Nov. 17, 1942. E. S. TALLMADGE 2,302,479

SPRING STRUCTURE

Filed March 17, 1941 3 Sheets-Sheet 1

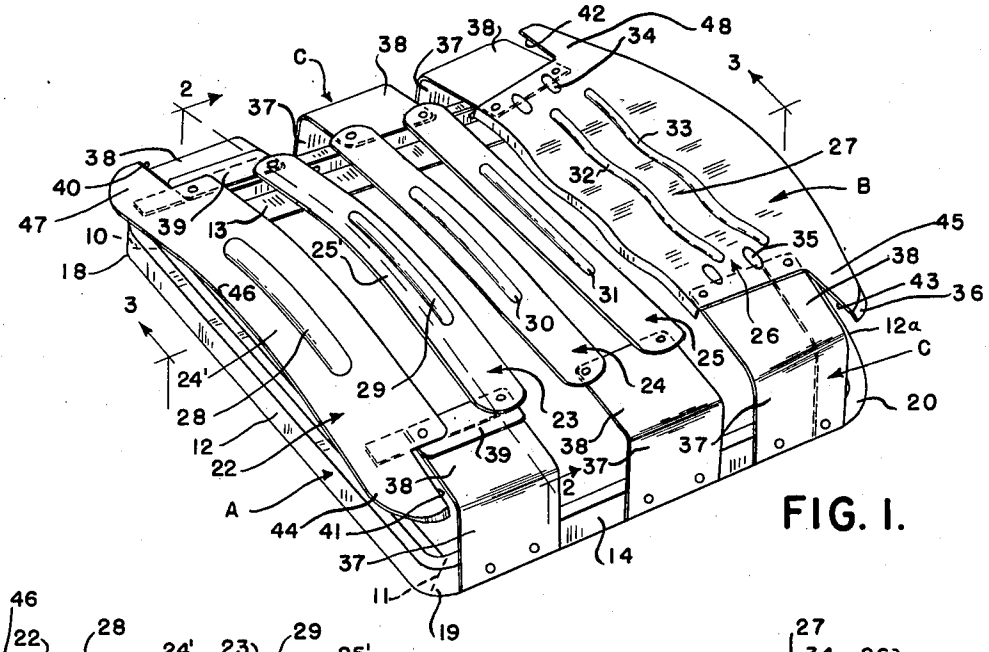

FIG. 1.

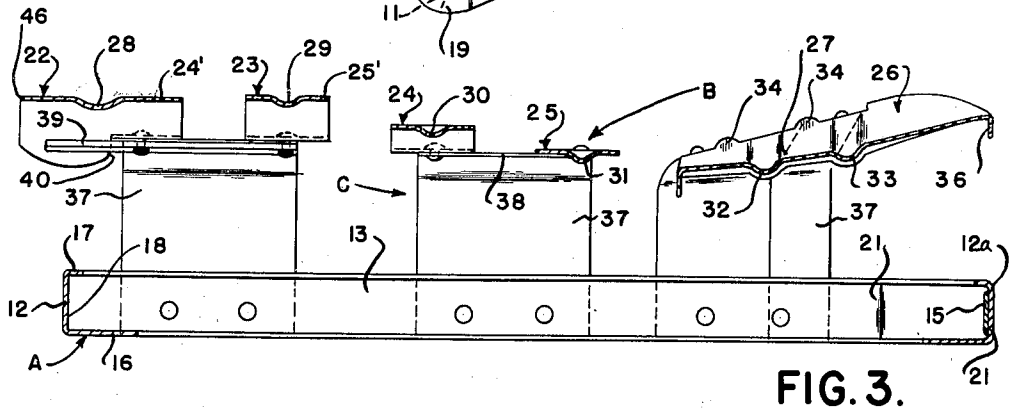

FIG. 3.

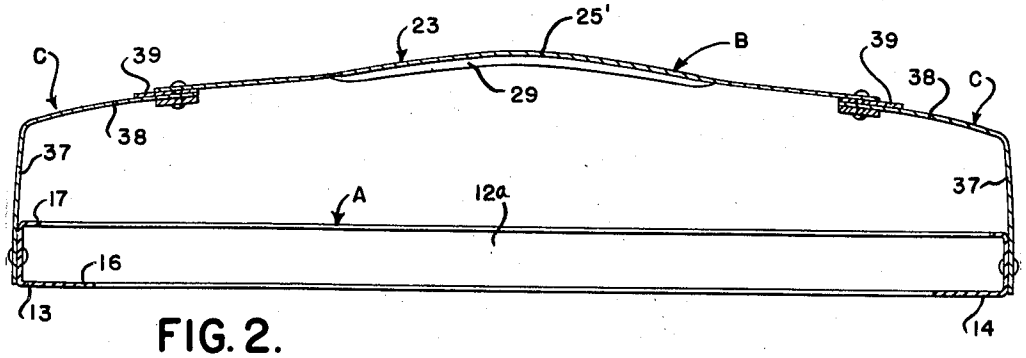

FIG. 2.

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SPRING STRUCTURE

Filed March 17, 1941 3 Sheets-Sheet 2

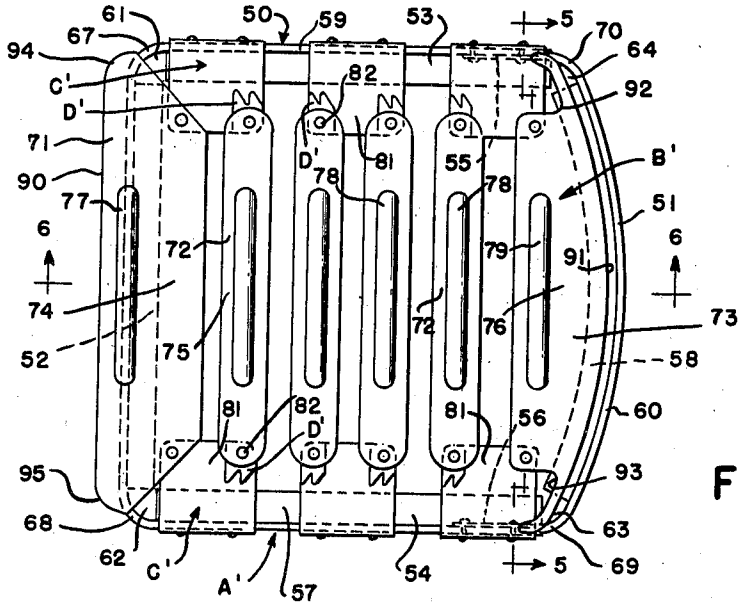

FIG. 4.

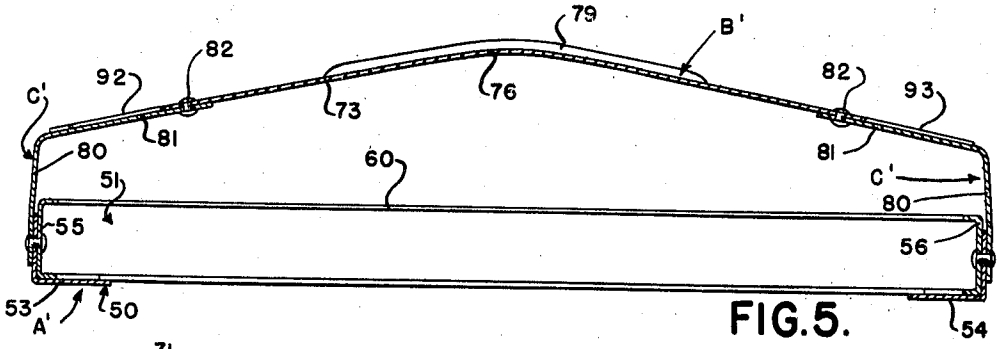

FIG. 5.

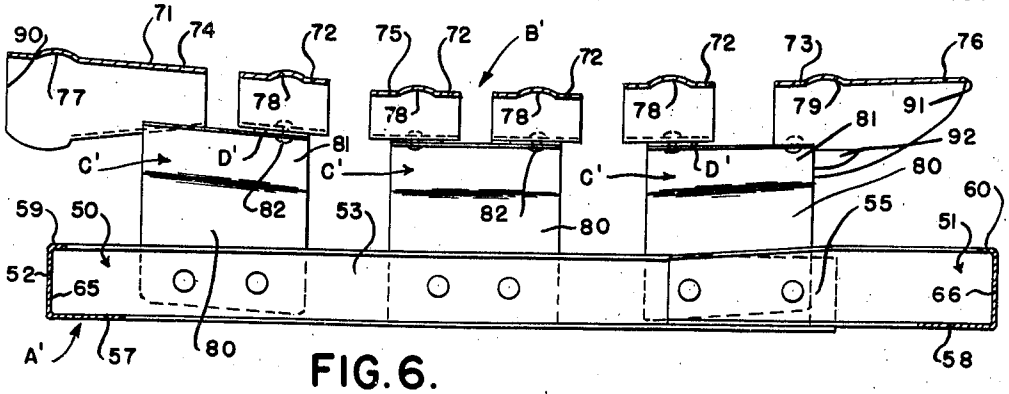

FIG. 6.

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SPRING STRUCTURE

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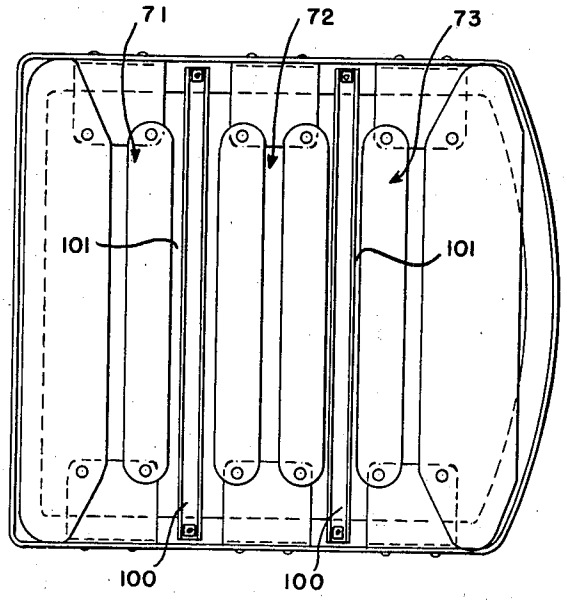

FIG. 7.

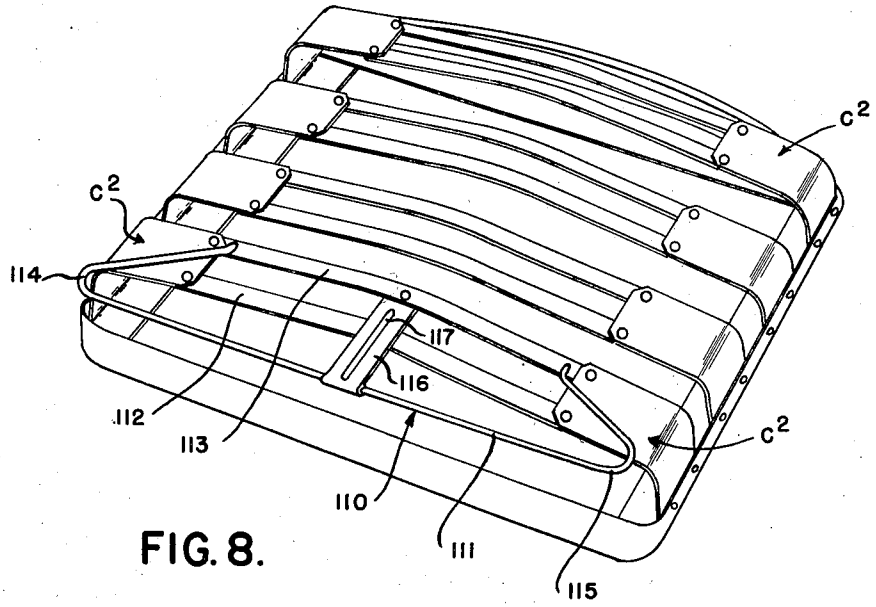

FIG. 8.

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Patented Nov. 17, 1942 2,302,479

UNITED STATES PATENT OFFICE

2,302,479

SPRING STRUCTURE

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Application March 17, 1941, Serial No. 383,838

16 Claims. (Cl. 155—179)

This invention relates generally to spring structures and refers more particularly to seat spring structures, especially those adapted for use in theatre seat constructions.

One of the essential objects of the invention is to provide a spring structure of this type that has a saddle effect and is shaped to insure the maximum seating comfort.

Another object is to provide a spring structure wherein the seating surface is curved transversely and/or longitudinally and is formed of leaf springs capable of producing the maximum cushioning effect.

Another object is to provide a spring structure that is strong and durable, economical to manufacture, and efficient in operation.

Other objects, advantages and novel details of construction of this invention will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a spring structure embodying my invention;

Figure 2 is a transverse sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view taken substantially on the line 3—3 of Figure 1;

Figure 4 is a top plan view of a slight modification;

Figure 5 is a transverse sectional view taken substantially on the line 5—5 of Figure 4;

Figure 6 is a longitudinal sectional view taken substantially on the line 6—6 of Figure 4;

Figure 7 is a top plan view of another modification;

Figure 8 is a perspective view of another modification.

Referring now to the drawings, A is the frame, B is the seating surface, and C are intermediate supporting springs of a spring structure embodying my invention.

As shown, the frame A is substantially square-shape in plan and is preferably formed from a single length of inwardly opening light weight channel-shaped stock. At the front corners of the frame are mitered joints 10 and 11 between the front crossbar 12 and the side rails 13 and 14, while at substantially the center of the rear crossbar 12a the ends of the channel stock are held in abutting relation by a suitable tiebar 15 welded to said stock. The lower side 16 of the channel stock is wider than the upper side 17 thereof and is engageable with a suitable support (not shown) for the spring structure. In the present instance the channel stock is curved at 18, 19, 20 and 21, respectively, to provide rounded corners.

The seating surface B is curved both longitudinally and transversely relative to the frame A and preferably comprises a series of substantially parallel transversely extending elongated leaf springs 22, 23, 24, 25 and 26, respectively. As shown, the springs 22 and 26 are at the front and rear of the frame and are wider than the intermediate springs 23 to 25, inclusive. Preferably the front wide spring 22 and the adjacent intermediate spring 23 are arched across the frame and have their crown portions 24' and 25', respectively, substantially in alignment at approximately the longitudinal median line of the frame, while the rear wide spring 26 has a depressed portion 27 in longitudinal alignment with the crown portions 24' and 25' of the arched springs 22 and 23. The intermediate spring 24 is only slightly arched across the frame, while the intermediate spring 25 is substantially straight across the frame, hence the intermediate springs 23, 24 and 25, respectively, provide a stepped-down structure between the front and rear springs 22 and 26. To stiffen and reinforce the structure, the leaf springs 22 to 25, inclusive, have longitudinally extending embossed narrow substantially trough-shaped portions 28, 29, 30 and 31, respectively, while the rear leaf spring 26 has two substantially parallel relatively long embossed substantially trough-shaped portions 32 and 33 and is provided at opposite ends of said embossed portions with relatively short embossed portions 34 and 35, respectively. The rear leaf spring 26 is also provided at its rear edge with a downturned flange 36.

The intermediate supporting springs C are also leaf springs and are preferably inverted substantially L-shape in configuration. Preferably the upright legs 37 of the L-shaped springs are rigidly secured at their lower ends to the side rails 13 and 14 of the frame at spaced points thereof, while the other legs 38 of the L's extent inwardly beneath and are secured to the leaf springs 22 to 26, inclusive, at opposite ends thereof. In the present instance, the leaf springs 22 and 23 are supported by and secured to the forward L-shaped springs C; the leaf spring 24 and 25 are supported by and secured to the intermediate L-shaped springs C; and the rear leaf spring 26 is supported upon and secured to the rear L-shaped springs C. Preferably narrow auxiliary leaf springs 39 extend along the inner edges of the forward L-shaped springs C beneath the end por-

tions of the leaf springs 22 and 23 to strengthen the structure.

By referring to Figure 1, it will be noted that the front leaf spring 22 projects forwardly beyond the front L-shaped springs C and is cut away at 40 and 41, while the rear leaf spring 26 projects rearwardly beyond the rear L-shaped springs C and is cut away as at 42 and 43, respectively, to afford clearance between the end portions 44 and 45, respectively, of said leaf springs and the adjacent L-shaped springs C so that the latter will have proper freedom of movement during the flexing action of the spring structure. Thus, better flexing action is obtained as a result of this construction.

Actually the forward edge 46 of the front leaf spring 22 is in advance of the front crossbar 12, and as the latter is well below and in rear of said edge, there is no interference with the action of the spring other than to act as a safety stop under an extreme load.

The rear flanged edge 36 of the rear leaf spring 26 is curved-like and is just in advance of the rear crossbar 12a of the frame. Thus, the rear leaf spring 26 is sufficiently forward of the rear crossbar 12a and at a suitable height relative thereto to flex without metal-to-metal contact. To provide the proper contour for upholstery material or padding (not shown) that may be mounted on the spring structure, the opposite ends of the leaf springs 22 and 26 are rounded as at 47 and 48, respectively.

In Figures 4 to 6, inclusive, I have illustrated a slight modification wherein the frame A' is substantially square-shape in plan and is preferably formed of two channel members 50 and 51, respectively. The member 50 is U-shape in plan and forms the front crossbar 52 and side rails 53 and 54 of the frame, while the member 51 forms the rear crossbar of the frame and is bowed outwardly from one side rail to the other.

55 and 56, respectively, are attaching flanges or extensions projecting forwardly from opposite ends of the bowed portion 51 of the rear crossbar and overlapping and rigidly secured to the side rails 53 and 54 at their rear ends. Preferably the channel members 50 and 51 are formed of relatively light gauge metal and open inwardly. The lower sides 57 and 58, respectively, of the channels 50 and 51 are relatively wide and are engageable with a suitable support (not shown) for the spring structure, while the upper sides 59 and 60 of said members are narrow but adequately stiffen and reinforce said members.

In the present instance, the lower sides 57 and 58 of the channel members are cut away as at 61, 62, 63 and 64, respectively, and the bases 65 and 66, respectively, of the channel members are curved at 67, 68, 69 and 70, respectively, to provide rounded corners. It will also be noted that the rear crossbar 51 is deeper than the front crossbar 52 and side rails 53 and 54. Thus, a comparatively light but sturdy and durable frame is provided.

The seating surface B' is curved both longitudinally and transversely relative to the frame A' and preferably comprises a series of substantially parallel transversely extending elongated leaf springs 71, 72 and 73, respectively. As shown, the springs 71 and 73 are at the front and rear of the frame and are quite wide, while the springs 72 are intermediate the springs 71 and 73 and are relatively narrow. In each instance, the springs are arched upwardly over the frame A' and have their crown portions 74, 75 and 76, respectively, substantially in alignment at approximately the longitudinal median line of the frame. Likewise, in each instance the crown portions 74, 75 and 76 of the springs have upwardly embossed downwardly opening trough-shaped portions 77, 78 and 79, respectively, that extend longitudinally of the arched portions of the springs across the longitudinal median line of the frame and serve to stiffen and reinforce the springs.

The intermediate supporting springs C' are also leaf springs and are preferably inverted substantially L-shaped in configuration. Preferably the upright legs 80 of the springs are rigidly secured at their lower ends to the rails 53 and 54 at spaced points thereof, while the other legs 81 of the L's extend inwardly beneath and constitute supports for opposite ends of the leaf springs 71, 72 and 73, respectively. As shown, the inwardly extending legs 81 oft he L's incline upwardly from the upright legs 80 and are preferably riveted at their inner ends of the leaf springs 71, 72 and 73, respectively. Preferably the spring 71 and adjacent spring 72 are secured to the springs C' at the front end of the frame; two of the springs 72 are secured to the center springs C'; and the spring 73 and adjacent spring 72 are secured to the springs C' at the rear end of the frame.

In order that the seating surface B' will be curved longitudinally of the frame with the lowest part of the curve about midway the ends of the frame, the springs C' at opposite ends of the frame incline toward the center of the frame and are spaced above the lower edges of the side rails 53 and 54, while the springs C' at the center of the frame are secured at a lower elevation so that the lower edges thereof are substantially flush with the lower edges of the rails 53 and 54. Thus, the springs 71 and 73 and adjacent springs 72 incline toward the center of the frame, while the two center springs 72 are at a lower elevation and have opposite ends thereof in a common horizontal plane substantially parallel to the rails 53 and 54.

For reinforcing the narrow leaf springs 72, I have provided supporting or secondary spring leaves D' between the inturned legs 81 of the springs C' and the ends of the springs 72. As shown, these secondary spring leaves D' are similar to those shown in my application Serial No. 338,623 filed June 3, 1940, and serve the same purpose. Such spring leaves D' are held in place by the rivets 82 that secure the springs 72 to the springs C'.

Preferably the wide springs 71 and 73 at the front and rear of the structure overhang the L-shaped spring C' to which they are secured so as to properly support upholstery material or padding therefor (not shown) of a seat construction. Actually the straight forward edge 90 of the leaf spring 71 at the front end of the structure is in advance of the front crossbar 52, and as the latter is well below and in rear of said edge 90, there is no interference with the action of the spring other than to act as a safety stop under an extreme load.

The rear edge 91 of the spring 73 at the rear of the structure is curved like the rear crossbar 51 but terminates short thereof. Thus, the spring 73 is sufficiently forward of the crossbar 51 and at a suitable height relative thereto to flex without metal-to-metal contact.

Preferably the leaf spring 71 is cut on the bias at opposite ends thereof as at 92 and 93, re-

spectively, so that upholstery material will not be cut thereby during the flexing movement of the spring structure. This arrangement also increases the freedom of movement of the L-shaped springs C' at the forward end of the structure.

To provide the proper contour for upholstery material, the opposite ends of the spring 71 at the forward end of the structure are rounded at 94 and 95, respectively.

In Figure 7 I have illustrated another modification wherein two auxiliary crossbars such as 100 are used in the frame construction. Preferably such bars are located in vertical alignment with openings 101 between the springs 71, 72 and 73 so there will be no metal-to-metal contact between such springs and the auxiliary crossbars when the structure is subjected to a normal load. However, under an extreme load the upholstery material or padding therefor on the springs 71, 72 and 73 would rest upon the auxiliary crossbars 100 which, in such instance, would serve as a safety or limiting stop.

In Figure 8 I have illustrated another modification wherein a wire 110 of relatively heavy gauge is employed at the forward edge of the spring structure for engagement with the upholstery material or padding therefor (not shown) when it is placed upon the spring structure. The wire has a portion 111 extending transversely across the structure in advance of the forward L-shaped springs C' to which they are secured so versely extending connecting leaf springs 112 and 113, and is provided at opposite sides of the structure with open return-bends 114 and 115 that extend rearwardly to and are disposed upon the leaf spring 113. For holding the wire 110, there is a metal strip 116 at the longitudinal median line of the structure terminally secured to the leaf spring 113 and to the portion 111 of the wire. Preferably this strip 116 extends beneath the leaf spring 113 and over the leaf spring 112 and is provided intermediate its ends with a longitudinally extending substantially trough-shaped embossed portion 117 to stiffen and reinforce the same.

Many other adaptations of my invention may be made. For example, the inverted L-shape leaf springs of the type illustrated herein could be used at the rear of a seat, for example, at the rear of an automobile seat, wherein springs of other configuration, for example, C-shape of the type illustrated in my application Serial No. 338,623, aforesaid, may be employed at the front thereof for supporting intermediate or connecting longitudinally extending leaf springs instead of transversely extending springs such as 22 to 26, inclusive. In fact, the L-shaped springs may be used on either or both sides or at either or both front and rear portions of any supporting seat frame structure, for the purposes herein set forth. Also, this idea could be embodied in a bed spring structure if desired.

Thus, from the foregoing, it will be apparent that each spring structure has a saddle effect. Under a load the transversely extending leaf springs will flex at opposite ends of the embossed portions thereof, while the L-shaped springs will flex inwardly and downwardly relative to the side rails of the supporting frame. The embossed portions of the leaf springs serve to stiffen and reinforce the structure so that it will properly support and cushion the load. Such embossed portions do not necessarily prevent all flexing of the springs at said embossed portions. In some instances, the embossed portions are shallow enough so that there is appreciable flexing at such points. The embossed portions do, however, control this flexing movement. As a result, the maximum comfort is afforded by the spring structure.

What I claim as my invention is:

1. A spring structure having a frame, and a seating surface yieldably supported upon said frame and curved longitudinally relative to said frame, said seating surface consisting of a series of spaced transversely extending leaf springs, some of said leaf springs being arched, adjacent springs at opposite ends of the frame being inclined toward the center of the structure.

2. A spring structure having a frame, and a seating surface yieldably supported upon said frame and curved transversely relative to said frame, said seating surface consisting of a series of spaced transversely extending leaf springs, some of said leaf springs being arched, the leaf springs at opposite ends of the structure being wider than the intermediate springs, one of said wide springs having a marginal downturned stiffening flange.

3. A spring structure having a frame, and a seating surface yieldably supported upon said frame and curved both longitudinally and transversely relative to said frame, said seating surface consisting of a series of spaced transversely extending leaf springs, some of said leaf springs being arched, the leaf springs at opposite ends of the structure being wider than the intermediate springs, the wide spring at the forward end of the structure overhanging the front portion of the frame.

4. A spring structure having a frame, and a seating surface yieldably supported upon said frame and curved both longitudinally and transversely relative to said frame, said seating surface consisting of a series of spaced transversely extending leaf springs, some of said leaf springs being arched, the leaf springs at opposite ends of the structure being wider than the intermediate springs, one of said wide springs being cut on a bias at opposite ends thereof.

5. A spring structure having a frame, and a curved seating surface yieldably supported upon said frame, said seating surface consisting of a series of spaced transversely extending leaf springs, some of said leaf springs being arched, the leaf springs at opposite ends of the structure being wider than the intermediate springs, one of said wide springs having rounded ends.

6. An all-metal seat spring structure having a seating surface curved both transversely and longitudinally to provide a saddle effect, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the transversely extending springs at the front and rear of the structure being wider than the transversely extending springs therebetween, the transversely extending spring at the front of the structure and the transversely extending spring next adjacent thereto being arched and having their crown portions substantially in alignment at approximately the longitudinal median line of the frame, the transversely extending spring at the rear of the structure having a depressed portion substantially in alignment with the crown portions just mentioned, the intermediate supporting springs being inverted substantially L-shaped leaf springs and constituting the sole supporting

means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to opposite sides of the base frame and the horizontal legs of the L's being secured in surface-to-surface relation to the transversely extending leaf springs at opposite ends thereof.

7. An all-metal seat spring structure having a seating surface, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the transversely extending spring at the front of the structure and the transversely extending spring next adjacent thereto being arched and having their crown portions substantially in alignment at approximately the longitudinal median line of the frame, the transversely extending spring at the rear of the structure having a depressed portion substantially in alignment with the crown portions just mentioned, the intermediate supporting springs being inverted substantially L-shaped leaf springs and constituting the sole supporting means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to opposite sides of the base frame and the horizontal legs of the L's being secured in surface-to-surface relation to the transversely extending leaf springs at opposite ends thereof.

8. An all-metal seat spring structure having a seating surface, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the intermediate supporting springs being inverted L-shaped leaf springs and constituting the sole supporting means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to opposite sides of the base frame and the horizontal legs of the L's being secured in surface-to-surface relation to the transversely extending leaf springs at opposite ends thereof, the transversely extending leaf springs at the front and rear of the structure projecting outwardly beyond and overhanging the outer edges of their supporting L-shaped springs and being cut away over the horizontal portions of the L-shaped springs to afford clearance between portions of said transversely extending springs and said L-shaped springs so that the latter will have freedom of movement during the flexing action of the spring structure.

9. An all-metal seat spring structure having a seating surface, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the intermediate supporting springs being inverted L-shaped leaf springs and constituting the sole supporting means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to opposite sides of the base frame and the horizontal legs of the L's being secured in surface-to-surface relation to the transversely extending leaf springs at opposite ends thereof, the transversely extending leaf spring at the front of the structure projecting outwardly beyond and overhanging the forward edges of its supporting L-shaped springs and being cut on the bias at opposite ends thereof so that upholstery material placed upon the structure will not be cut by said transversely extending leaf spring and the L-shaped springs supporting said transversely extending spring will have greater freedom of movement during the flexing movement of the spring structure.

10. An all-metal spring structure having a frame, a transversely arched yieldable seating surface above the frame, and inverted L-shaped leaf springs carried by the frame and constituting the sole support for said seating surface, the yieldable surface at opposite ends of the structure being separate leaf springs inclined toward the center thereof so that opposite ends of the seating surface are higher than the center portion thereof.

11. A seat spring structure having a seating surface curved both transversely and longitudinally to provide a saddle effect, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the transversely extending spring at the front of the structure and the transversely extending spring next adjacent thereto being arched and having their crown portions substantially in alignment at approximately the longitudinal median line of the frame, the transversely extending spring at the rear of the structure having a depressed portion substantially in alignment with the crown portions just mentioned, the intermediate supporting springs being inverted substantially L-shaped leaf springs and constituting the sole supporting means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to the base frame at opposite sides thereof, and the horizontal legs of the L's being secured to the transversely extending leaf springs at opposite ends thereof.

12. An all-metal seat spring structure having a seating surface, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of substantially parallel transversely extending elongated leaf springs, the transversely extending spring at the front of the structure and the transversely extending spring next adjacent thereto being arched and having their crown portions substantially in alignment at approximately the longitudinal median line of the frame, the intermediate supporting springs being inverted substantially L-shaped leaf springs and constituting the sole supporting means for the transversely extending springs forming said seating surface, the upright legs of the L's being secured to opposite sides of the base frame and the horizontal legs of the L's being secured in surface-to-surface relation to the transversely extending leaf springs at opposite ends thereof.

13. A seat spring structure having a seating surface, a rigid base frame, and intermediate supporting springs, the seating surface consisting of a series of spaced transversely extending elongated leaf springs, some of said transversely extending springs being arched, the intermediate supporting springs being inverted substantially L-shaped leaf springs, the upright portions of the L's being secured to the base frame at opposite sides thereof, the horizontal portions of the L's extending inwardly over the frame and being secured to the transversely extending springs at opposite ends thereof, the transversely extending leaf springs at opposite ends of the structure being wider than the other transversely extending springs, at least one of said wider leaf springs projecting outwardly beyond and freely overhanging the outer edges of the horizontal portions of its supporting springs.

14. A seat spring structure having a rigid base frame, inverted substantially L-shaped leaf springs having the upright portions thereof secured to the base frame at opposite sides thereof, the horizontal portions of the L-shaped springs extending inwardly over said base frame, and transversely extending leaf springs spanning the space between and terminally secured to the horizontal portions of said L-shaped springs, the transversely extending spring at the front of the structure and the transversely extending spring next adjacent thereto being arched and having their crown portions substantially in alignment at approximately the longitudinal median line of the frame, the transversely extending spring at the rear of the structure having a depressed portion substantially in alignment with the crown portions just mentioned.

15. A seat spring structure having a rigid base frame, inverted substantially L-shaped leaf springs having the upright portions thereof secured to the base frame at opposite sides thereof, the horizontal portions of the L-shaped springs extending inwardly over said base frame, and transversely extending leaf springs spanning the space between and terminally secured to the horizontal portions of said L-shaped springs, the transversely extending leaf spring at the front of the structure being arched and having its crown portion at approximately the longitudinal median line of the frame, the forward portion of said transversely extending spring at the front of the structure projecting forwardly beyond and overhanging the horizontal portions of the foremost L-shaped springs, said forward overhanging portion being movable freely relative to said foremost L-shaped springs.

16. A seat spring structure having a rigid base frame, inverted substantially L-shaped leaf springs having the upright portions thereof secured to the base frame at opposite sides thereof, the horizontal portions of the L-shaped springs extending inwardly over said base frame, and transversely extending leaf springs spanning the space between and terminally secured to the horizontal portions of said L-shaped springs, the transversely extending leaf spring at the front of the structure being wider than adjacent transversely extending springs and projecting forwardly beyond and overhanging the horizontal portions of the foremost L-shaped springs, the overhanging portion of the transversely extending spring at the front of the structure being free to flex relative to said foremost L-shaped springs.

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