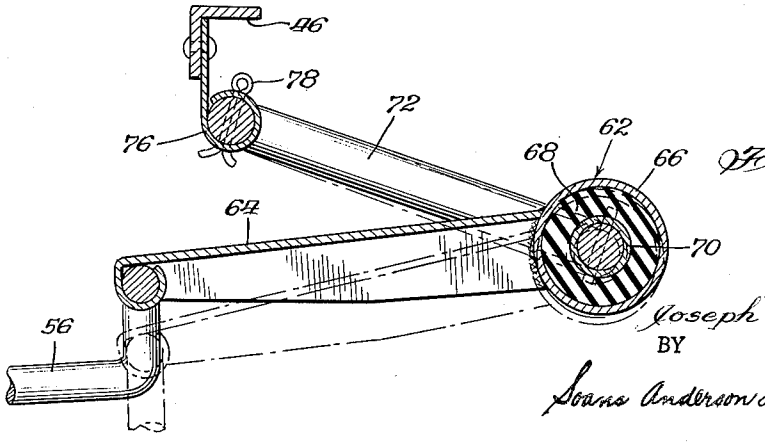


Fig. 6.

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SPRING SEAT

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Filed Feb. 12, 1958, Ser. No. 714,781
6 Claims. (Cl. 297—452)

This invention relates to basic improvements in upholstered furniture and is applicable to individual chairs and to multiple seating units, such as love seats and sofas. More specifically, the invention relates to an improved seating base and to improvements in the back structures of upholstered chairs which are particularly useful with the improved seating arrangement herein disclosed, but may have application as well to upholstered furniture having conventional seat bases.

Upholstered furniture, as it is now known, usually consists of a skeletal frame of wood or metal in which there is mounted a seat base in the form of webbing or flat springing or the like, over which there is placed a cushioning structure of springs or rubber or other cushioning materials in various combinations. Along the front of the seat base there is often provided an edge which is usually stiffer than the main body of the cushioning structure and forms a kind of abutment to prevent the forward shifting movement of the body of the occupant as he reclines in the chair.

The known constructions, despite the variety which have been evolved, exhibit a common tendency toward "hammocking," i.e., a tendency toward greater deflection in the center of the seat than at its front and rear edges, and have the tendency, because of the nature of the support provided for the cushioning structure, to cause the occupant of the chair to slide forward from the back of the chair to the center of the seating area. As the occupant slides forward, the lower part of the spine moves away from the back of the chair, into an uncomfortable slouched posture.

This has led in recent years to the development of so-called "contour" lounging chairs in which the occupant may recline, and in which his weight is thereby shifted in part to the back of the chair and held against the back of the chair by raising the front of the chair seat as the back reclines, causing the occupant to slide down wholly against the back. Chairs of this type, however, must be made in unattractive proportions, i.e., with high backs and auxiliary leg rests, in order to support the body in the reclined position, and being otherwise constructed in their seats and back in a conventional manner are hardly more comfortable in the upright position than chairs of the non-reclining type.

It is the object of this invention to provide a construction which can be used in non-reclining chairs having the usual eye-pleasing proportions of upholstered living room furniture, but which, because of its novel seat, aided by a novel back, will permit the occupant, regardless of his stature, to assume an upright position of seated comfort which can be maintained indefinitely without fatique.

More specifically, it is an object of this invention to provide a seat structure in which the tendency toward hammocking, common in conventional seat structures, is eliminated by providing a rigid seat base which is mounted for resilient downward deflection at its back end. It is a further object of the invention to provide a chair construction which will reasonably accommodate itself to persons of varying length of leg by providing a front spring edge which will properly perform its function regardless of whether the weight of the occupant is concentrated more rearwardly on the seat, as is the case with taller persons, or more forwardly on the seat, as is the case with shorter persons, and by providing an upholstered back structure which is firm in its lower portion and softer in its upper portion.

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

FIGURE 1 is a vertical sectional elevation showing the basic structure of the chair frame, the seat suspension, and the inner construction of the spring base and the upholstered back;

FIGURE 2 is a plan view of the seat suspension mechanism removed from the skeletal chair frame and enlarged for clarity of illustration;

FIGURE 3 is a perspective view of the front spring edge, partially broken away to show its several elements;

FIGURE 4 is a perspective view of the skeletal frame of the chair partially broken away and with the seat suspension mechanism removed for clarity of illustration;

FIGURE 5 is an enlarged plan view of the spring elements which resiliently support the rear end of the seat platform; and

FIGURE 6 is a sectional elevation taken along the line 6—6 of FIGURE 5 showing in more detail the construction of the spring elements, and showing by broken lines an alternate position of the same, indicating the direction of deflection under load.

Briefly, a chair constructed in accordance with the invention is provided with a rigid seat base which is flexibly secured at its front end to the frame of the chair and resiliently supported by means of suitable springing elements so that its rear end may deflect downwardly under load. Carried on the rigid but resiliently mounted platform is a unitary spring construction which, in the preferred form of the invention shown, is constructed as a removable sub-cushion.

Forwardly of the main spring base is a spring edge having the usual inclined upper surface extending somewhat above the level of the main spring base, but differing from conventional construction in that it is upholstered entirely separately from the main body of the spring base and is, therefore, capable of independent action. Specifically, by constructing the spring edge independently from the main body of the spring base, it deflects only in response to the load which it carries and is unaffected by the deflection of the main body of the spring base which lies immediately behind it. The two independent bodies of the spring base provide support for a removable, overlying seat cushion.

The back of the chair comprises a rigid frame, the front face of which is formed, from top to bottom, as a smooth, reverse curve, the lower portion of which extends considerably farther forwardly than the upper portion. This curved face is overlayed with a spring construction of uniform thickness in the uncompressed condition, but when the padding and cover are added, as indicated in FIGURE 1, the cover is drawn closer to the lower portion of the front face of the back frame than to the upper portion, but in such a way as to maintain the front face of the back cover in a reasonably straight line from top to bottom. Because of the preformed back frame, the compression of the spring construction is thus graduated from top to bottom providing soft support for the shoulders of the occupant and firm support for the small of his back.

Referring more specifically to the drawings for a detailed description of a chair in accordance with the invention, and particularly to FIGURES 1 and 4, the chair comprises a skeletal frame 10 which may be defined generally as including spaced side panels 12 each comprising a rear upright 14 formed as a chair leg at its lower end, a forwardly extending lower side member 16 and arm framing 18, modified in the illustrated case for design

purposes by wing panels 20. The side panels 12 are connected together by a front cross rail 22, a lower rear cross rail 24 and an upper rear cross rail 26. For purposes of the appearance design of the illustrated chair, the back of the frame is extended upwardly by a supplemental cross frame 28, the upright side pieces of which are secured to the inside faces of the rear uprights 14 of the side panels. The chair frame is supported at its front end by short legs 30 which are secured by means of screws to bracing blocks 32 in the front corners of the frame.

All of the aforementioned frame structure may be desirably constructed of wood pieces suitably secured together by dowels and screws in the manner well known in the art.

The seat suspension mechanism 34 (FIGS. 1 and 2) is preferably constructed as a self-contained sub-assembly of metal which is supported by the wooden chair frame but does not rely upon the wood frame for its strength. The suspension frame is preferably constructed of angle iron and may comprise a front cross member 36, rearwardly extending side members 38, and rear uprights 40. The rearward ends of the side members 38 are maintained in properly spaced relation by a cross member 42 riveted at its ends to the side members, and having its vertical flange turned downwardly to engage the front face of the rear cross rail 24 of the chair frame to assist in locating the suspension mechanism in the chair frame. Extending forwardly from each of the rear uprights 40 are upper side members 44 which are connected together at their forward ends by an upper rear cross member 46. The upper and lower side pieces of the suspension frame are maintained in properly spaced relation by a bracing plate 48 which is riveted to the upper and lower side members 44 and 38 respectively.

Spaced rearwardly from the front cross member 36 is an intermediate cross rail 50 to which is secured a pair of bearings 52 disposed one toward either side of the frame. Disposed in the space between the side members 38 is a heavy wire grid 54 which serves as the platform or base for the spring construction previously mentioned and later to be described in detail. The platform comprises a very heavy peripheral rod 56, which, as indicated in FIGURE 2, is bent to conform generally to the space defined between the side members 38 of the seat suspension frame, the side portions being closer together at the rear of the platform than at the front. Along the rear edge of the platform the border rod 56 is bent upwardly and extends across the back of the platform above the plane of the platform. Extending from front to back of the platform, and welded to the border frame, are two intermediate support rods 58 of the same weight as the border frame and similarly bent upwardly at their rear ends for attachment at those points to the underside of the border frame. Spanning the border frame from side to side are numerous wire elements 60 which are spaced sufficiently closely to provide substantially continuous support for an overlying cushion, and the wire elements 60 are spot-welded to the border frame 56 and intermediate support rods 58 of the grid or platform 54.

The front portion of the border frame 56 of the seat platform 54 is journalled in the bearings 52 which permit swinging movement of the platform 54 on a horizontal axis at its front end. At its rear end, the seat platform 54 is resiliently supported by a pair of spring toggles 62. Each spring toggle consists of a lower arm 64 preferably formed of sheet metal in the shape of a flaring channel and having one end thereof curled about the rear portion of the border rod 56, as shown more particularly in FIGURE 6. At its opposite end, the lower toggle arm 64 is welded to a metal sleeve 66 into which is pressed a rubber bushing 68 which acts as a torque spring at the knee of the toggle. The rubber spring element 68 is bonded by vulcanization to an inner metal sleeve 70, the relative dimensions of the rubber bushing and outer collar 66 being such as to provide a secure frictional bond between the rubber bushing and the outer collar, capable of preventing slippage between the two under the loads normally encountered in this application.

The upper arm 72 of the spring toggle consists of a heavy, U-shaped cylindrical rod, one leg of which is housed within the inner sleeve 70 of the torque spring, and keyed thereto by means of suitable pins 74, and the other of which is journalled in a bearing 76 comparable to the bearings 52 which support the forward end of the platform 54. A cotter key 78 prevents the withdrawal of the toggle arm 72 from the bearing. The bearings 76 are riveted to the upper rear cross rail 46 of the seat suspension frame, as indicated in FIGURE 1.

The seat suspension frame 34 is secured in place by screws 79 which pass through its side member 38 and rear upright 40 into the side panels 12 of the chair frame.

As shown in FIGURES 1 and 6, the arms of the spring toggles 62 are disposed at an acute angle in the unloaded condition, at which the seat platform 54 is disposed approximately horizontal. The lower arm 64 of the spring toggle is longer than the upper in order that the cross rail 46 supporting the upper arm bearings 76 can be located sufficiently rearwardly of the seat to prevent the creation of a "hard spot" in the back of the chair.

When the seat platform swings downwardly at its rearward edge under load, the arms of the spring toggles 62 become more divergent, as indicated by the broken line positions of FIGURE 6, and the rubber torque spring 68 twists until sufficient torsional resistance is developed to balance the load.

While it is possible to obtain a quite satisfactory result with other forms of spring support for the rear of the seat platform 54 (e.g. helicals stretched between the rear edge of the platform and the cross rail 46), the refinement of the spring toggles is preferred because of the modification of spring characteristic which is obtained from the geometry of the toggle linkage. With the arms of the toggle at a fairly acute angle in the unloaded condition, the spring action is "soft" initially because the angular displacement of the torque spring 68 increases only slightly faster than the linear distance between the ends of the toggle arms. However, as the deflection of the seat platform continues, the angular displacement of the torque spring per unit deflection of the seat platform increases more rapidly and its mechanical advantage improves rapidly, with the result that the effective spring force is greatly increased. This arrangement is desirable because it permits the development of substantial seat pitch by persons of small stature but only slightly greater pitch by persons of heavy stature.

The framing of the seat platform 54, illustrated in the form of a heavy wire grid, is sufficiently sturdy to be substantially rigid under heavy seating loads, i.e., insusceptible of any perceptible bowing or hammocking. Over the top of, and supported upon the seat platform, is an integral spring construction which is preferably made as a removable cushion 78. In the illustrated case it consists of an assembly of axially vertical coil springs 80 which are preferably, although not necessarily, of the pocketed or so-called Marshall type. The top and bottom faces of the spring construction are preferably covered with a thin pad 82 of sturdy fibrous material, such as sisal or the like, and the top pad is covered with a thin layer 84 of cotton felt to give a smooth appearance to the enclosing cover 86. which is made of sturdy textile material such as denim or the like. The cushion 78, which is in fact a spring base for the removable upper seat cushion, need not be constructed to be reversible, inasmuch as the loads which it receives from the upper cushion are not sufficiently localized to promote undue wear.

Immediately forwardly of, and separate from the cushion **78** is the spring edge **88**. The spring edge consists of a single row of wire coil springs **90** which are formed of a heavier gauge wire than those used in the base cushion **78** and which are preferably of the hourglass or double cone type. The top convolutions of the coils **90** are connected together by their attachment to a border frame **92** of heavy wire and may also be connected together by a steel strap **94** which extends along the middle of the row diametrically of the top convolutions. This strap also serves to divide the open area of the top convolutions of the springs to provide a suitable base for upholstery padding.

The springs **90** of the spring edge **88** are secured to a wooden board **96** by means of staples or the like, which permits them to be installed in the chair as a sub-assembly. Referring to FIGURE 1 and 3, it may be seen that the front border wire of the spring edge is enfolded by a thin pad **97** of sisal, and the assembly is then covered with another pad **98** of sisal to which are sewed front and rear flaps **99** of burlap or the like, which are pulled taut and tacked to the board **96**. The assembly is then further covered with cotton padding **100** to give a smooth appearance to the outer upholstery cover **101** which is likewise secured to the board **96**.

The spring edge assembly is emplaced upon the front portion of the metal seat suspension frame **34** and is secured thereto by means of screws which pass upwardly through channel shaped attaching brackets **102** on the seat suspension frame into the base board **96** of the spring edge. As clearly shown in FIGURE 1, the spring edge is upholstered entirely separately from the main body of the spring base and acts independently of the latter.

A removable seat cushion **104**, which is coextensive from front-to-rear with the spring edge **88** and the spring cushion **78**, may be of any desired construction, i.e., may have a core of foam rubber or other plastic material, or a padded spring construction, or the like.

The back of the skeletal wood frame **10** is provided with a curved front face comprising a series of ribs **106** formed of heavy steel strap bent in a mildly reversing or S-shaped curve. The ribs **106** are bent at their lower ends to form feet which are riveted to the top rear cross rail **46** of the seat suspension frame **28**, and are secured at their upper ends by means of screws to the upper cross frame **28** of the back. The lower portions of the ribs **106** extend well forwardly of the back of the chair frame and recede well rearwardly into the plane of the upper cross frame **28**. The ribs **106** are shown as four in number, connected together below their midpoints by means of a cross strap **108** to which each of the ribs is riveted. However, it will be understood that a different number may be used according to the support required for the resilient cushion core, still to be described, with which the back is upholstered, and that the contoured front face of the back may likewise be formed of wood, metal sheet or lattice, or suitable substitute.

Emplaced upon the contoured front face of the back is a spring construction **110** (FIG. 1) comprising a series of rows of wire coil springs which are preferably of the Marshall or pocketed-coil construction. A sheet **112** of heavy burlap is placed between the spring construction and the ribs **106** to provide continuous support for the spring construction across the full width of the back.

The spring construction **110** is supported at its lower end upon the ledge formed by the receding attachment feet at the lower ends of the ribs **106**, and the front face of the spring construction is provided with a border frame **114** of heavy spring wire or the like for shape retention. The front face of the spring construction is covered with a muslin sheet **116** of greater area than the face of the construction, and the edge portions of the sheet **116** are pulled back and tacked to the wood frame to secure the springs in place against the ribs **106**. The muslin sheet **116** is then covered with cotton padding **118** which

extends over the top and around the sides of the spring construction **110**, and the whole is enclosed by the outer upholstery cover **120**. In the illustrated case, a wood filler strip **122** in the angle iron cross rail **46** of the seat suspension frame, serves as the tacking strip for the lower end of the muslin sheet **116** and the upholstery cover **120**.

The spring construction **110** used in the back of the chair is one in which the thickness of the spring core, i.e., the height of the individual springs, is uniform throughout the construction when in the uncompressed condition before the completion of the upholstery. In the upholstery process, specifically in the attachment of the edges of the muslin sheet **116** to the wood tacking strip **122**, and to the wood frame of the back, the sheet **116** is drawn in more tightly to the lower portions of the ribs **106** than to the upper portions to achieve a fairly straight front surface from top to bottom of the construction **110**. In the process, the springs in the lower portion of the construction are compressed or preloaded to a substantially greater extent than those in the upper portion of the construction. In this manner, the spring construction is "hardened" in its lower portion to provide firm support in the small of the occupant's back, but remains soft in its upper portion to provide depth to cushion the occupant's shoulders.

If desired, the firming effect of the gradually increased compression from top to bottom of the construction may be accentuated by the use of stiffer spring coils in the lower portion of the construction, a difference of one number in the wire gauge having a noticeable and desirable effect. Furthermore, it has been found desirable to provide slightly stiffer springs in the periphery of the construction **110** in order to offset the increased local compressive effect of the side and top panels of the back cover, and thus to maintain a trim, square appearance in the upholstered article.

Résumé

In a chair in accordance with the invention, the tendency of conventional chairs to encourage forward sliding of the occupant on the chair seat is eliminated by the downward movement of the extreme rear portion of the seat when it is sat upon. This develops a comfortable pitch in the seating surface, which increases, as needed, with the weight of the occupant. The effective angle between the seat and the back decreases in actual use in an amount depending upon the weight of the occupant, i.e., upon the amount of deflection of the seat, and the extent to which the body penetrates the upholstered back.

The separation of the spring edge **88** from the main body **78** of the spring base is particularly important in the accommodation of the chair to persons of shorter stature, whose shorter legs require them to sit farther forwardly on the seat of the chair. The spring edge, remaining unaffected by the deflection of the main body **78** of the spring base, serves equally well as a retaining abutment whether the main weight of the occupant is fully to the rear of the seat, as when the occupant is tall, or farther forward, as when the occupant is short. The accommodation of the chair to shorter persons is enhanced by the novel construction of the back, whose softer upper portion permits sufficient penetration by the shoulders of the occupant to offset the diminished support of the lower part of the spine resulting from the more forward placement of the main body weight upon the seat. The penetration of the softer upper part of the upholstered back by the shoulders straightens the line of the spine and supports the back, greatly reducing the fatigue of shorter persons by permitting them to assume a comfortable position.

The features of the invention believed new and patentable are set forth in the appended claims.

I claim:

1. In a seat for upholstered chairs or the like, an

upper removable seat cushion, a base for said cushion comprising a unitary spring construction underlying the main body of said removable cushion, and a separate spring-edge disposed beneath the front peripheral portion of said removable upper cushion, said spring-edge being contiguous to the forward edge of said spring construction and having a greater resistance to downward deflection per unit supporting area than said spring construction, said spring edge being upholstered separately from said spring construction, whereby the spring actions of said spring construction and said spring edge are independent of each other.

2. An upholstered chair or the like comprising a normally stationary support frame, a seat comprising a substantially rigid platform member flexibly connected at its forward edge to said support frame for downward hinging movement about said forward edge under seating loads, resilient means connected between said platform and said support frame for resisting said downward hinging movement, a removable spring cushion carried on said platform, an upholstered spring edge extending across the front of said chair contiguous to said spring cushion, said spring edge being separate from said spring cushion and having a greater resistance to downward deflection per unit of supporting area than said spring cushion, and a removable seat cushion overlying said spring edge and said spring cushion.

3. A chair or the like comprising a normally stationary supporting frame, a seat comprising a substantially rigid frame member carried at its forward end on said supporting frame for downward hinging movement of its rearward end under seating loads, and a resilient connection between the rear of said seat frame and said supporting frame including a torsion spring having an arm pivoted to said seat frame member, said torsion spring being movably so connected to said supporting frame that the ratio of its torsional displacement to the linear deflection of the rear of the seat frame increases with said deflection of seat frame.

4. A chair or the like comprising a normally stationary supporting frame, a seat comprising a substantially rigid frame carried at its forward end on said supporting frame for downward hinging movement of its rearward end under seating loads, and a torsion spring having a pair of arms extending in acute angular relation to one another, one of said arms being connected to said supporting frame and the other of said arms being connected to the rear of said seat frame so that the angle between said

arms increases incident to increased downward deflection of said seat frame.

5. In a seat for upholstered chairs or the like, an upper removable seat cushion and a base for said cushion comprising a cushion construction underlying the main body of said removable cushion, and a separate resilient supporting edge disposed beneath the front peripheral portion of said removable upper cushion, said resilient supporting edge being contiguous to the forward edge of said cushion construction and having a greater resistance to downward deflection per unit supporting area than said cushion construction, said resilient supporting edge being upholstered separately from said cushion construction, whereby the load resisting action of said cushion construction and said resilient supporting edge are independent of each other.

6. An upholstered chair or the like comprising a normally stationary support frame, a seat comprising a substantially rigid platform member flexibly connected at its forward edge to said support frame for downward hinging movement of its rearward end about a horizontal axis under seating loads, resilient means connected between said platform and said support frame for resisting said downward hinging movement, a first removable cushion carried on said platform, an upholstered resilient supporting edge extending across the front of said chair contiguous to said first cushion, said supporting edge being separate from said first cushion and having a greater resistance to downward deflection per unit of supporting area than said first cushion, and a second removable seat cushion overlying said resilient supporting edge and said first cushion.

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