

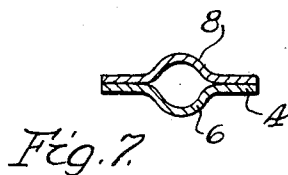
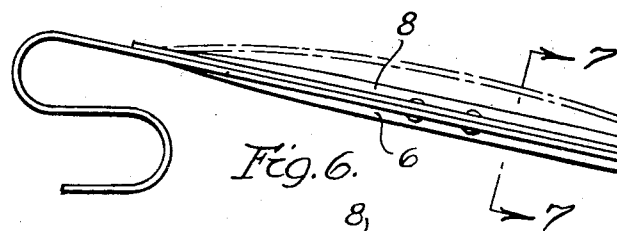
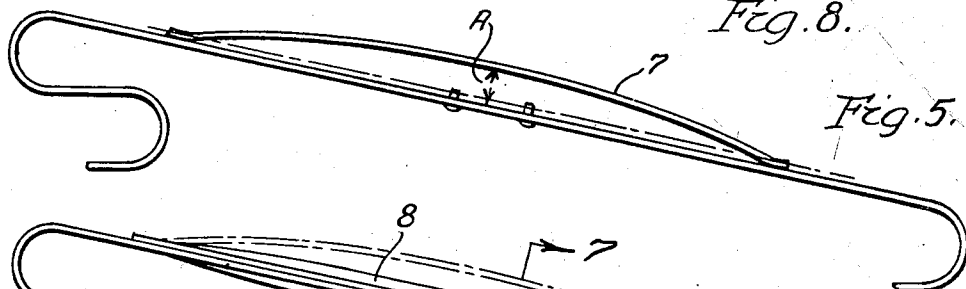
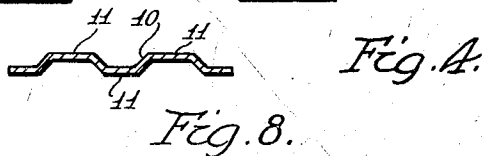
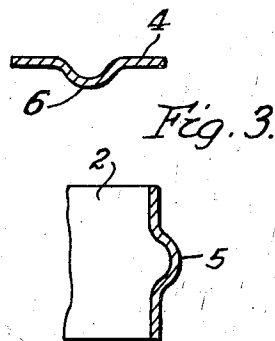
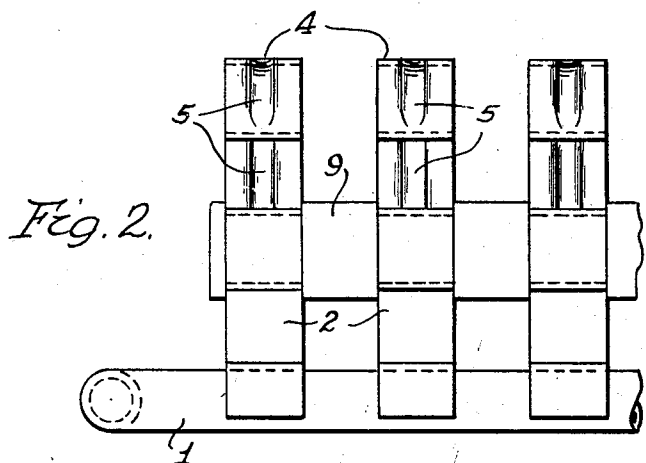
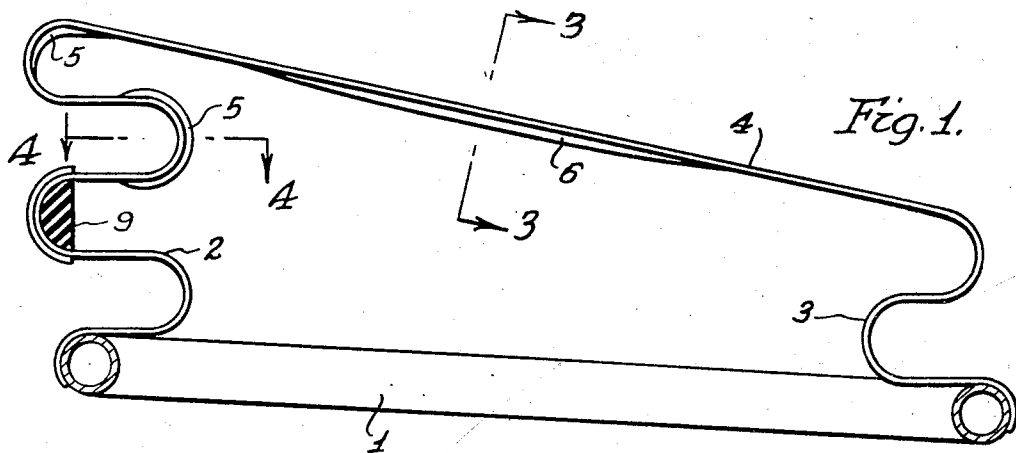
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K. K. PROBST

2,202,301

LEAF SPRING CONSTRUCTION

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2,202,301

LEAF SPRING CONSTRUCTION

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Application November 28, 1938, Serial No. 242,684

8 Claims. (Cl. 267—1)

This invention relates to leaf springs of the type particularly suitable in seat cushions and the like and has for its object to provide a spring which will give improved riding comfort at lower cost. This application is a continuation in part of my application Serial No. 237,596, filed October 29, 1938.

Among the important considerations in the design of a seat cushion and the springs therefor are the following: the cushion must deflect a substantial amount under the static loading of an occupant in order to give the sensation of softness; it must deflect substantially whether the occupant be a small, light weight person or a large, heavy person; it must not bottom under expected road shocks; it must be sufficiently soft for comfort during short occupancy and it must, at the same time be sufficiently stiff to be restful after a long period of occupancy; it must be substantially form fitting to an occupant and at the same time sufficiently stable to withstand pressures imposed by entire leg weight on the forward edge or pressures imposed during braking, both of which tend to roll the top of the cushion forwardly; it must have low rebound and damping characteristics; and, if it is to be built at lower cost, it must be of lighter weight. An object of the present invention is to provide a leaf spring construction for use as the springing medium for a seat cushion which will have all of these characteristics.

More particularly, it is an object to provide a leaf spring construction in which the stresses are controllable and which, therefore, can be made to conform to given set of deflections with the stresses therein equalized or coordinated with said deflections. It has been found that, without special design, portions of the length of the springs are materially understressed and that by thus equalizing the stresses a material saving in weight results. As will be hereinafter more fully explained, the front loops, the rear loop and the intermediate or bridge portion may each be altered in such manner as to change the stresses therein in order to give the effect of localized stiffness without requiring a change in the thickness of stock which would adversely affect the saving in weight thus effected.

Another object is to provide a leaf spring having an increasing rate or load deflection ratio in order to obtain initial softness with low frequency and increasing stiffness under loading without undue increase in frequency.

A further object is to provide damping,—that is, a reduction in the number of oscillations fol-

lowing a deflection, and to do this a predetermined extent and with a recognition of the above stated principles of maximum stressing of all the metal. More particularly, it is an object to employ one or more auxiliary leaves at the bridge section which, together with the bridge section, will deflect in accordance with a given load deflection curve and which will also damp the spring action to the extent desired. Damping can be controlled by alteration of any of its factors which may be described as follows: original camber between the main and auxiliary leaves before attachment together; the ratio of the length of the auxiliary to the main leaf; the pressure between the two leaves, particularly at the ends of the auxiliary leaf; and the coefficient of friction between the contacting surfaces. It is noted, in passing, that the damping can be substantially altered without altering the frequency of the spring.

Another object is to provide a seat cushion employing a plurality of leaf springs each anchored at each end to the frame of the cushion but each capable of springing movements independently of each other both vertically and torsionally in combination with spacer means capable of restoring the leaves to their original positions. A need for such means is apparent where the springs have been subjected to torsion because of the large amount of friction between the spring edges and the padding thereabove. This object entails the provision of a spacer means capable of restoring the springs to their original position without materially interfering with their independence of deflecting movements.

Other objects and advantages will become hereinafter more fully apparent as reference is had to the accompanying drawing in which my invention is illustrated and in which:

Fig. 1 is a side elevation of a spring constructed according to a part of my invention and mounted on a frame which is shown in section,

Fig. 2 is a front elevation of the assembly of Fig. 1,

Figs. 3 and 4 are details taken along the lines 3—3 and 4—4 respectively of Fig. 1,

Fig. 5 is a view of a spring similar to that of Fig. 1 without the ribbing and with an auxiliary leaf ready for attachment thereto,

Fig. 6 is a view similar to Fig. 5 with the parts secured and with the parts ribbed as shown in Fig. 1,

Fig. 7 is a detail section taken along the line 7—7 of Fig. 6, and

Fig. 8 is a section illustrating modified ribbing.

More particularly, 1 indicates a seat cushion frame which may be of tubular or other form and which supports a plurality of leaf springs of the type generally described in my said application Serial No. 237,596. The springs extend in the direction of gaze of an occupant and are composed of two multiple loop end portions 2 and 3 connected by a central bridge portion 4. The front end 2 has a larger number of loops than the rear end in order to provide additional softness and the loops of the front end are so placed and arranged that there is a decided tendency of the front end of the spring to roll-rearwardly under vertical or braking loads.

The first structural object previously described is to equalize the stresses in the spring. It has been found that the top loops of the front end, when designed according to the proportions illustrated, deflects substantially more than the lowermost loop. In order to equalize the stresses in these loops, therefore, I have found that it is possible to stiffen these top loops by ribbing as illustrated at 5 as can be done during the rolling of the strip stock from which the spring is made, with little or no increase in cost. The front end 2 as a whole is thus stiffened to a greater extent than is desired so that thinner, and hence lighter and cheaper, stock may be used.

In addition, the long length of the bridge portion 4 is too flexible if of uniform thickness with the ends when the weight is decreased as above described and will not conform to recognized deflection requirements. This portion may also be stiffened by forming a groove or channel 6 therein, in the general manner of the groove or channel 5. It is recognized that this groove may be altered in depth, as by tapering in both directions from any point, as illustrated, in order to make the spring conform to body shape. The rear loops 3 may also be grooved, if desired, but it is not desirable in the construction which I contemplate in which the bottom of the back cushion (not shown) resides thereabove and prevents direct vertical loading thereon. The grooving 5 and 6 may be carried to the extent that the stresses will be equalized throughout the length of the spring as nearly as possible and formed to comply with conventional deflection requirements.

In order to improve over conventional requirements by the introduction of a changing spring rate and damping, one or more auxiliary leaf 7 is provided for attachment to the bridge portion 4. This leaf has substantial initial camber with respect to the portion 4, as indicated at A in Fig. 5 in order to provide substantial pressure at its ends with the portion 4 when secured thereto; it also has substantial length thereby increasing the distance of rubbing action; and the surfaces expected to be subjected to the greatest rubbing action,—that is, those adjacent the outer end of the spring are fabricated to give the desired coefficient of friction. For instance, these surfaces may be used without treatment, or they may be plated with cadmium or other plating metals or a thin sheet of material such as fiber or rubber may be inserted. This principle of damping may be employed without the ribs 5 and/or 6, but their joint use is highly recommended.

Where the auxiliary leaf or leaves and the ribs are both employed, as illustrated in Fig. 6, it will be understood that the auxiliary leaf will not only damp as above described but that it will also

stiffen the bridge so that the rib 6 of the bridge should be decreased accordingly. It will be found that very light stock may be used in the auxiliary leaf if it is ridged as indicated at 8.

The several springs are anchored to the frame 1 in mutually spaced relation, as indicated in Fig. 2. It will be understood that padding and upholstery is to be added. In order that the springs may act independently of each other according to their predetermined and desired manner of deflection, it is necessary that a spacing means be provided as otherwise they will lose their correct relative positions. I, therefore, employ a connection therebetween, preferably capable of substantial elasticity. As illustrated, this connection is in the form of a bar 9 of rubber or equivalent material, notched at intervals the width of a spring and surface bonded or otherwise secured thereto. This bar 9 may be suitably, although not necessarily, placed inside the intermediate loop of the front end 2. The main consideration is that a means be provided to act as a restoring force to return the springs to original position after occupancy of the seat, without interfering with the deflecting characteristics thereof to an extent greater than is actually necessary.

Fig. 8 shows a cross-section of a spring 10 which is a modified form of the spring 4 or of the spring 7. It is ridged at 11 in such manner that the areas on each side of the neutral axis are equal and in such manner that the distance from the neutral axis to the outermost fibres on one side thereof is equal in order to subject the entire cross-section to equal stresses.

What is claimed is:

1. The combination of a plurality of parallel leaf springs each terminating in multiple loop ends, frame members supporting said springs, and elastic means interposed between each of said springs and the adjacent springs constituting means for restoring said springs to mutually parallel relation after a displacement thereof.

2. The combination of a plurality of parallel leaf springs each terminating in multiple loop ends, frame members supporting said springs, each of said springs being capable of substantial deflection substantially independently of the remainder thereof, and elastic means connecting one end of each spring to the next adjacent spring to constitute a restoring means in the event of lateral displacement of any thereof.

3. The combination of a plurality of leaf springs each terminating at each end in multiple loop formations, frame members supporting said springs in mutually parallel relation, damping means active against that portion of each of said springs intermediate its ends, and elastic means separating said springs and constituting means for restoring each thereof to its mutually parallel relation after a lateral displacement thereof.

4. The combination of a plurality of leaf springs each terminating in multiple loop ends with the corresponding ends of the springs having similar loop formations, frame members supporting said springs, and flexible means connecting a loop of every spring to the similar loop of an adjacent spring.

5. The combination of a plurality of leaf springs each terminating in multiple loop ends with the corresponding ends of the springs having similar loop formations, frame members supporting said springs, a cushioning element disposed in corresponding loops of every spring, and flexible means connecting every cushioning element to an adjacent cushioning element.

6. In combination, a seat cushion frame, a plurality of parallel leaf springs, each spring having multiple loop bends at their rear ends connected to the rear end of the frame, each spring
5 having a greater number of multiple loop bends at its forward end attached to the forward end of the frame, the greater number of bends at the forward end causing a tendency for the front ends of the springs to roll rearwardly under vertical or
10 braking loads, and means for altering the load deflection rate of certain of said bends to cause substantially equal stressing of all front loops under loading and in the presence of said rolling tendency.

15 7. In combination, a seat cushion frame, a plurality of parallel leaf springs, each spring having multiple loop bends at their rear ends connected to the rear end of the frame, each spring having a greater number of multiple loop bends at its
20 forward end attached to the forward end of the

frame, the greater number of bends at the forward end causing a tendency for the front ends of the springs to roll rearwardly under vertical or braking loads, and means stiffening the upper loops of the front multiple loops to cause substantially equal stressing of all loops under loading and in the presence of said rolling tendency. 5

8. In combination, a seat cushion frame, a plurality of parallel leaf springs, each spring having multiple loop bends at their rear ends connected to the rear end of the frame, each spring
10 having a greater number of multiple loop bends at its forward end attached to the forward end of the frame, the greater number of bends at the forward end causing a tendency for the front ends
15 of the springs to roll rearwardly under vertical or braking loads, and flexible means connecting one of the front loops to a similar loop of the next adjacent spring.

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