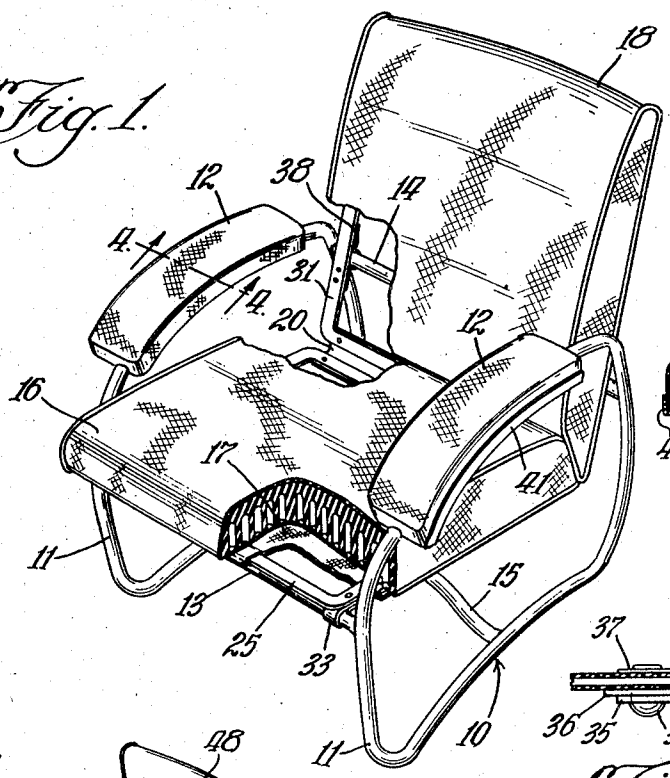
Nov. 30, 1948. M. M. CUNNINGHAM 2,454,912

SPRINGY ADJUSTABLE SEATING STRUCTURE

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Fig. 1.



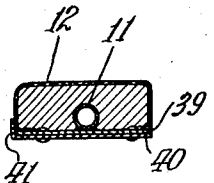


Fig. 4.

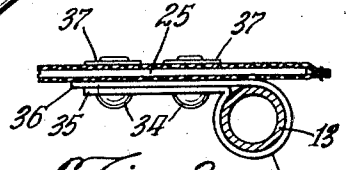


Fig. 3.

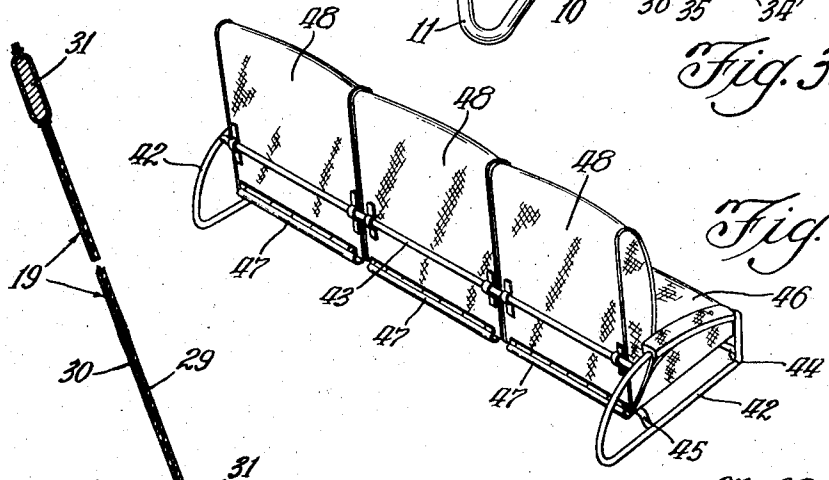


Fig. 5.

Fig. 2.

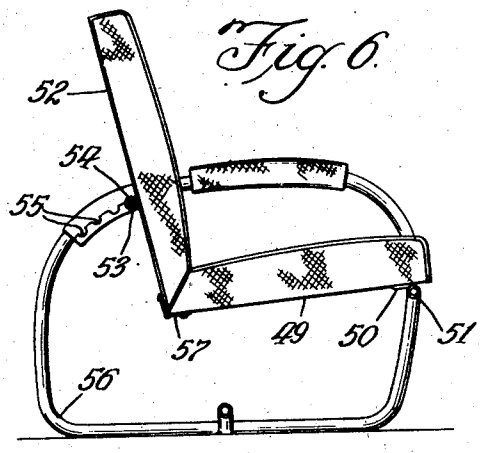
Inventor:
Marion Morgan Cunningham
By Eugene M. Giles
Atty.

Nov. 30, 1948. M. M. CUNNINGHAM 2,454,912

SPRINGY ADJUSTABLE SEATING STRUCTURE

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Fig. 6.



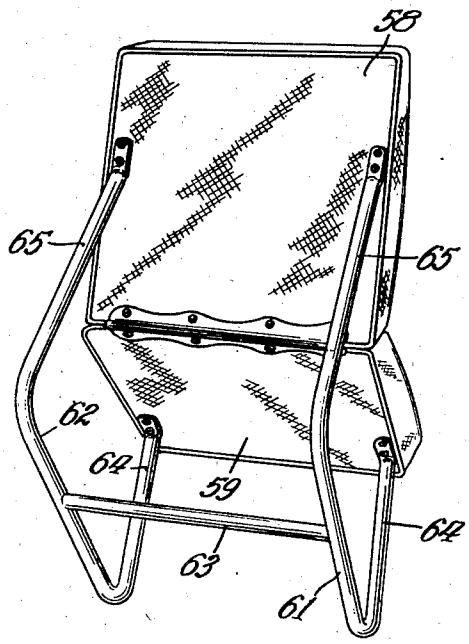


Fig. 7.

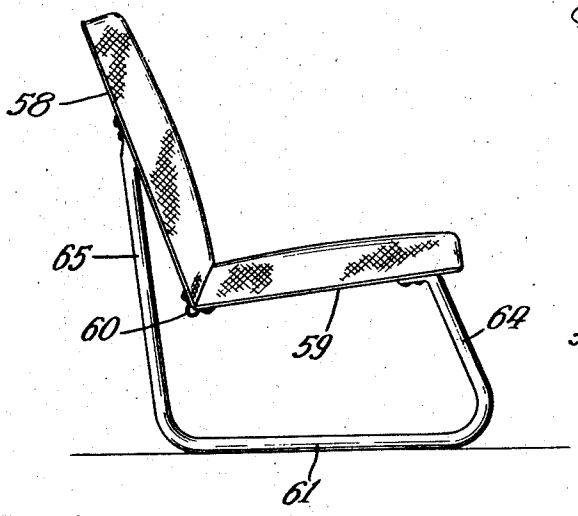
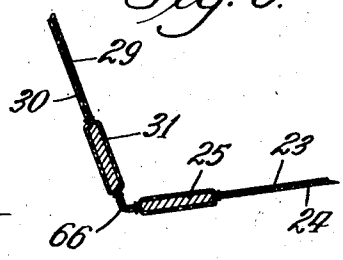


Fig. 8.

Fig. 9.



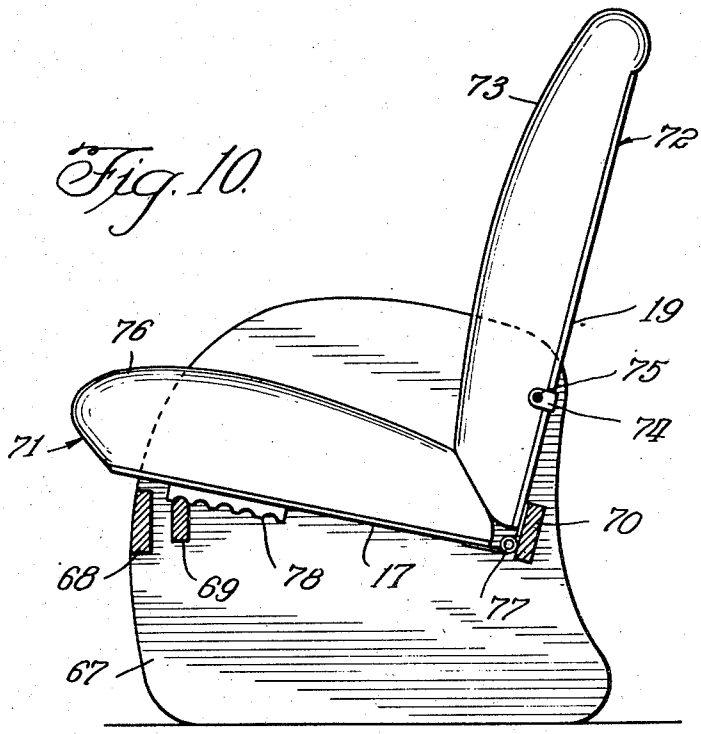
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Atty

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SPRINGY ADJUSTABLE SEATING STRUCTURE

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Fig. 10.



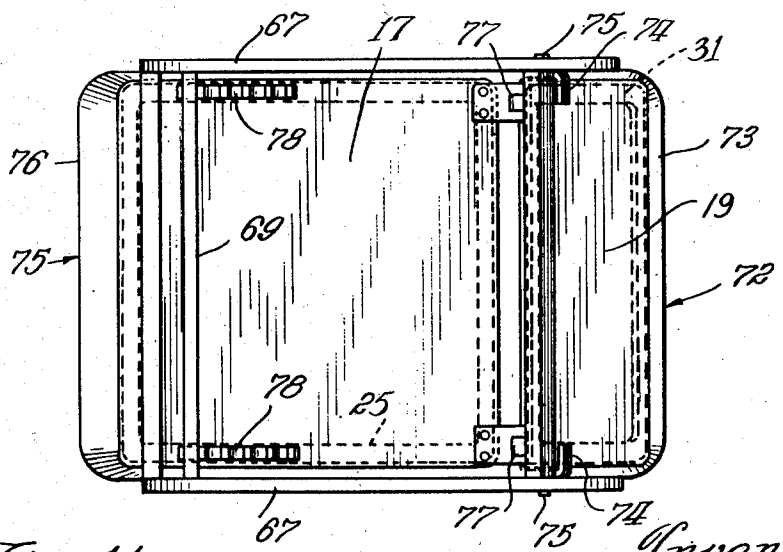


Fig. 11.

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Patented Nov. 30, 1948 2,454,912

UNITED STATES PATENT OFFICE

2,454,912

SPRINGY ADJUSTABLE SEATING STRUCTURE

Marion Morgan Cunningham, South Bend, Ind., assignor to Mishawaka Rubber and Woolen Manufacturing Company, Mishawaka, Ind., a corporation of Indiana

Application October 30, 1944, Serial No. 560,978

8 Claims. (Cl. 155—116)

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My invention relates to seating structures, such as chairs, davenports, and the like and has reference more particularly to seat bottoms and seat backs with springy marginal frames and the mounting thereof in a manner to afford unusual flexibility and comfort. One particular field in which the invention may be used advantageously is in transportation seating, as for example, in lounge cars or other types of railway equipment.

This improvement involves cushion supports or decks similar to those heretofore described in my application Serial No. 347,627, filed July 26, 1940 on which Patent No. 2,371,954 was granted March 20, 1945, and wherein a fabric deck or cushion backing is stretched on a marginal frame of the same shape or contour as the cushion which it supports, the present application being a continuation in part of my aforesaid application Serial No. 347,627. It is also a continuation in part of my application Serial No. 377,610 filed February 6, 1941 which was voluntarily abandoned on November 8, 1944.

According to my present invention the marginal metal frames of the cushion supports are made of a flat spring steel similar to that used in leaf springs. As a result these cushion supports have a degree of flexibility and resiliency dependent upon the thickness and the springiness of the steel frames.

The cushion support for the seat bottom of a chair constructed in accordance with my invention is connected at its rear to the lower end of the cushion support of the seat back by means of a springy L-member or a hinge arrangement, or in other similar manner, so that some degree of hinging action is provided. The front of the seat bottom is mounted, preferably pivotally, upon the front portion of the chair frame, as for example, on a tubular steel or other cross member, and the seat back support which supports the rear end of the seat bottom, is mounted, also preferably pivotally, on the chair frame at corresponding points on opposite sides part way up the seat back, these seat bottom and seat back connections with the chair frame being made directly to the springy marginal frames of the seat bottom and seat back.

The principal objects of my invention are to provide an improved light-weight resilient seat structure; to simplify and minimize the cost of seating structures; to insure a high degree of flexibility and maximum comfort; to provide a seat or cushion mounting arrangement which is adaptable to a large variety of single and multiple unit seating equipment; and to procure individualized springing of each member of multiple seats which are mounted upon the same frame; these and other objects being accomplished as pointed out hereinafter and as shown in the accompanying drawings, in which:

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Fig. 1 is a perspective view of a chair constructed in accordance with my invention, with portions broken away to show details of construction;

Fig. 2 is a vertical sectional view of the seat and back cushion supports of the Fig. 1 structure;

Fig. 3 is an enlarged sectional view of the mounting of the seat bottom support on the cross member of the chair frame;

Fig. 4 is a sectional view of the arm rest taken on the line 4—4 of Fig. 1;

Fig. 5 is a rear perspective view of a multiple unit seat involving my invention;

Fig. 6 is a side elevation, with the nearest side frame removed, of a modified form of my chair construction with an adjustable back;

Fig. 7 is a rear perspective view of another form of chair built in accordance with my invention;

Fig. 8 is a side view of the chair shown in Fig. 7;

Fig. 9 is a cross sectional view of a form of hinge connection that may be employed between the seat bottom support and seat back support;

Fig. 10 is a side view of another modified form of chair with parts broken away and showing an adjustable seat bottom chair constructed in accordance with my invention; and

Fig. 11 is a bottom view of the chair of Fig. 10.

Referring to the drawings, the frame of the chair shown in Fig. 1 is designated by the reference numeral 10 and is of tubular steel construction consisting of somewhat rectangular shaped side frames 11 each with arm rests 12 thereon. These side frames 11 are joined together by a front cross member 13, a rear cross member 14 and a brace 15 located centrally and connecting the portions of the side frames 11 at the bottom.

The seat cushion 16 is mounted on a seat bottom 17 and the back cushion 18 is mounted on a seat back 19. The seat bottom 17 and seat back 19 are joined together by means of an angular strip 20 of spring steel with a rounded bend 21 between the flanges 22 thereof to afford increased flexibility.

The seat base or bottom 17 consists of two plies of rubberized fabric 23 and 24 mounted and stretched taut upon a surrounding endless marginal steel frame 25 which is made of flat spring

steel of suitable width to be substantially rigid in the plane of the seat bottom but of a thickness so that it is springy in a direction normal to the plane of the seat bottom. The two tautly stretched plies of rubberized fabric 23 and 24 are bonded together by adhesive or in other desired manner throughout the area bounded by the steel frame 25 and said plies are stitched together at both sides of the steel frame along the inner and outer edges thereof as shown at 26 and 27, and thereafter trimmed off slightly beyond the outer stitching 27 so that a marginal edge 28 remains all around said seat base 17, all as disclosed in my aforesaid co-pending application Serial No. 347,627 of Patent 2,371,954. The back support 19 is of the same type of construction with rubberized fabric plies 29 and 30 mounted on a spring steel frame 31 which may be more springy than that of the seat bottom, if desired.

The seat and back cushions 16 and 18 respectively are attached to the seat base and back supports 17 and 19 respectively by cementing or in some other appropriate manner and both may be suitably upholstered. The seat base 17 and back support 19 are connected in proper angular relation by the angular strip 20, the flanges 22 of which are secured respectively to the frames 25 and 31 by means of screws 32. The front or free end of the seat base 17 is mounted on the front cross member 13 of the chair frame 10 by means of loop members 33 such as illustrated in Fig. 3 in detail. These loop members 33 are located at opposite sides of the seat base 17 and are connected thereto by any suitable means such as rivets 34 extending through the doubled together attaching arms 35 and 36 of the loop members 33 and through the fabric covered frame 25 and headed over washers 37 as shown in Fig. 3. This type of mounting permits some degree of rotation of the seat bottom 17 upon the front cross member 13, and requires a corresponding hinging or flexing action in the angular strip 20, to which the rear of the seat base 17 is attached, when the seat base 17 is flexed downwardly in the direction of its springiness by pressure thereupon such as when a person is sitting on the cushion 16.

A similar mounting is provided for the back support 19 at each side thereof by means of a loop member 38 in engagement with the tubular rear cross member 14 of the chair frame 10. This mounting also permits a slight rotation of the loop members 38 upon the rear cross member 14. Thus, when pressure is applied against the upper portion of the back cushion 18, the upper portion of the back support 19 will yield or flex in accordance with pressure thereupon owing to the springy character of the frame 31 of the said back support 19 and the location of the mountings 38 below the middle of the back.

Thus, as a person sits in a seat constructed in accordance with this invention, the weight upon the seat portion causes the springy seat base 17 to yield somewhat and provides a comfortable resiliency. Likewise the back support 19 yields as the occupant of the chair leans against the back cushion 18 and it is to be noted that the upper portion of said back support 19, which is entirely free and not secured to the frame 10 of the chair, will yield somewhat under pressure when the occupant leans back thereagainst and will resume normal position when the pressure thereupon is released.

Arm rests 12 of any desired form may be provided, preferably of an upholstered spongy rubber similar to that of the cushions 16 and 18. For this purpose a plate 39 may be welded to the underside of the top portion of each side frame 11 and a finish plate 40 may be attached to the under side thereof and provided with an upturned flange 41 along the outer side. The sponge rubber arm rest 12 is molded to fit on this composite plate structure 39, 40 and is formed with a recess to accommodate the tube portion 11 and secured in place by cementing or in other convenient manner.

Fig. 5 shows a multiple unit seat such as a davenport which involves substantially the same construction as above described except that it is of greater width for multiple seating. This davenport has the side frames 42 connected by a rear cross member 43, a front cross member 44 and a bottom brace 45. Three individual seat units, each comprising a seat portion 46 each individually connected at its rear by a springy angle plate 47 (like the angle plate 20 of Fig. 1) to the lower end of a companion back portion 48, are mounted on the front cross member 44 and rear cross member 43 in the same manner as the individual seat unit shown in Fig. 1. By virtue of the individual hinging of each of the seat units, each seat 46 and back 48 flexes individually of the other seat units 46, 48 in accordance with the pressure and seating position of the persons sitting on the respective portions of a sofa or davenport constructed in accordance with this invention.

Fig. 6 shows a modified form of seat structure especially adapted for use in railroad coaches, busses and other commercial transportation units. In this construction the seat base 49 is mounted in the same manner as the seat base 17 in Fig. 1 by means of loop members 50 on a front cross member 51. The back support 52 is mounted by means of similar loop member 53 on a rear cross member 54. Said rear cross member 54 is not rigidly mounted upon the chair frame, but is supported by corresponding sets of notches 55 of the opposite side member 56 of the chair frame. Thus the degree of inclination of the seat back may be regulated at will by adjusting the rear cross member 54 in different notches 55.

The seat base 49 and the back support 52 may be joined together by means of a resilient angle strip similar to the angle strip 20 shown in Fig. 2, if desired, but preferably a piano type hinge 57 is used instead. This type of seat is especially advantageous for use in commercial passenger transportation where it is desirable to afford adjustment of the seats to upright, reclining or other positions in order to suit the individual preferences of the passenger.

Figs. 7 and 8 show a modified form of chair structure in which the back support 58 and the seat base 59 are united by means of a resilient angle plate 60 and mounted directly on a simple frame consisting of two corresponding sides 61 and 62, connected by a bottom cross brace 63. The tops of the front upright legs 64 of the frames 61 and 62 are secured to the side portions of the springy marginal frame of the seat base 59 and the rear upright legs 65 are secured to the side portions of the springy marginal frame of the seat back 59.

Fig. 9 shows a detail of a modified form of connection that may be employed for hingedly connecting the rear edge of the seat base to the lower edge of the seat back. In this connection the fabric layers 23 and 24 of the seat bottom are a

continuation respectively of the fabric plies 29 and 30 of the seat back with a sufficient width 66 of the two ply fabric between the respective marginal frames 25 and 31 of the seat bottom and seat back to serve as a hinge as shown. In other respects, the construction of this type of chair would correspond to the construction of the chairs shown in the previous figures of the drawings.

In Figs. 10 and 11 a further modification of my invention is shown, wherein the seat bottom is adjustable instead of the seat back.

In this structure of Figs. 10 and 11 two side frame members 67, which may be wood panels, are secured together by cross members 68, 69 and 70 in proper spaced relation to accommodate the chair bottom 71 and the chair back 72 therebetween. The chair back 72 comprises a fabric back deck 19 with marginal spring steel frame 31 thereabout, like the seat back of Figs. 1 and 2, and has an upholstered cushion 73 secured to the front thereof. Each opposite side portion of the frame 31 of the seat back 72 has a similar hinge lug 74 secured thereto part way up the back and extending forwardly therefrom along the inner face of the respective side frame 67 and pivoted thereto as at 75.

The chair bottom 71 likewise comprises a fabric seat deck 17 with marginal spring steel frame 25 therearound, like the seat bottom of Figs. 1 and 2, and has an upholstered cushion 76 secured thereto. At the rear this chair bottom is suspended from the lower end of the chair back 72 by hinges 77 attached to the frames 31 and 25 of the chair back and chair bottom respectively. The cross member 69 which extends between the side frames 67 and loosely supports the chair bottom near the front and the cross member 70 which extends between the side frames 67 at the lower end of the chair back 72 serves as a back stop to limit rearward movement of the chair bottom and the lower end of the chair back.

Thus the chair back swings on the pivots 75 and the chair bottom rests on the cross member 69, these being the only points of support of the combined chair back and bottom.

The chair bottom 71 may, if desired, be provided with no interlocking engagement with the cross member 69 for adjustment and thus be merely slidably supported on the cross member 69 but I prefer to provide on the underside of the seat bottom at each side thereof a rack member 78 to engage the top edge of the cross member and thereby permit adjusting and holding the seat bottom 71 at various positions on the bar 69. When adjusted to the extreme forward position it swings the lower end of the back 72 forwardly therewith and provides a reclining position whereas when adjusted to the extreme rear position wherein the hinged connection abuts against the cross member 70, it affords an upright sitting position.

These racks are secured respectively to the opposite side lengths of the bottom spring steel frame 25 and have a sufficient rocking engagement on the upper edge of the cross member 69 so that this adjustable connection does not interfere with the flexing of these side lengths of the frame 25 under the weight of the chair occupant.

The frame 25 of the chair bottom 71 is accordingly unsupported except at the rear hinges 77 and at the cross member 69 and being of flat spring steel flexes under load at the unsupported places and contributes added resiliency to the chair bottom. Also the frame 31 of the chair back is unsupported only at the side pivots 75 and held against tipping by the hinge connection 77 with the bottom 71 or by the cross member 70 in the upright sitting position and this frame likewise being of flat spring steel flexes under pressure against the seat back, especially above the pivots 75 and contributes greatly to the ease and comfort of the occupant of the chair.

While I have shown and described my invention in a preferred form I am aware that various modifications can be made without departing from the spirit of my invention, the scope of which is to be determined by the appended claims.

I claim as my invention:

1. In a seating structure of the class described the combination of a supporting frame having mounted thereon two seat elements one of which is an upwardly extending seat back and the other of which is a seat bottom hinged to the lower end of the seat back and extending forwardly therefrom, at least one of said elements comprising a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to said plane and said supporting frame being connected with said element solely at lateral marginal locations remote from the hinge connection between the two elements.

2. In a seating structure of the class described the combination of an upwardly extending seat back, a seat bottom hinged to the lower end of the seat back and extending forwardly therefrom, and a supporting frame connected with said back and with said bottom solely at lateral marginal places thereof remote from said hinge, said seat back and seat bottom each being an individual assembly composed of a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel and said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to said plane.

3. In a seating structure of the class described the combination of three independent individual assemblies joined together in associated cooperative relation, two of the assemblies being a seat back and a seat bottom respectively and each comprising a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to the plane of the fabric panel and said other assembly being a supporting frame for said seat back and said seat bottom, said seat bottom and said seat back being connected together solely at their respective rear and lower ends and said supporting frame being connected with said seat bottom and seat back solely at side marginal places thereof remote from their aforesaid rear and lower end connection.

4. In a seating structure of the class described the combination of three independent individual assemblies joined together in associated cooperative relation, two of the assemblies being a seat back and a seat bottom respectively and each

comprising a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to the plane of the fabric panel and said other assembly being a supporting frame for said seat back and said seat bottom, said seat bottom and said seat back being connected together solely at their respective rear and lower ends and said supporting frame being connected with said seat bottom and seat back solely at side marginal places thereof remote from their aforesaid rear and lower end connection, the connection of the said supporting frame with one of said other two independent individual assemblies being a pivotal connection and with the other of the said two assemblies being an adjustable connection whereby that assembly is movable forwardly and rearwardly to optional positions on the supporting frame.

5. In a seating structure of the class described the combination of three independent individual assemblies joined together in associated cooperative relation, two of the assemblies being a seat back and a seat bottom respectively and each comprising a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to the plane of the fabric panel and said other assembly being a supporting frame for said seat back and said seat bottom, said seat bottom and said seat back being connected together solely at their respective rear and lower ends and said supporting frame being connected with said seat bottom and seat back solely at side marginal places thereof remote from their aforesaid rear and lower end connection, the connection of the supporting frame with at least one of said other two independent individual assemblies being a rack connection whereby that assembly is adjustable forwardly and rearwardly on the supporting frame.

6. In a multiple seating structure of the class described the combination of a supporting frame comprising two frame ends with a front stretcher and a rear stretcher extending therebetween and holding said frame ends in separated relation, and a plurality of separate seat backs interposed between said frame ends and each supported solely by the rear stretcher, and each seat back having a seat bottom connected to and extending forwardly from the lower end thereof and supported at its forward end by the front stretcher, each seat back and seat bottom comprising a fabric panel tautly stretched on a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and relatively thin and resiliently bendable transversely to the plane of the fabric panel and said other assembly being a supporting frame for said seat back and said seat bottom, said seat bottom and said seat back being connected together solely at their respective rear and lower ends and said supporting frame being connected with said seat bottom and seat back solely at side marginal places thereof remote from their aforesaid rear and lower end connection.

7. In a seat structure, a supporting framework including laterally spaced upright side members, a seat base and a seat back base, said seat base being supported at its front between said upright side members and joined at its rear to the lower end of the seat back base for relative pivotal movement thereof, said seat back base being supported between said upright side members at a locality intermediate its upper and lower ends, and said seat base and seat back base each comprising a fabric panel tautly stretched in a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel and resiliently bendable transversely to said plane and the portions of each of said marginal frames at the opposite lateral margins of the seat base and seat back base being free to yield in leaf spring manner throughout the greater portion of their length.

8. In a seat structure, a supporting framework including laterally spaced upright side members, a seat base and a seat back base, said seat base being fulcrumed at its front between said upright side members and joined at its rear to the lower end of the seat back base for relative pivotal movement thereof, said seat back base being fulcrumed between said upright side members at a locality intermediate its upper and lower ends, and said seat base and seat back base each comprising a fabric panel tautly stretched in a surrounding flat marginal frame consisting of a springy flat bar extending continuously around and lying flatwise in the plane of the fabric panel, said bar being of such width that it is substantially rigid and unyielding in the plane of the fabric panel and resiliently bendable transversely to said plane and the portions of each of said marginal frames at the opposite lateral margins of the seat base and seat back base being free to yield in leaf spring manner throughout the greater portion of their length.

MARION MORGAN CUNNINGHAM.

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