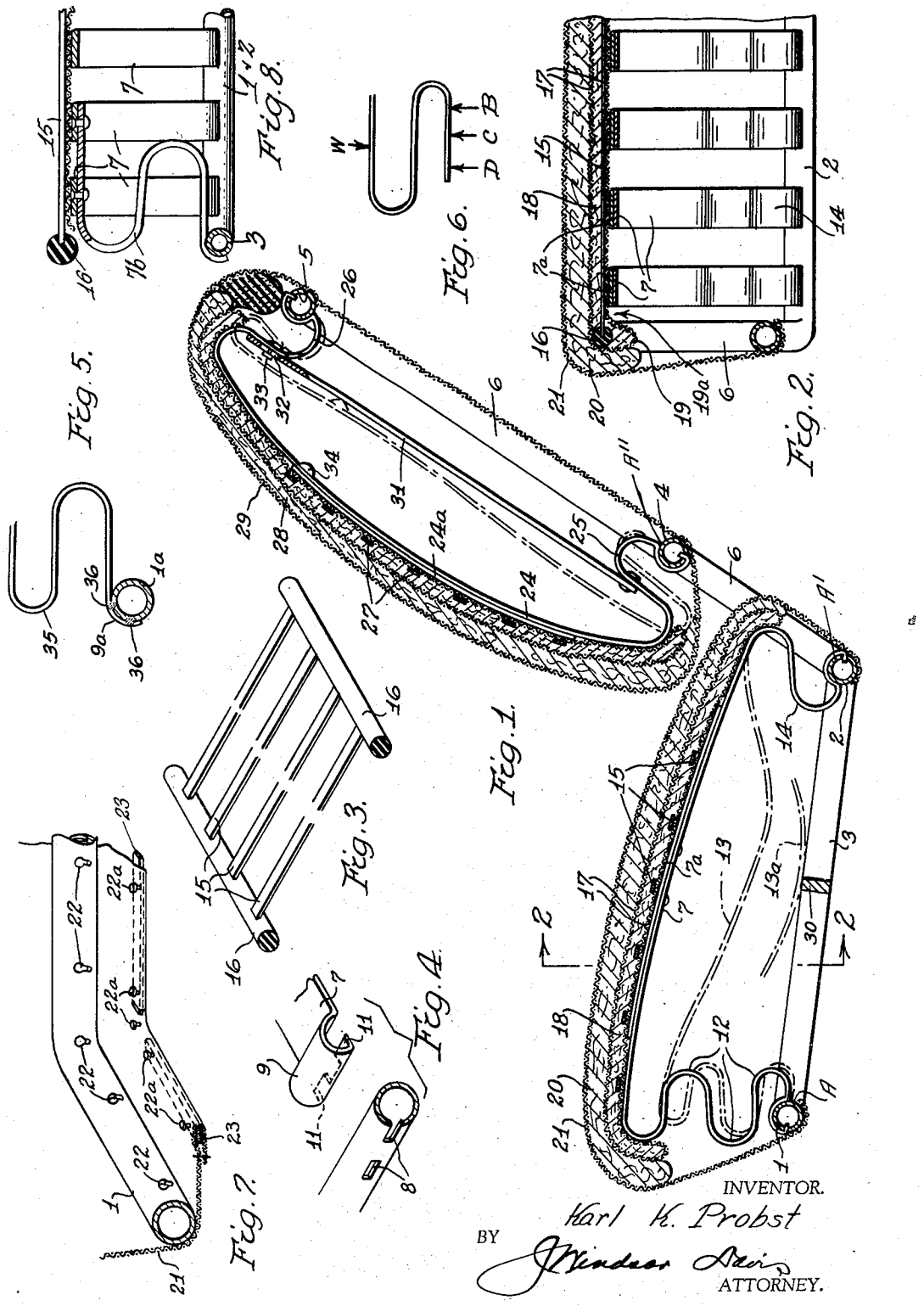
Aug. 26, 1941. K. K. PROBST 2,253,914

SEAT CUSHION

Filed Oct. 29, 1938



Patented Aug. 26, 1941 2,253,914

UNITED STATES PATENT OFFICE

2,253,914

SEAT CUSHION

Karl K. Probst, Detroit, Mich.

Application October 29, 1938, Serial No. 237,596

4 Claims. (Cl. 155—179)

This invention relates to a construction of seats for furniture, vehicles and the like and particularly for automobiles and has for its primary object to provide a seat and a back rest with the resilient elements thereof composed of leaf springs, which will have improved riding qualities over present practice, and which will be very materially lighter in weight and more economical to manufacture.

Another object is to provide seat cushions composed of leaf springs which are graded or, in other words, which vary in resiliency throughout their length, to enable the springs to assume the approximate contour of that part of a passenger's body contacted thereby, thus giving more equal unit pressure over that portion of the body in contact with the cushion.

Another object is to provide seat cushions composed of leaf springs having a variable spring rate or load deflection ratio so that as the load thereon increases they become increasingly stiffer in a manner which can be predetermined.

Another object is to provide seat cushions composed of leaf springs with a configuration providing for a higher degree of deflection at the forward edge of the seat than at the rear, thereby to provide a soft effect when the body load is shifted forwardly in a lounging position. This forward edge of the seat cushion is also contacted by a person entering and leaving an automobile, and its ability to yield readily under such conditions is a desirable characteristic.

Another object is to provide seat cushions composed of leaf springs, which will not roll forwardly when the load is shifted towards the front edge thereof nor under directly vertical loading, nor under brake application, but which will preferably roll rearwardly when subjected to such forces.

Another object is to provide a leaf spring cushion back having sufficient vertical resilience and properly anchored ends so that the seat cover will tend to follow the passenger's back during vertical movements of the seat cushion.

Another object is to provide springs and anchorages of a type which will prevent the ends from moving laterally, longitudinally or torsionally, and so placed that the relationships of the reaction points will give the desired motion of the front and rear portions of the spring for purposes outlined above.

Another object is to provide a seat and back rest having cushioning means composed of leaf springs, the frame and springs having cooperating means which removably hold the springs in place. In this connection, individual removability of the springs may be desirable in that in the event of breakage of a single spring, it can be replaced without requiring removal of the other leaves.

Another object is to provide seat cushions composed of a marginal frame or its equivalent and leaf springs, the frame and leaf springs having cooperating means rendered effective to prevent displacement of the springs by attachment of the covering or upholstering material to the frame. More specifically, said cooperating means is rendered effective to hold the springs positively in place when the springs are under load, and the covering or upholstering material holds the springs slightly compressed when secured to the frame. The cooperating, spring-holding elements actively lock the springs in place, therefore, only when the covering is in place, and permit removal and replacement of a broken spring when the cover is released adjacent the broken spring.

Another object is to provide a seat cushion of the character referred to immediately above embodying means for simply and quickly removably securing the covering material to the frame for purposes of cleaning, repair or replacement.

Another object is to provide a seat cushion composed of leaf springs extending fore and aft, and a second series of springs extending transversely thereof for distributing loading to an increased number of leaves and springs, and to provide more surface to support the cushion, which in present constructions is subject to excessive wear due to high local pressures.

Another object is to provide a leaf spring seat, as above described, which will be quiet and hence which will not be subject to squeaks expected to result from movement of the transverse upon the longitudinal leaves, nor by the non-fixed anchorage of the leaves in the frame where removability of leaves in the frame is incorporated.

Another object is to provide transverse spring members mutually spaced and flexibly connected together, but without metal connection to the frame, the advantages being in the resulting ability to secure definite cushion contours under loading while stiffening the ends of the cushion to compensate for the lack of adequate load distribution in more than one lateral direction, and to permit the transverse leaves to shorten in over all length without edge bending of the longitudinal leaves. In this connection, a plurality of transverse spring members are held in spaced relation by resiliently flexible elements,

preferably rubber strips, in which their ends are imbedded. The transverse springs and their flexible anchoring strips are unsecured with respect to the leaf springs and are held in place by attachment of the upholstering material to the seat frame. The flexible strips, in which the ends of the transverse springs are imbedded, in addition to spacing the transverse springs prevent their endwise displacement and the damage which would result to the upholstering material were they permitted to contact therewith.

Another object is to provide means for restricting flexing movement of the leaf springs to prevent breakage in case the springs are overloaded. This is accomplished in two distinct methods, one of which results from a special spring configuration which permits limiting of the maximum bending stresses at one part, and a positive means for restricting flexing movement at another part.

In operation of an automobile, when pressure is applied on the brake pedal the reaction is taken by the back rest, with the result that the back rest springs are subjected to a relatively high load. If the springs are sufficiently yieldable to provide the desired degree of comfort, they bottom under this load. If the springs are sufficiently stiff to resist the excessive load resulting from braking, they are too stiff for comfort. This invention has for another object to modify the springs of the back rest by adding an additional spring member to each thereof which becomes effective after a predetermined amount of flexing of the back rest springs. These auxiliary springs yieldingly reinforce the back rest springs and provide a substantial increase in the yield resistance only when the main springs are subjected to an abnormal load.

With the above objects in view, and others which will become apparent from the following description, the invention is described with reference to the accompanying drawing, in which:

Fig. 1 is a transverse vertical section through the seat cushion and back both constructed according to my invention;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a fragmental perspective of the transverse spring assembly;

Fig. 4 is a detail of the removable spring securing means;

Fig. 5 is a section through the frame showing a fixed spring securing means;

Fig. 6 is a diagram of a spring end for purposes of explanation;

Fig. 7 is a perspective of a frame corner showing the upholstery fastening means; and

Fig. 8 is a vertical section showing an alternate form of stiffener means for the end leaves.

The seat and back rest frame is composed of tubular metal elements united, as by welding, to form a one-piece marginal frame. The seat portion of the frame is composed of two horizontal members 1 and 2, extending transversely, and united at their ends by fore and aft members 3 (one of which is shown). The back rest portion is similarly composed of two horizontally extending members 4 and 5, united by upwardly extending members 6 (one of which is shown). The members 6 extend angularly to provide the usual angularity in the back rest.

A plurality of leaf springs 7, spaced apart transversely approximately the width of a spring, have their forward ends secured to the transverse frame member 1, and their rear ends secured to the transverse member 2. The means for securing the ends to their respective frame members is identical in each case and for both ends thereof and, as shown in Fig. 4, comprises slots 8 in the cross member 1 into which the end of the spring 7 is inserted. The ends of the springs are curved or bent as indicated at 9 to overlie and find substantial contact with the top of the member 1, the ends thereof being reversely bent and terminating in prongs 11 which engage the slots 8. As will hereinafter appear, the upholstery material is pulled over the springs and anchored to the frame members with tautness sufficient to impose an initial and constant deflection of the springs so that the ends of the springs are always in pressure contact with their supporting frame members.

The forward edge of the seat cushion should deflect more readily under equal vertical loading than the rear edge, and for this reason, among others, the springs 7 are provided with a serpentine formation 12 composed, preferably, of four connected loop formations, although this same result may be obtained simply by making the front loops longer than the rear ones. The lowermost loop formation is disposed inwardly of the frame member, and when the spring is subjected to an average load it deflects as indicated by the broken lines 13 and under a maximum load to the broken line 13a. It will be noted that, under deflection of the spring, the lowermost loop flexes and fulcrums about the reaction point A and tends to draw the spring loops 12 inwardly of the frame. In other words, the spring loops 12, in addition to providing ready yieldability, obviate the tendency of the springs to roll forwardly under vertical loading and in combination with the anchorage at the rear spring end oppose the tendency to roll forwardly under conditions where the loading is concentrated near the front end of the seat, and also under conditions where brake application pressures tend to roll the spring forwardly.

In this connection, and by way of further explaining the fulcruming action of this type of spring, attention is called to Fig. 6 wherein a multiple loop spring end is illustrated. If this spring is subjected to a vertical loading W, it may be supported at a point B about which the top loop will roll or fulcrum in the direction to the left of the reader. If the support is moved to the left a point C can be readily located where there will be no tendency of the top loops of this spring to roll forwardly or rearwardly under vertical loading, but if an off-center load is applied there will be a tendency to roll in the direction of the force. If the support point is moved further to the left of the point C to D the loops of the spring will roll or fulcrum to the right under the vertical loading W. The action of the spring in these respects are so pronounced that if the point D is moved sufficiently forwardly of the point C the spring loops will roll to the right even though the loading be from a direction other than vertical, as for instance when the vehicle brakes are applied by the seat occupant. The reason for this is that all such forces may be considered as composed of two components, one of which is in a horizontal direction and the other of which is in a vertical direction, the latter being sufficient to cause the rearward rolling as explained above.

Referring to Fig. 1, the support composed of the frame elements 1, 2 and 3 is inclined rearwardly with respect to the axes of the loops 12. This results in a rearward rolling action when

the spring loops 12 are subjected to vertical loading.

At their rear ends, the springs 7 have loop formations 14, less in number than at the forward edge, because a lower degree of flexibility is desirable at this edge.

It will be seen that one advantage of this type spring is that, properly designed, the cushion will assume the approximate contour of a body load, being very restful to an occupant. In order to secure this advantage one or more additional spring leaves 7a may be secured to the leaves 7. In the drawing one auxiliary spring leaf 7a is provided for each spring 7, but it will be understood that in some cases this auxiliary leaf may be dispensed with, or a number greater than one might be used. To prevent breakage by excessive flexing of the springs 7, a rigid transverse member 30 against which the springs 7 seat when unreasonably overloaded, is interposed between the members 1 and 2 and anchored at its ends to the members 3.

After assembly of the leaf springs 7 in the frame, transverse spring members are placed thereon. The transverse spring members comprise a plurality of resiliently flexible metal strips 15 having their ends imbedded in flexible rods 16, the rods preferably being formed of rubber. The transverse strips 15 and the rubber rods 16 are enclosed in a fabric casing 17, which also encloses some padding material 18. If the padding material 18 is in the form of sponge rubber to which they are surface bonded the end rods 16 may be omitted or of such form as to serve merely as guards against perforation of the upholstery by the rod ends. When laid upon the springs 7, the fabric casing 17 is interposed between the strips 15 and the springs 7, thereby preventing metal to metal contact with its accompanying undesirable noises. These springs strips 15 are transfer means to distribute the loading over the main springs. Since they cannot properly distribute loading on the ends of the cushion, the springs 7 at the seat ends are stiffer than the others. An ideal construction would include graduated, progressively stiffer springs 7 toward each end of the cushion and this should be approached insofar as practical. The same result can be accomplished by stiffener springs 7b riveted or otherwise fixed to the frame side rails 3 and only to one or two end springs, where there is no graduation of the leaves. This alternative construction is shown in Fig. 8.

The casing 17 is proportioned larger than the length of the transverse spring unit and when assembled the end portions depend at 19 over the sides of the two outside leaf springs 7. Clearance as shown at 19a permits the transverse leaves to shorten and conform to body contouring without transversely bending the longitudinal springs. Thus the padding material 20 and the upholstering or covering material 21 hold the casing 17 and transverse springs 15 in place.

In order to fasten the seat cover with even tension throughout its circumference, a metal strip 23 is sewed in each of its four sides. Fastened to each strip are two or more headed pins 22a which are inserted into the bayonet slots 22. The tension of the cover holds these pins, strips and cover securely in place. At the corners a similar pin 22a is fastened to the cloth. This permits the cover to open larger than the frame for assembly.

In regard to fastening means for both the springs 7 and the fabric 21, the necessary slots 8 and the apertures 22 do not materially weaken the frame.

The back rest, which may also be described broadly as a seat cushion, has springs 24 with their opposite ends secured respectively to the frame members 4 and 5, the means for securing the leaves 24 being identical to that shown in Fig. 4. The springs 24 have auxiliary leaves 24a and loop formations 25 and 26 at opposite ends, which cooperate to provide the desired degree of resiliency. Transverse springs 27, padding material 28, and upholstering or covering material 29 are assembled and secured in the same manner as the corresponding elements in the seat cushion.

The springs 24, with their auxiliary springs 24a and loop formations 25 and 26, are designed to provide a degree of resiliency which is comfortable under ordinary conditions and which will move downwardly during deflections, as previously explained. In order to prevent bottoming of the springs 24 under exceptionally heavy loads, such as occurs during braking of a vehicle, they are designed for a variable spring rate by incorporating therein a secondary spring means. The secondary spring means comprises a leaf spring 31 secured to the loop formations 25 and 26. One end of the spring 31 is slotted at 32 and engages a pin 33 on the loop formation 26. When the springs 24 deflect a certain amount, rubber buttons 34 thereon engage their respective secondary springs 31, and the latter yieldingly oppose further flexing of the springs 24.

Fig. 5 shows an alternate form of attachment of the leaf springs to the main frame. A spring 35 terminates in an end as previously described except that the end prongs are omitted. The spring end 9a thus overlies the main frame member 1a and is permanently secured thereto as by welding or by riveting as indicated at 36.

Although a specific embodiment of the invention is shown and described, it will be understood that various changes may be made within the scope of the appended claims without departing from the spirit of the invention, and such changes are contemplated.

What is claimed is:

1. A seat cushion comprising front and rear frame members each having a plurality of slots therethrough, a plurality of leaf springs reversely curved into multiple loops near each end thereof, the ends of said springs being also reversely bent and demountably inserted in slots at opposite sides of said frame, and a covering for said springs secured to said members and imposing initial deflection thereon thereby causing the ends of said springs to exert a pressure against said members.

2. Load transfer means for use with a spring assembly having a plurality of parallel leaf springs having doubly reversely bent ends connected to frame members, said transfer means comprising a multiplicity of spring strips, and resiliently flexible means connecting adjacent ends of the strips and maintaining them in parallel relation, said connecting means being arranged in parallel relation and being adapted to overhand the outermost leaf springs to hold the spring strips in transverse relation to the leaf springs.

3. Load transfer means for use with a spring assembly having a plurality of parallel leaf

springs having doubly reversely bent ends connected to frame members, said transfer means comprising a multiplicity of spring strips, and resiliently flexible means connecting adjacent ends of the strips and maintaining them in parallel relation, said connecting means being arranged in parallel relation and being adapted to overhang the outermost leaf springs, said connecting means being of rounded surface and adapted to constitute means for preventing contact of upholstering material directly with the outermost leaf springs.

4. Load transfer means for use with a spring assembly having a plurality of parallel leaf springs having doubly reversely bent ends connected to frame members, said transfer means comprising a multiplicity of spring strips, resiliently flexible means connecting adjacent ends of the strips and maintaining them in parallel relation, said connecting means being arranged in parallel relation and being adapted to overhang the outermost leaf springs, and a sack-like covering enclosing said transfer means and insulating the spring strips against direct rubbing contact with the leaf springs, said sack-like covering having loosely depending portions overhanging said connecting means and adapted to coact with the outermost leaf springs to position said connecting means with the spring strips in transverse relation to the leaf springs.

KARL K. PROBST.