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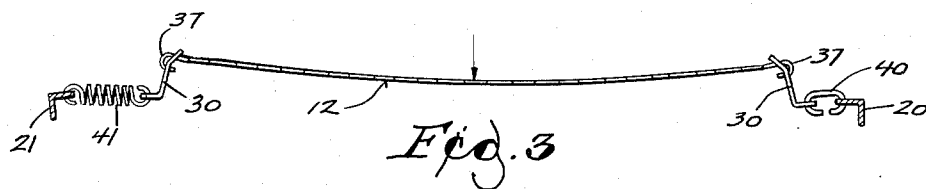
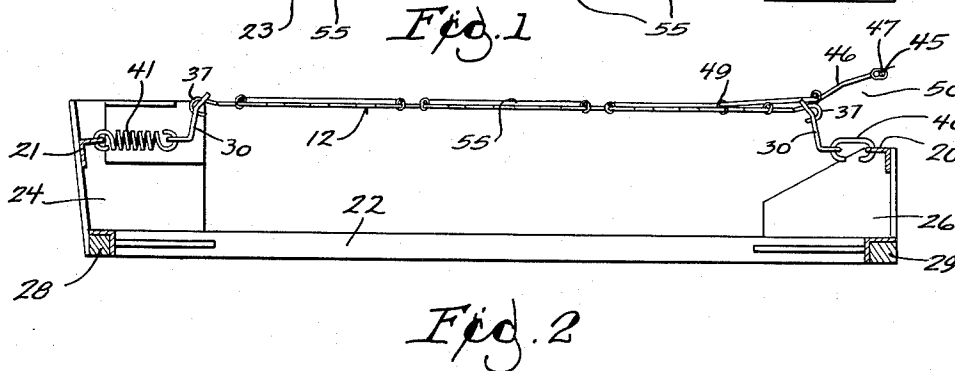
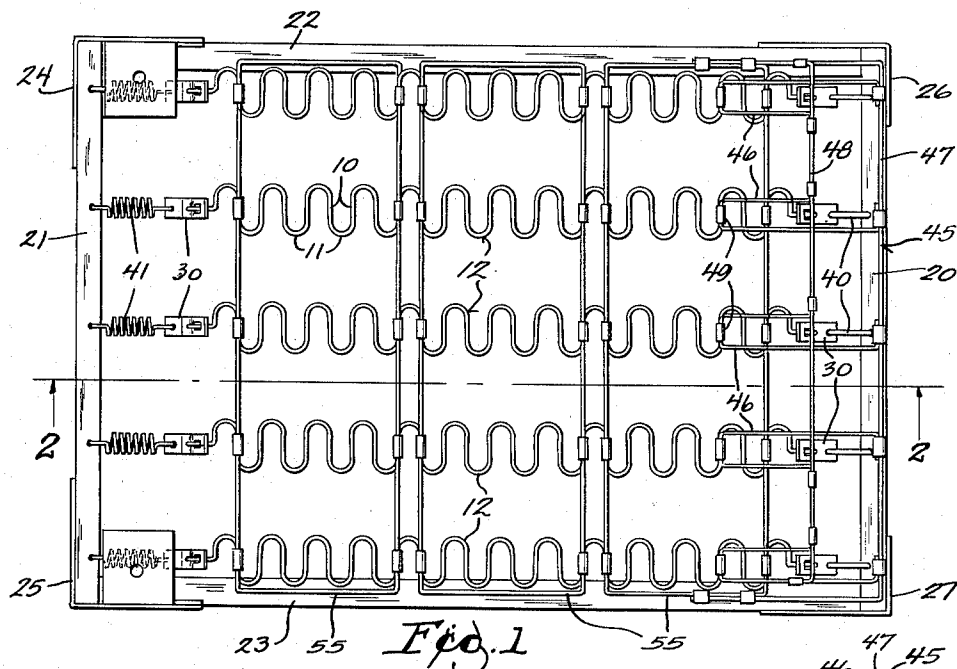
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2,958,375

PRESTRESSED SPRING SEATING

Filed Feb. 3, 1958

2 Sheets-Sheet 1



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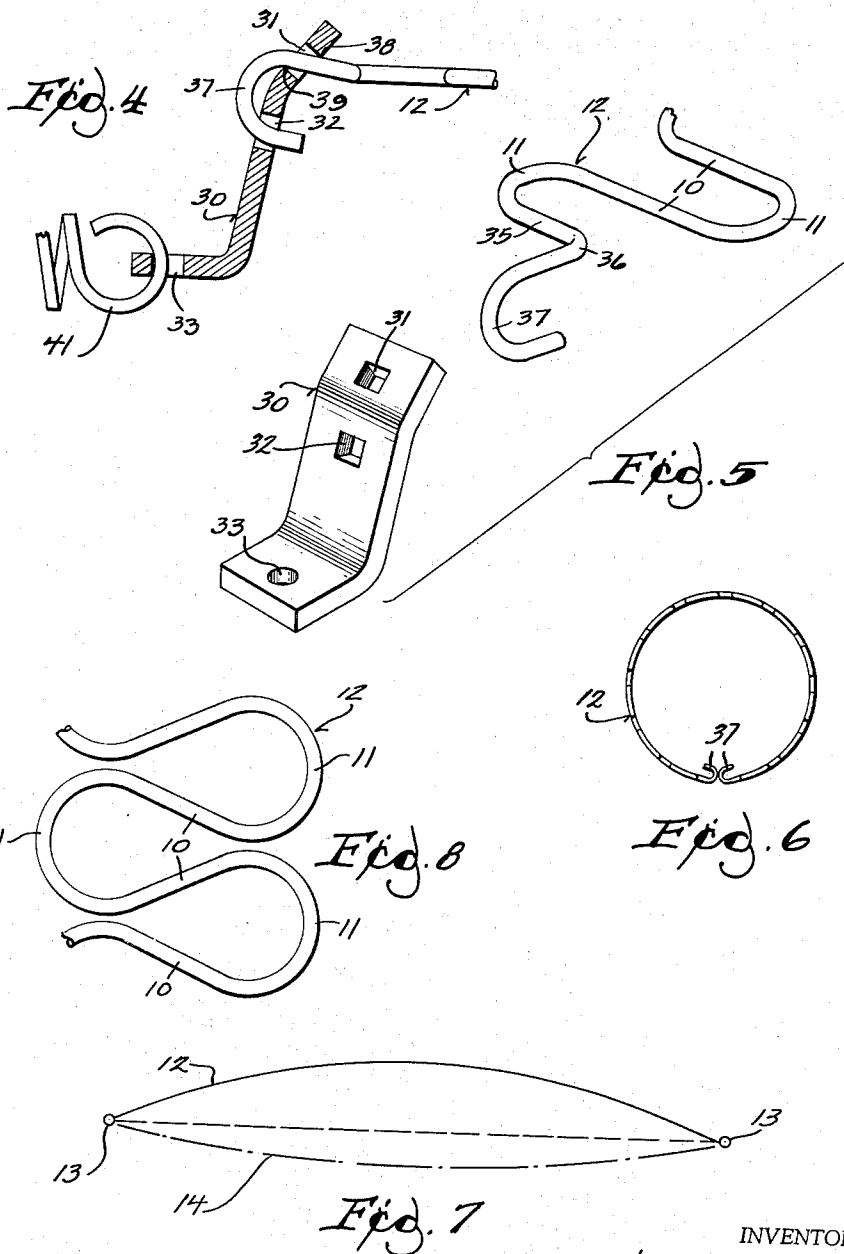
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2 Sheets-Sheet 2



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PRESTRESSED SPRING SEATING

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9 Claims. (Cl. 155—179)

This invention relates to improvements in prestressed spring seating.

Chair bottoms and the spring seating support for cushions in furniture such as chairs, settees, davenports and the like have in recent years used so-called zigzag springs of the type disclosed in U.S. Letters Patent to Kadin reissue 21,263 dated November 14, 1939. The instant invention relates to the prestressing of a zigzag spring in a spring bottom and also to the provision of a special prestressing lever which I use to terminally connect a zigzag spring in prestressed condition across, and between the frame members, of a chair or other furniture.

Objects of the invention include the proper prestress mounting of a zigzag spring; the provision of a prestress lever for attaching the terminal portions of zigzag spring to chair bottom supports; balanced tension and torsion prestress mounting of zigzag springs; and "soft front" protection of a prestress lever in an array of zigzag springs mounted in accord with this invention.

In the drawings:

Fig. 1 is a plan view of a chair bottom embodying this invention.

Fig. 2 is a cross sectional view on line 2—2 of Fig. 1.

Fig. 3 is a view of the zigzag spring and its prestress levers and supports showing the effect of a load upon the assembly.

Fig. 4 is an enlarged fragmentary view partially in cross section showing the relationship of a terminal portion of a zigzag spring band with a prestress lever and a helical tension spring connector.

Fig. 5 is an enlarged perspective exploded view of a prestress lever and the terminal portion of a zigzag spring band to be connected therewith.

Fig. 6 is a side elevation showing a zigzag spring band in unstressed position.

Fig. 7 is a diagrammatic view showing arched position of prior art zigzag springs and dotted line indication of a spring band when loaded.

Fig. 8 is a diagrammatic view showing a portion of the zigzag spring band of Fig. 7 under load.

The zigzag spring band referred to above is shown most clearly in Figs. 1, 5, 6 and 8. It is made up of a multiple of approximately parallel reaches 10 of spring material such as wire. At each end of one of these reaches 10, the reach merges into an approximately semicircular portion 11, which in turn merges into another parallel reach, and the dimensions are such that the succession of reaches and semicircular bands form a long band 12 which, in repose, unstressed, takes a characteristic position shown in Fig. 6.

Heretofore springs of this type have usually been anchored fixedly at each end thereof as shown at 13 in Fig. 7 with the band 12 arched upwardly between the anchored ends. When a load has been placed upon a zigzag spring so anchored at the ends of the band, it is obvious that as the arch of the spring is flattened, the respective reaches 10 will not only respond to torque by

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rotation upon the longitudinal axis of each reach, but also, since the arch is being flattened and the length of the band is shortened, the respective reaches will no longer be parallel with one another as the semicircular bends 11 are flexed (see Fig. 8). This means that as the band 12 assumes a flat arc between the anchorages 13, a maximum amount of "compressive" stress has been placed upon the semicircular portions 11 of the band and as the band moves on down into the position shown in dotted lines at 14 in Fig. 7, the spring action of the curved portions 11 is relieved to permit of the elongation of the band which the arc 14 requires. Thus while it is true that the flexing of the band 12 from the position shown in full lines in Fig. 7 to the position shown at 14 involves a continual increase in the torsional stresses upon each of the reaches 10, the load is assisted in overcoming the torsional strength of the reaches 10 by opposing spring action and the relieving of stress in the semicircular portions of the band. It may be said of this type of zigzag spring mounting that after the load has forced the spring past the horizontal arc shown in Fig. 7, the spring is fighting itself. One of the benefits derived from the instant invention is the correction of the objectionable features of a zigzag spring band mounting such as that which has just been described.

In accord with the instant invention, a frame for a chair bottom is shown in the drawings as an environment for the array of zigzag spring bands adequate to support a person in sitting position. Such environment includes a forward frame member 20, such as an angle iron, and a rearward frame member 21 of similar construction. Side members of any construction such as 22 and 23 may be used to separate the angle irons 20 and 21, and a set of corner pieces 24, 25, 26 and 27 secured to the side members 22 and 23 and secured to the angle irons 20 and 21 completes the chair bottom except that appropriate cross pieces 28 and 29 are used as members to which legs (not shown) may be attached.

The important consideration is that angle irons 20 and 21 are rigidly and fixedly supported as anchorages between which the array of zigzag spring bands, prestress levers, helical springs, soft front springs and anchorage clips are connected and supported as will now be described.

Probably one of the most important mechanical elements in this invention is the prestress lever 30 shown most clearly in Figs. 4 and 5. It is a substantially rigid, somewhat L shaped member preferably made of metal since the stresses to which it is subjected in use are quite great. Near one end there are two spaced apertures 31 and 32 to provide for a connection to the band 12 of a zigzag spring. Near the other end of the prestress lever is an aperture 33, through which some form of connection may be inserted so that the prestress lever may be connected to one of the frame members, either the forward or the rearward frame member 20 or 21.

To facilitate connection of prestress lever 30 with the band 12, the terminal reach 35 of a band is bent at 36 approximately midway of its length and then twisted to provide a terminal hook 37 as shown clearly in Fig. 5. This terminal hook is receivable through the apertures 31 and 32 in the position shown in Fig. 4. Here it will be seen that the margin of aperture 31 at 38 and the margin at 39 bear upon the terminal 37 of the band in such a way that a pull upon the prestress lever at 33 will place torsional stress at 35 adequate to force band 12 toward a flat arc as shown in Fig. 2, it being understood that the portion of the terminal 37 extending through aperture 32 tends to keep the band in the position shown in the drawings in that the band is not permitted to tip.

It may be said of the prestress lever that it is connected

to the zigzag band so as to position the lever approximately as a radius of the relaxed band (Fig. 6).

As shown in the drawings, several means may be provided for attaching prestress lever 30 to the angle iron 20 or 21. In Fig. 2 it will be seen that an ordinary "C" link 40 may be hooked through an aperture in the angle iron 20 and may be hooked through the aperture 33 in the prestress lever, it being noteworthy that the prestress lever extends upwardly from the link 40 to the band 12. As shown in the drawings, the other end of the band 12 is hooked to angle iron 21 by means of a helical tension spring 41.

The length of the prestress lever 30 and the tension provided by helical spring 41 in relation to the spring characteristics of band 12 is such that when the assembly is set up as shown in Figs. 1, 2 and 3, the band 12 is disposed in flat arc between the upper ends of the respective prestress levers; the reaches 10 of the band 12 are parallel; and without a load, in the sense that no one is sitting upon this chair bottom, the tension spring 41 is only slightly extended from its relaxed position.

When a load is placed upon a band 12 or group of bands mounted as just described, these bands are depressed so that they not only must elongate, but to the extent to which the terminal hooks 37 change angle with respect to their attitude relating to angle irons 20 or 21, they and the prestress lever will be thrust somewhat downwardly and the angular attitude of the helical tension spring 41 will continue to apply leverage at 35, 36 and 37 to distribute torsional stresses upon each of the reaches 10 throughout the length of the band. Also, the curved portions 11 of the band will be "opened" in the sense that they will become slightly less than a full semicircle while the reaches 10 will be increasingly divergent from one another away from their relaxed parallel relation.

Reference has already been made to the fact that the placing of a load upon the assembled spring and anchorage elements thus far described tends to swing the prestress levers bodily downwardly. Since the load in a chair bottom very often is disposed quite forwardly of the center and there is a tendency to depress the assembly in the region of the prestress levers 30 along the forward part of the chair bottom, there is great activity which may be detrimental to any upholstery materials in the region just rearwardly of the angle iron 20. Therefore, there is provided along the forward margin of this chair bottom a spring front 45 made up of spring wire, levers 46 shaped as shown most clearly in Fig. 1, where it will be seen that the spring front 45 including forward wires 47 and intermediate wires 48 are held upwardly and outwardly by the spring wire levers 46 which are J shaped in configuration and have the loop of the J secured to a reach 10 somewhat inwardly of the front at 49. Special clips are provided for this purpose in a manner well known in this art. Thus the front wire 47 and the intermediate wire 48 overlie the parts 20, 30 and 40 in spaced relation and create somewhat of a tunnel at 50 allowing wide range of movement without allowing any opportunity for upholstery materials to come in contact with the various parts which are in articulate relation to each other.

The complete chair bottom is made up of as many bands 12 as may be needed to provide a complete array for satisfactory support of cushions or other upholstery elements arranged upon them, and as is somewhat customary in the arrangement of zigzag springs, a set of spring wire frames 55 is clipped in position to tend to force the respective bands 12 to conform somewhat to the movement in response to a load.

In making up a chair bottom utilizing the above described elements, a frame having structurally strong support for forward and rearward angle irons 20 and 21 respectively provides an open area to be spanned by an array of bands 12. Each band 12 is provided with terminal hooks 37 at either end thereof and to each of

these terminal hooks is applied a prestress lever 30 as shown most clearly in Fig. 4. Through the aperture 33 in what is to become the lower end of prestress lever 30, a link 40 or a helical spring 41 is attached. With the help of the two prestress levers 30, the band 12, therefore in repose in the form of a circle as shown in Fig. 6, may then be placed in position as shown in Fig. 2. This is done by hooking a link 40 through one of many apertures in the angle iron 20 and by hooking helical spring 41 (or another link 40) through apertures in angle iron 21 at the rear of the frame. To arrive at a successful assembly of a band, prestress lever 30 and these connected elements, the band must be placed under prestress as applied by the levers in the position shown in Fig. 2, and, of course, a helical tension spring at 41 will be somewhat stressed (elongated) so that the leverage exerted by prestress lever 30 will bring the band 12 to a horizontal (flat) arc. Then the several wire frames 55 are applied to the several or many bands 12 which have been stretched between the angle irons 20 and 21 and the clips are attached to relatively loosely bond the frames 55 to the adjacent reaches 10 as shown.

Front assembly 45 is then receivable upon and attachable to the forward part of the array of bands 12 as shown particularly in Fig. 1, whereupon cushions or other upholstery may be applied to the chair bottom.

When a load is applied to the complete assembly as described above, it will have the effect shown in dotted lines at 14 in Fig. 7. If a softer action is desired at the front, the C link 40 may be replaced by a tension helical coil such as the one shown at 41, but because the quickness of response to load is obtained by the many torsion reaches 10 and spring curves 11 related to the articulate motion of the parts adjacent the angle irons 20 or 21, it will often be found that helical springs 41 are not necessary and that links 40 are satisfactory at both the forward ends and the rearward ends of the bands. Furthermore, it will be understood that empirical determination of the length of the levers 30 may be necessary with the particular gauge of wire of which the band 12 may be made.

I claim:

1. A spring bottom comprising zigzag spring bands each of which, in unstressed condition, has a multiple of short approximately parallel reaches each connected at its opposite ends to different adjacent parallel reaches by approximately semicircular reaches to provide a zigzag band approximately circular in repose, said bottom having spaced structural members to and between which the springs are attached in approximately flat arc configuration with the semicircular reaches in substantially unstressed condition, said attachment comprising, prestressing members including at each end of a zigzag band a link providing articulate connection and, at least at one end of said spring comprising a rigid prestressing lever secured to the spring in a spring prestressing position pulling the band in a minimum linear tension between the structural members and torsionally flexing the parallel reaches in a preloading direction whereby the band assumes a flat arc.

2. For a zigzag spring normally relaxed in a circular band, a spring mount including frame members spaced from one another to resist forces tending to pull them toward each other, one end of said band being secured to one of said frame members and the other end being provided with a lever rigidly extending laterally of the band in a direction approximately corresponding to a radius of said relaxed band, a portion of said lever spaced from the band being secured to the other of said spaced frame members, and the length of the band being such that the band is in tension adequate to force the band downwardly out of its relaxed circular configuration into a flat arc when unloaded.

3. A spring assembly positioned to span a space within a frame, said assembly including a zigzag spring

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band having parallel torsion reaches joined by semi-circular tension compression portions, a prestress lever positioned to provide articulate connection between the frame and one end of the band but rigidly connected to the band, said lever extending downwardly from the end of the band and being provided at a point below said end of the band with a connection shaped to provide an articulate connection to said frame whereby upon placing of a load upon the spring band the lever tends to place the torsion reaches under greater torsional stress, and a connection between the frame and the other end of the band.

4. The assembly of claim 3 wherein the articulate connection includes a tensioned helical spring between the lever and the frame.

5. A furniture spring and mounting, a zigzag spring band having a normally upwardly arched curvature between its ends in its unstressed condition; anchorage members spaced apart a greater distance than the distance between said unstressed band ends; means articulately securing said ends respectively to said anchorage members; said means as to one of said ends including, intermediate said last mentioned end and its anchorage member, a prestress lever relatively rigidly secured to said end and having an extended portion of thereof offset from the secured portion and connected to one of said anchorage members in such a manner as to straighten the arc of said curvature and thereby place said spring under initial stress.

6. The furniture spring and mounting of claim 5 wherein a complete seat bottom includes an array of said zigzag spring bands and certain of said levers are connected to an anchorage member by means of helical tension springs.

7. The furniture spring and mounting of claim 5 wherein the portion of the zigzag band adjacent the lever is provided with a spring front comprising a J lever secured to the zigzag spring in position to overlie the prestress lever.

8. A spring bottom comprising a spring of zigzag spring wire forming a band of normally circular configuration in unstressed condition but in a chair bottom being prestressed downwardly to approximately flat arc configuration, a chair bottom support provided with spaced fixed frame members between which said band is extended, and a rigid prestress lever rigidly connected at one end thereof to one end of said band whereby to provide at the other end of said lever at a point substantially offset from alignment with said flat arc a point of leverage attachment to one of said frame members, means for attaching said lever to said frame member at said point of attachment, the other end of said band being attached to another of said frame members, and the direction of said offset being such as to tend to downwardly press the spring band.

9. A zigzag spring having parallel torsion reaches and approximately semicircular reaches connecting said torsion reaches at alternate ends, said reaches in relaxed position being so disposed as to provide a flat band upwardly arched into substantially circular repose, an end of said zigzag spring having a lever rigidly disposed laterally of the band in a direction toward a radius of the relaxed band and said lever having an anchorage connection spaced from the band, said band being pulled into flat arc load bearing position between anchorage members and secured in said load bearing position by attachment of one end of the band to one of said anchorage members and connection of the lever at said anchorage connection to another of said anchorage members.

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