

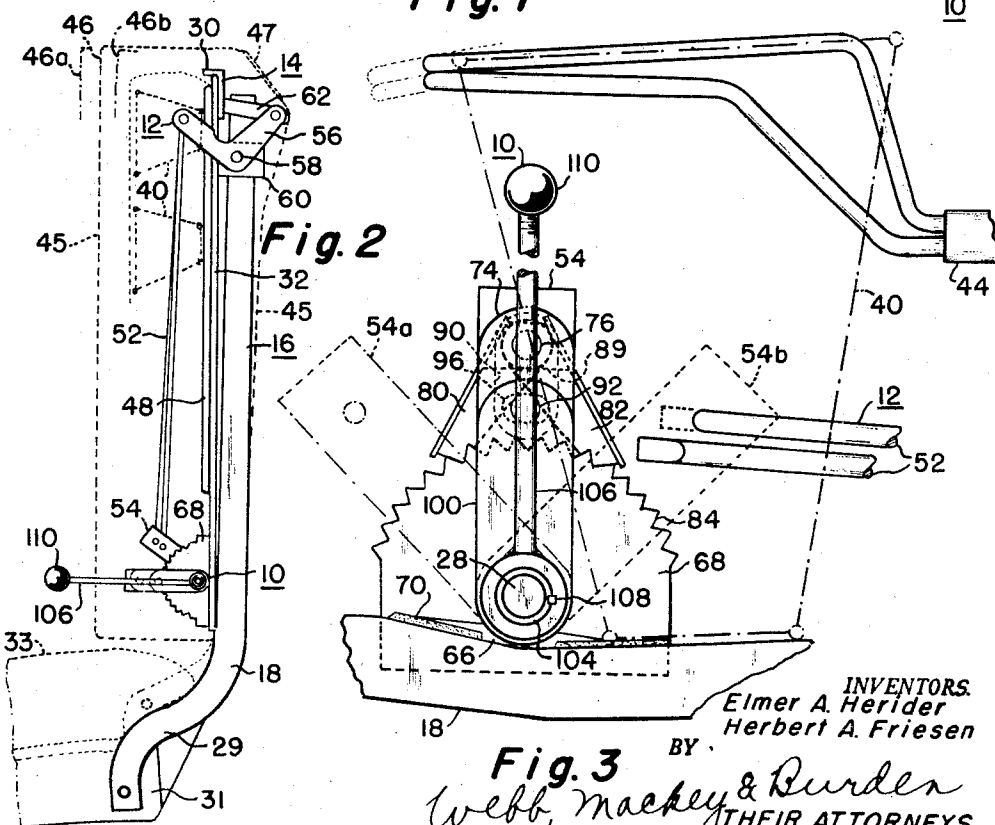
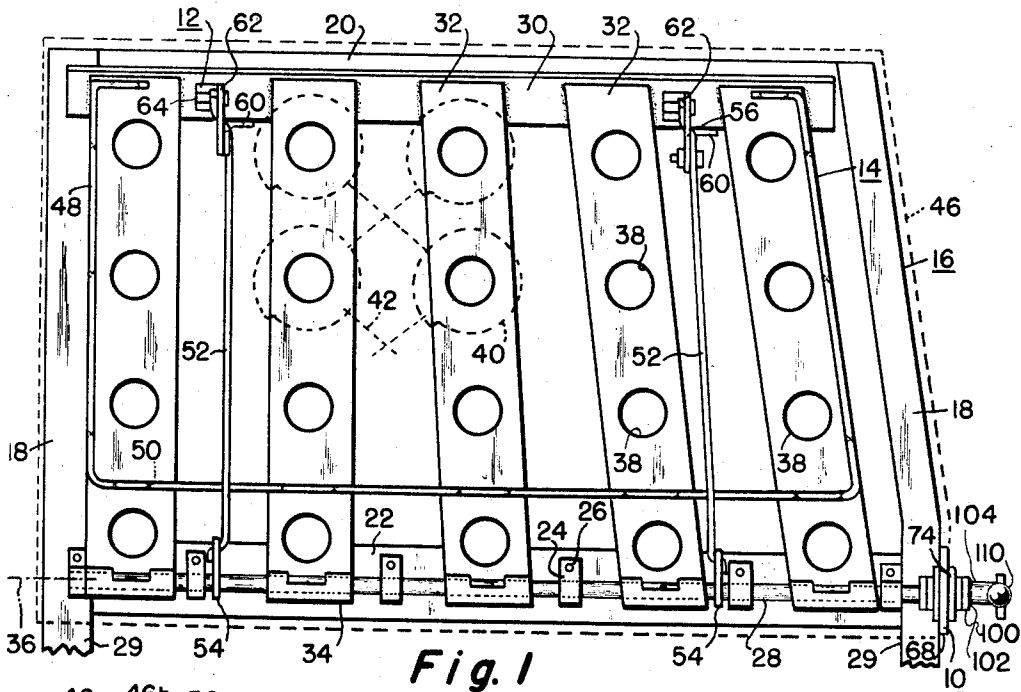
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E. A. HERIDER ET AL

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### ADJUSTABLE BACK REST CONSTRUCTION

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**INVENTORS.**  
**Elmer A. Herider**  
**Herbert A. Friesen**

**BY**

**Fig. 3** BY: *Webb, Mackey & Burden*  
THEIR ATTORNEYS

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2,853,121

## ADJUSTABLE BACK REST CONSTRUCTION

Elmer A. Herider, Dearborn Township, Wayne County, and Herbert A. Friesen, Centerline, Mich., assignors to Rockwell-Standard Corporation, a corporation of Pennsylvania

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This invention relates to an adjustable back rest construction for vehicle seats, and more particularly to a unitary construction for back rests enabling them to carry an independently adjustable captive cushion which we pivotally mount thereon in slightly inclined disposition and for which we provide a novel built-in or internal adjustment in the back rest making it angularly adjustable within itself for changing the inclination of that cushion. According to the present invention, the pivoted cushion structure on the back rest is capable of moving only to the extent of compensating for preferences in personal comfort and it is in this mere matter of degree wherein it chiefly differs in its adjustment from so-called reclining back rest structures. In other words, the present concept provides for adjusting the cushion at selected inclinations primarily to a vertical plane rather than to the horizontal or reclining plane.

As above indicated, this invention is particularly adapted for vehicle seats and, in fact, the pivoted back rest cushion specifically disclosed herein is embodied in folding back rest structure of the split type well-known in automotive use, but this particular back rest structure is angularly adjustable in itself independently of its normal folding movement for the usual purpose. More specifically, the folding back rest according to the present invention is normally vertically disposed and comprises a front frame for carrying the back rest cushion, a rear frame supporting the front frame and pivoted to a seat base, a rotatable linkage moving the upper end of the frames in adjustably separated positions to position the cushion at a selected inclination to a vertical plane, and a motivating shaft which hinges the frames together at their lower end and which is operatively connected in torque transmitting relationship between an actuator and the rotatable linkage to transmit the actuator force from the bottom of the back rest to the top for rotating the linkage to adjusted positions for adjusting the cushion in the described manner.

It will be readily apparent that the mechanism of the preceding paragraph is broadly applicable to any body engaging cushion in a seating structure and it is manifest in connection with back rest cushions specifically, that this mechanism is equally adapted to full width back rests regardless of whether the stationary or folding type.

Further features, objects, and advantages will either be specifically pointed out or become apparent when for a better understanding of the invention, reference is made to the following description taken in conjunction with the accompanying drawing in which.

Figure 1 is a front elevational view of folding back rest structure embodying a preferred form of the present invention;

Figure 2 is a sectional view in side elevation of the structure of Figure 1, and

Figure 3 is a fragmentary view corresponding to Figure 2, and showing an actuator portion thereof to enlarged scale.

In the drawing a manual actuator 10 and an adjusting

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linkage 12 controlled thereby are shown associated with one of the folding halves of a split type folding back rest structure for seating assemblies, not entirely shown but provided with supported and supporting frames 14 and 16 in that back rest which are hinged together along the lower edge and adjustably separated at the upper end by means of the adjusting linkage 12. In their ordinary upright position the frames 14, 16 are slightly inclined in the same rearwardly offset position from a vertical plane, with the supported frame 14 disposed at the front and arranged to assume preselected angularity approaching, but never completely vertical. According to personal preference, the back rest halves in the present seating assembly may or may not be symmetrically identical with one another in their construction and internal mechanism and the companion half to the one illustrated may be of conventional construction if desired.

The supporting frame 16 is generally rectangular, including a pair of spaced vertical side rails 18 joined together by means of upper and lower cross rails 20 and 22. The lower cross rail 22 carries a series of individual loops of steel strip stock which form a row of shaft bearings 24 and which are riveted at 26 to the cross rail 22 at longitudinally spaced points thereon. The bearings 24 carry a torque transmitting cross shaft 28 journaled therein to be rotated by the actuator 10 which has an operative connection to a protruding end portion of the cross shaft 28.

The vertical side rails in the frame 16 have lower extension portions 29 which may be rigid with, but actually as shown they are pivotally secured for folding movement, on a seat frame base 31 which carries the usual full width detachable seat cushion indicated at 33. The supported frame 14 includes a lengthwise extending rim 30 at the top, to which the upper ends of a row of spring strip retainers 32 in this frame are welded. The spring strip retainers 32 are turned at the lower end 34 to loop about the torque shaft 28 so as to hinge on the supporting frame 16 about the longitudinally extending fixed shaft axis 36 with a swinging movement independent of shaft rotation. Each of the spring strip retainers 32 has a row of four circular flanged seats 38 for supporting a like number of tapered coil springs 40 disposed in similar vertical rows with their rear ends retained by the flanges of the seats 38. At their larger forward ends the coil springs 40 have an interconnecting series of tie connections 42 to provide a unitary surface and a relatively stiff border wire frame 44, aligned with the large ends of these coil springs, forms therewith a unified spring cushion surface. The surface is covered with the usual foam rubber padding and external upholstery cloth 45 to complete the hinged padded cushion structure 46. The cloth 45 has a short insert of stretchable fabric 47 therein allowing the hinged frames 14 and 16 relative movement at the upper end without wrinkling the cloth. The spring retainers have a common reinforcing bar 48 of general U-shape which is tack welded at two or more points 50 to each retainer 32 so as to rigidify the supported frame 14.

The adjusting linkage 12 includes a vertically extending pair of spaced linking wire rods 52 each crimped with an offset for connection at the lower end to an individual crank 54 fast to the torsion shaft 28 and having a crimped-in offset at the upper end which is pivotally connected in an opening in the front arms of vertically disposed bell cranks 56, each thereby cooperating with one crank 54 vertically aligned therewith to form a parallelogram linkage. Each bell crank 56 has a fixed lower pivot 58 at its apex which carries it for rocking movement forwardly and rearwardly upon a mounting bracket 60 affixed to the underside of the upper cross rail 20. The rear arm of each bell crank 56 is pivotally connected to

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a forwardly extending flat link 62 which passes through a slot in the rim 30 to a point slightly in front thereof where it is pivotally connected to a supporting bracket 64 rigid with the rim 30 at the top of the supported frame 14. When the bell cranks 56 rotate counter-clockwise together as viewed in Figure 2, the rear legs or links thereof joined to the flat links 62 cause the latter to pivot the supported frame 14 forwardly about the axis 36 of the torque shaft 28 as a center. Clockwise movement of the bell cranks 56 about their pivots 58 causes the supported frame 14 to pivot rearwardly into close approach to the supporting frame 16.

The torque shaft 28 protrudes through a relieved portion in an interrupted ratchet wheel 68 having welds 70 securing it perpendicularly to the lower front surface 66 of the side rail 18. At a point adjacent the plane of the arch 66 the torque shaft 28 rigidly carries a lock plate 74 which turns with the shaft and has a transversely extending pawl pin 76 rigidly affixed to the swinging end thereof. The pawl pin 76 pivotally carries a pair of divergent spring-biased pawls 80 and 82 each provided with a set of two teeth engageable at balanced locations with a set of ratchet teeth 84 provided on the outside periphery of the ratchet wheel 68. The pawls 80, 82 are scarfed at their converging ends to have only a half thickness apiece, thereby compactly interfitting with one another in well-known manner so as to overlap and swing in a common plane to the fixed ratchet wheel 68. A one-piece stamping having a center web forms a pawl recentering spring 89 arranged with a divergent pair of flat strip legs which continually bias the pawls 80 and 82 toward one another into engagement with the ratchet teeth 84, and which are joined at the upper side by means of the common center web in which a hole is punched. The pin 76 protrudes through this hole to perform the retaining function.

The angle subtended by the ratchet teeth 84 is less than 180° and the dimensions of the parts of the adjusting linkage 12 are such that the available travel along the ratchet teeth is sufficient motion to adjust the back rest cushion 46. The end of the pawl pin 76 extends past the plane of the ratchet wheel 68 and protrudes loosely through a retainer plate 90 which is on the opposite side of the ratchet wheel and which aids in retaining the recentering spring 89. A crank pin 92 which is received in the retainer plate 90 in common with the pin 76, is adapted to have slight relative motion of separation to the latter along their line of centers, by movement in slightly oversize openings in the plane of the plate 90 about the axis 36 as a center. The crank pin 92 passes from the retainer outwardly of the teeth 84 and through an elongated slot 96 formed in the lock plate 74 and the end of the pin 92 is fixed by welding it in transverse relationship to the swinging end of the drive plate 100. The drive plate 100 lies alongside the lock plate 74, having the hub welded at 102 to a quill control shaft 104 which is piloted concentrically on the extension of the torque shaft 28 and which carries an operating handle 106 keyed at 108 thereto. A hand lever knob 110 is threaded to the outer end of the operating handle 106.

The plates 74, 100 swing together with a smooth wiping action in arcs on the same side of the ratchet wheel 68 thereby leaving its opposite side fully exposed. The crank pin 92 on the drive plate 100 has a neutral or satisfied position in which the spring-biased pawls 80 and 82 straddle it in a balanced contacting relationship whereby they exactly center it in the slot 96. These pawls 80 and 82 swing in a common parallel plane adjacent the plane of the slot 96 and thus lie squarely in the path of motion of the crank pin 92 at all times so that at least one of these pawls is in continual contact therewith under the bias of the recentering spring 88.

In overall operation of the actuator 10 of the preceding figures, the operating handle 106 constitutes a self-

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locking lever which is manually rocked clockwise or counterclockwise as viewed in Figure 3 to move the drive plate 100 with similar motion. After predetermined initial movement, the crank pin 92 takes up the entire clearance at the end of the slot 96 to solidly engage it and simultaneously it disengages one of the pawls 80, 82 from the ratchet wheel so as to cause the lock plate 74 to move and drive the torque shaft 28 and the spaced cranks 54 conjointly therewith. The linking wire rods 52 in the parallelogram linkage 12 cause the bell cranks 56 to rotate counterclockwise or clockwise on their pivots 58 and correspondingly pivot the cushion-carrying, supported frame 14. Thus the cushion 46 pivots forwardly into its dotted line position 46a (Figure 2) in response to downward pressure on the hand lever knob 110 as it forces the cranks 54 into the lowered position shown by the dotted lines 54a in Figure 3. These movements are, of course, independent of the normal folding movement of the back rest member to the usual point downwardly adjacent the face of the seat bottom cushion 33. It is noted that the coil springs 40 closest to the bottom of the spring strip retainers 32 will have a minimum amount of movement whereas those springs farthest from the cross shaft 28 which hinges the strip retainers will have the greatest amount of movement and thus throw the seat occupant forward at his shoulders. It is further noted that the load of the shoulders of the occupant will tend to force the cushion 46 to the rear and the reaction force in the wire rods 52 will, therefore, be in tension enabling them to readily resist the loads. The full angle of adjustment is relatively small being only 1" full travel at the top in one physically constructed embodiment of the invention, which therefore essentially provides for internal adjustment for slight angular differences within itself to compensate for preferences in personal comfort, rather than for reclining.

Motion of the crank pin 92 either way from the center of the elongated slot 96 is the motion required for unlocking the pawls and simultaneously completing a lost motion positive drive connection with the lock plate 74. This motion can be varied by varying the size of the teeth 84 on the ratchet wheel and by varying the location of the crank pin 92 with respect to the pawl carrying pin 76. The fact that the crank pin 92 is a single element which both releases one pawl and establishes the drive accounts for a highly satisfactory consolidated operation in which there are no pairs of elements or companion parts subject to bending or wear which must be exactly coordinated in driving the present mechanism.

The actuator 10 just discussed forms no per se part of the present invention, being described and claimed in our copending application, Serial No. 636,072, filed January 24, 1957, and assigned to the assignee of the present application.

Variations within the spirit and scope of the invention described are equally comprehended by the foregoing description.

We claim:

1. Seating structure including a seat base, a folding back rest pivoted to the seat base comprising supported and supporting frames, and force transmitting means to pivot the supported frame into angularly adjusted positions on the supporting frame independently of folding movement of the back rest, comprising a cross shaft mounted to the supporting frame and having means driven thereby forming an adjustable connection between the frames for changing the angle of their relative separation in response to shaft rotation, and means for rotating the cross shaft.

2. Seating structure including a seat base, a folding back rest pivoted to the seat base comprising supported and supporting frames, and means to pivot the supported frame into angularly adjusted positions on the supporting frame independently of folding movement of the back rest, comprising a motivating shaft mounted cross-

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wise to the bottom of the supporting frame and having means driven thereby forming an adjustable connection between the frames for changing the angle of their relative separation at the top in response to shaft movement, and locking actuator means to actuate said shaft to adjust and lock the back rest frames.

3. A folding back rest for seats comprising a pair of frames with one arranged for supporting the other and with the supported frame carrying a back rest cushion, shiftable means in the back rest connected for holding the frames adjustably separated at the upper end and movable to provide an internal angular adjustment of the back rest effective to rotate and hold the back rest cushion at selected inclination to a vertical plane, a cross shaft hinging the frames together on a fixed axis at the bottom of the back rest but being mounted for independently turning on said axis and operatively connected to said shiftable means, and means for turning the cross shaft so as to set the shiftable means in motion and rotate the cushion carrying frame and the back rest cushion about said axis.

4. A folding back rest for seats comprising a pair of frames with one arranged for supporting the other and with the supported frame carrying a back rest cushion, a pair of joined link means in the back rest connected between and holding the frames adjustably separated at the upper end and rotatable to provide an internal angular adjustment of the back rest effective to rotate and hold the cushion at a selected inclination to a vertical plane, a cross shaft hinging the frames together on a fixed axis at the bottom of the back rest and being mounted for independently turning on said axis and being operatively connected to said rotatable joined link means, and a manually driven actuator for turning the cross shaft so as to set the joined link means in motion, and rotate the cushion carrying frame and the back rest cushion about said axis.

5. A back rest comprising the combination with supported and supporting frames, of a torque shaft common thereto and hinging the frames together adjacent one end of the back rest, a crank fast to the torque shaft, means forming a parallelogram linkage comprising said crank and one arm of a bell crank having a fixed pivot axis at the opposite end of said back rest, a link connected between the other arm of said bell crank and the adjacent end of the supported frame, and means connected to said torque shaft for driving the parallelogram linkage in opposite directions to selectively pivot the supported frame forwardly and rearwardly about its hinge connection to the supporting frame.

6. Back rest structure comprising a supporting frame at the rear thereof, a supported frame adapted to carry a back rest cushion forwardly of the supporting frame and including a row of vertical retainer strips having a common rim rigid therewith at their upper end, said supporting frame carrying a cross shaft associated in common with the retainer strips at their lower ends for hingedly joining them to the supporting frame, a bell crank rotatably mounted to the upper end of the supporting frame and having one arm connected for movement with the rim of said supported frame, means linking the other arm of the bell crank and the cross shaft so as to impart the rotational motion of the shaft to the bell crank and to the supported frame, and means to rotate the cross shaft.

7. A cushion carrying seat assembly having a supporting frame, a supported frame mounted thereupon adapted to carry a body contacting cushion outwardly of the supporting frame and including a row of retainer strips having a common rim rigid therewith at one end, said strips having the opposite ends turned to form a set of coaxial loops and said frames being arranged at that end with a common cross shaft passing through the loops on said retaining strips for hingedly joining them to the supporting frame, a bell crank rotatably mounted to

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said supporting frame adjacent said one end of the supported frame and having one arm connected for movement with the rim of said supported frame, means linking the other arm of the bell crank and said shaft so as to impart the rotational motion of the shaft to the bell crank and to the supported frame, and means to rotate said shaft.

8. Back rest structure comprising a supporting frame at the rear thereof, a supported frame adapted to carry a back rest cushion forwardly of the supporting frame and including a row of vertical retainer strips having a common rim rigid therewith at their end, said supported frame having a cross shaft common to the lower end of the retainer strips for hingedly joining them to the supporting frame, a bell crank rotatably mounted to the upper end of the supporting frame, a link protruding forwardly through a slot in the rim and having the front end pivotally mounted to the front of the rim and being connected at the opposite end to one arm of the bell crank, means linking the other arm of the bell crank and the cross shaft so as to impart the rotational motion of the shaft to the bell crank and the supported frame, and means to rotate the cross shaft.

9. Seating structure including a seat base, an upright back rest having a supported frame at the front and a rear frame arranged with portions at the lower end for attachment to the seat base, said supported frame including a back rest cushion, means on the rear frame pivoting the supported frame for moving the cushion into adjusted positions on the back rest comprising cross shaft means defining a fixed pivot axis at the lower end of the cushion, means disposed at the upper end of the cushion forming an adjustable connection between the frames, and a common cloth covering the rear frame and the cushion carrying frame and cushion thereupon including a stretchable fabric insert at the upper end of the back rest enabling the frames to undergo relative movement without wrinkling the cloth at their adjusted connection aforesaid.

10. Seating structure including a seat base, an upright back rest having a supported frame at the front and a rear frame arranged with portions at the lower end for attachment to the seat base, said supported frame including a back rest cushion, means on the rear frame pivoting the supported frame from moving the cushion into adjusted positions on the back rest comprising cross shaft means defining a fixed pivot axis at the lower end of the cushion, link means rotatably mounted in the vicinity of the upper end of said cushion to form a two-way drive connection between said frames for moving the cushion, and force transmitting means connected to rotate said link means to adjusted positions for adjusting the cushion in the described manner at a selected inclination to a vertical plane.

11. A seat with body engaging structure which includes a cushion carrying frame, a frame supporting the cushion carrying frame and having portions therebelow for attachment to a support, means on said supporting frame for moving the cushion carrying frame into adjusted positions on said structure comprising a rotatable shaft fixed crosswise in one end of the structure and having an actuator connected end portion protruding from the side of said structure at that end, link means rotatably mounted adjacent the opposite end of said structure to form a two-way drive connection between the frames for moving the cushion carrying frame in opposite directions, and force transmitting means connected to the rotatable shaft and to the link means for transmitting the actuator motion from one end of said structure to the opposite end so as to rotate the link means to adjusted positions for adjusting the cushion carrying frame at a selected inclination.

12. A seat with upholstered body engaging structure which includes a cushion carrying frame, a second frame arranged generally parallel to and supporting the cushion

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carrying frame and having portions integral with the second frame for movably mounting same to a support, means mounting the cushion carrying frame to pivot out of parallelism through predetermined angles of adjustment to and on an axis fixed in the supporting frame, an upholstery cloth covering common to said frames including a stretchable insert at an end point remote to said axis to enable that end of the cushion carrying frame to adjust to different angles as aforesaid without wrinkling the covering at that point, and adjustment means to hold said frames in positions of predetermined angularity as aforesaid with respect to the mounting means.

13. In a seat, body engaging structure forming a foldable upholstered back rest therefor, comprising a cushion carrying frame, a frame arranged generally parallel to and supporting the cushion carrying frame and means manually operable to pivot said cushion carrying frame out of parallelism through predetermined angles of adjustment to and on an axis fixed in the supporting frame,

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there being an upholstery covering common to said frames and to a cushion thereon, said manually operable means including leverage delivering actuator means therefor constituted by a self-locking lever for applying the leverage to adjust the cushion carrying frame in either direction and re-lock same all with a single motion of the hand in that direction.

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