Feb. 22, 1966 H. J. KAUFMAN 3,236,558

FOLDING CHAIR WITH CONCEALED LINKAGE

Filed April 22, 1964 2 Sheets-Sheet 1

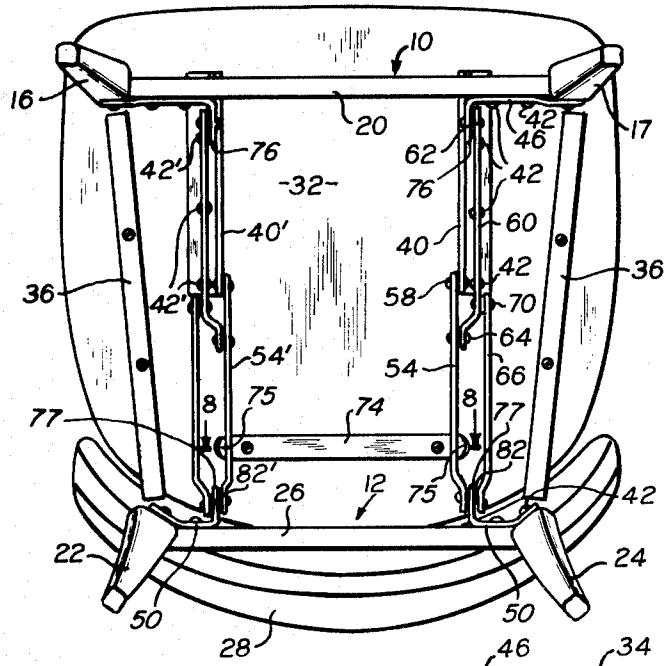

FIG. 4.

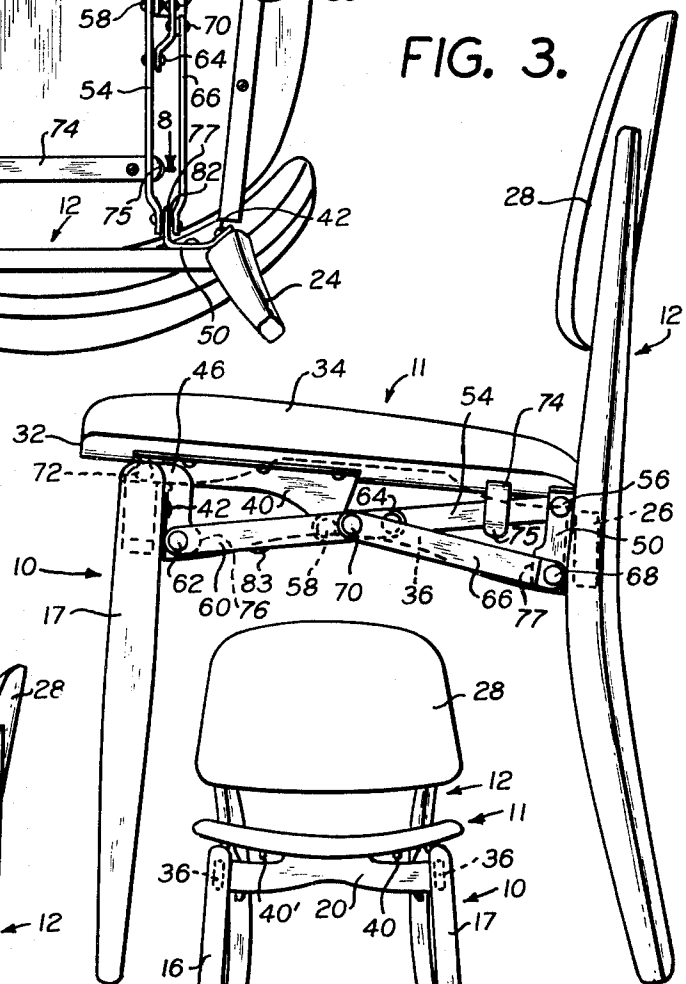

FIG. 3.

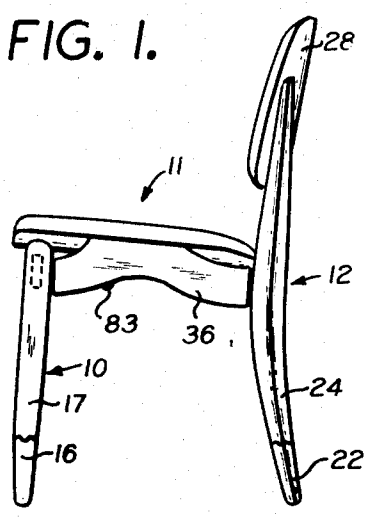

FIG. 1.

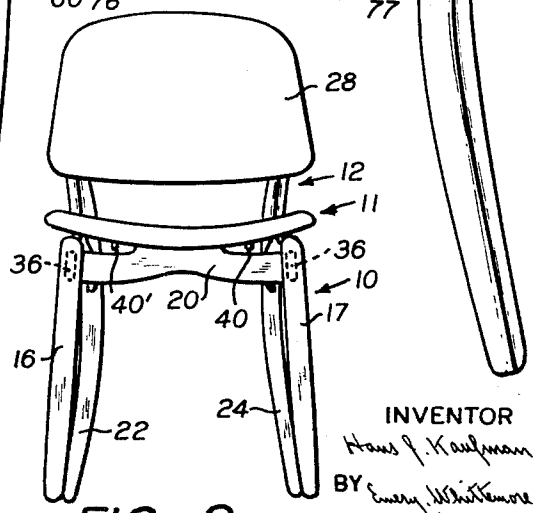

FIG. 2.

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FIG. 5.

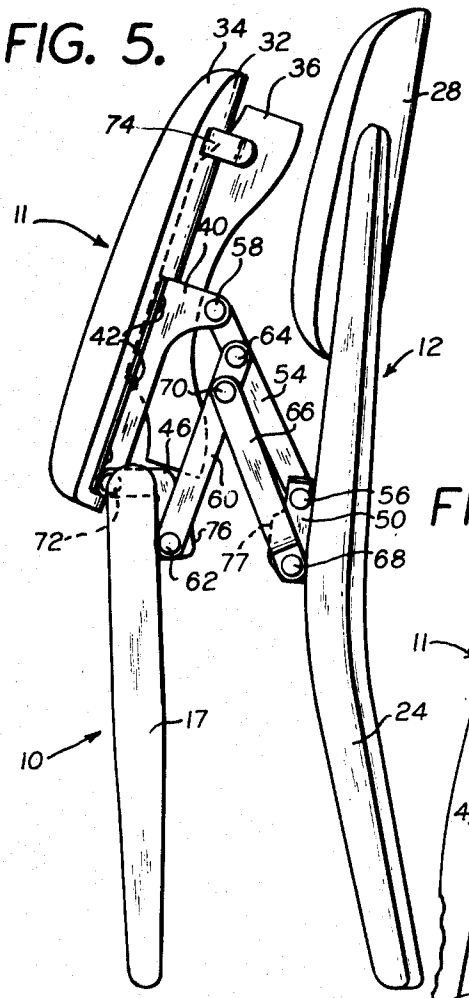


FIG. 6.

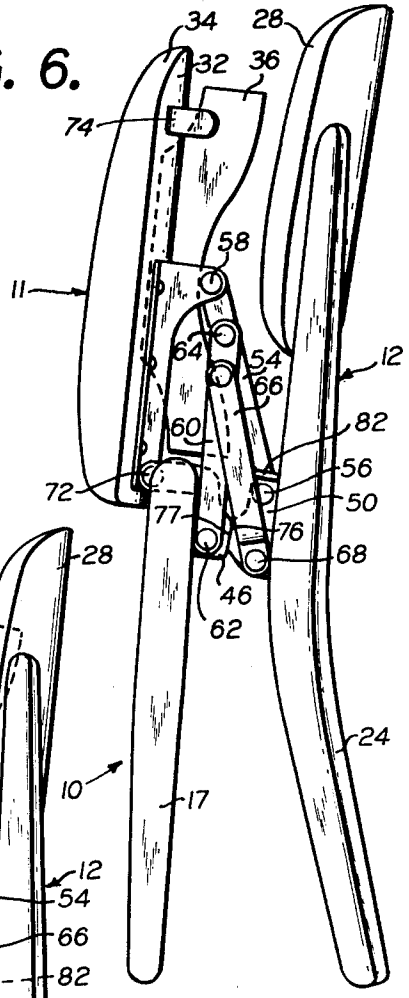


FIG. 7.

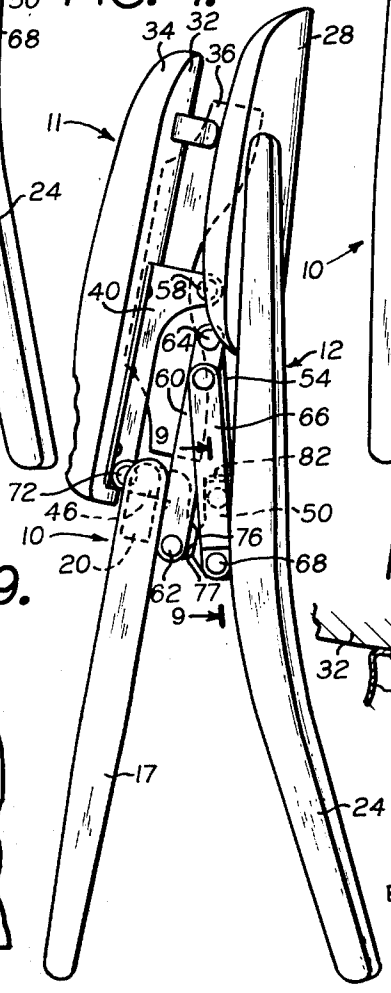


FIG. 9.

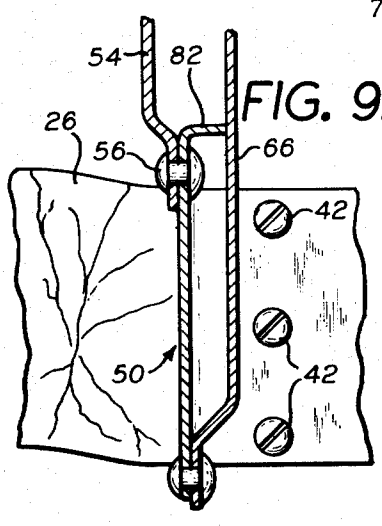
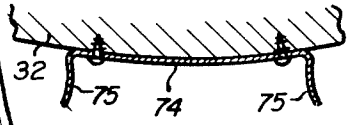


FIG. 8.



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3,236,558

FOLDING CHAIR WITH CONCEALED LINKAGE

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5 Claims. (Cl. 297—59)

This invention relates to folding chairs, and more especially to chairs that have folding linkages of the type disclosed in the Geller Patent 2,044,473 of June 16, 1936.

It is an object of the invention to provide an improved folding chair of the character indicated. A more specific object is to provide a folding chair in which the seat does not constitute one of the links of the folding linkage, and to construct all parts of the linkage out of brackets and links that form a complete system without using the seat or any other parts of the chair as an element of the linkage.

In the preferred construction, the brackets and links are made of metal so that there is no shrinkage with passage of time, as in the case of prior construction where parts of a wooden chair constituted part of the linkage. The metal is also stronger than wood and the use of all-metal linkages connected with the wooden parts of the chair by brackets makes possible a construction where the manufacturing tolerances are closer, and pivots can be located closer together and subjected to more severe loading without danger of breakage. This results in a more compact linkage, and one that can be concealed behind a rail or skirt extending downwardly from a chair seat.

Another object of the invention is to provide a wooden chair with metal brackets for a folding linkage, and with the brackets connected to legs and transverse runners of the chair frames to reinforce the connections between the wooden parts themselves.

Other features relate to divergence of the legs of the chair when folded so that it will stand up, to stops for limiting and controlling the folding, and to the correlation by which the parts of the chair are retained in folded condition.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views;

FIGURE 1 is a side elevation of a chair made in accordance with this invention;

FIGURE 2 is a front elevation of the chair shown in FIGURE 1;

FIGURE 3 is a greatly enlarged side view of the chair shown in FIGURE 1 but with the skirt removed from one side of the seat so as to show the linkage which permits folding of the chair;

FIGURE 4 is a bottom view of the chair shown in FIGURE 3, and with the skirt or apron (imitation side rail) located on the sides between front and back legs, but attached to the seat;

FIGURE 5 is a view similar to FIGURE 3 but showing the chair in a partially folded condition;

FIGURE 6 is a view similar to FIGURES 3 and 5 but showing the chair folded until abutments on the front and back brackets come in contact with each other;

FIGURE 7 is a view similar to FIGURES 3, 5 and 6 but showing the chair in fully folded condition;

FIGURE 8 is a sectional view taken on the line 8—8 of FIGURE 4; and

FIGURE 9 is a greatly enlarged view on the section line 9—9 of FIGURE 7.

The chair shown in the drawing includes a front frame 10, a seat 11 and a back frame 12. The front frame 10 has two front legs 16 and 17 connected together at their upper end by a transversely extending rail 20.

The back frame 12 includes back legs 22 and 24 connected together by a transversely extending rail 26 and by a back rest 28. The rail 26 is at the approximate level of the seat 11 and the back rest 28 is at the upper end of the back frame 12. Below the rails 20 and 26, the front frame 10 and back frame 12, respectively, have no transversely extending connections. This leaves the space between the front legs open so that an occupant of the chair can move his legs back between the legs of the chair and it makes possible the "nesting" of the legs of folded chairs in a manner which will be explained later.

The seat 11 includes a panel 32 which bows downwardly toward the center, in a transverse direction, to provide formfit comfort to the occupant of the chair. The panel 32 is covered by upholstery 34 which preferably includes padding, to increase the comfort of the seat. There is a skirt or apron 36 imitating side rails attached to the underside of the seat on both sides of the seat 11, as is clearly shown in FIGURE 1 and partly visible in FIGURE 2.

FIGURES 3 and 4 show the folding system of the chair including the various links and brackets. There is a seat bracket 40 and the seat 11 is rigidly secured to the bracket 40 by detachable fastenings 42. This makes it possible to replace the seat readily; a great advantage for service.

There is a front bracket 46 attached to the front frame 10. This front bracket 46 extends for some distance along the rail 20 and extends across the upper end of the leg 17. It is connected with the rail 20 and leg 17 by fastenings 42 and constitutes a reinforcement of the connection of the leg and rail to each other. The front bracket 46 constitutes a unitary structure with the front frame 10.

There is a back bracket 50 connected to the back frame 12. This back bracket 50 extends along part of the length of the rail 26 and across the front of the back leg 24. It is connected with both the rail 26 and the leg 24 by fastenings 42 so as to constitute a unitary structure with the back frame. This metal connection between the rail 26 and the back leg 24 reinforces the connection of the rail and back leg to one another and greatly strengthens the construction of the back frame 12.

In the preferred construction of the invention, the legs 17 and 24, the rails 20 and 26, and the seat panel 32 are made of wood, and the brackets 40, 46 and 50 provide metal connections for joining links to these legs, rails and seat panel.

A first link 54 is connected to the back bracket 50 by a pivot connection 56; and is connected at its other end to the rearward portion of the seat bracket 40 by a pivot connection 58. A second link 60 is connected at its forward end to the front bracket 46 by a pivot connection 62. The other end of the second link 60 is connected to the first link 54 by a pivot connection 64 located between the pivot connection 56 and 58 of the first link.

A third link 66 is connected at its rearward end to the back bracket 50 by a pivot connection 68. This third link 66 is connected with the second link 60 by a pivot connection 70 at a location between the pivot connections 62 and 64.

The forward end of the seat bracket 40 is joined to the front bracket 46 by a pivot connection 72 on which seat 11 swings upwardly as the chair folds and in a manner which will be explained in connection with the other figures. The rearward portion of the seat 11 is supported by a clip 74 extending across a portion of the bottom of the seat panel 32 in positon to contact with the top surface of the link 54; and the clip 74 has sides 75 extending downwardly and in friction contact with the link 54 and a

corresponding link 54' on the other side of the seat 11 as shown in FIGURE 4. The lower ends of these downwardly extending sides 75 of the clips 74 flare outwardly for receiving the links 54 and 54' as the seat 11 is moved into its horizontal position, shown in FIGURE 3; the side 75 being distorted slightly so as to provide a spring action for gripping the links 54 and 54'.

FIGURE 4 shows brackets and links, similar to those shown in FIGURE 3 and already described, connected with the chair on the other side of the seat. This second folding system has the parts indicated by the same reference characters as in FIGURE 3 but with a prime appended. It will be understood that both of the folding systems are independent and complete in themselves as originally assembled but they operate in unison after they are attached to the chair since they are connected to the same parts of the chair.

The pivot connections 62 and 68 (FIGURE 3) are located at lower levels than the pivot connections 72 and 56, respectively. When the chair is in set-up condition, as shown in FIGURES 1 and 3, the portion of the skirt or apron 36 which extends downwardly at the sides of the chair conceals the linkage. From the front and with the eyes in a lower than normal position it is possible to see that the chair is a folding chair, if one looks for the signs of it. The reason that this is possible is that bracket 46 and link 40 protrude through the front rail. In the Danish style design used for the illustrations the cut-out has been accentuated to give the seat a floating effect, but even with the cut-out 38 in the Danish style design, the linkage behind the rail 20 is not visible from the front of the chair. Thus the rails 20 and 26 serve to conceal most of the linkage from view when the chair is looked at from the front or back.

The chair is most easily folded by lifting the rear of the seat with both hands and then pressing the upturned seat and the back of the chair together until the chair is locked.

The seat 11 swings upwardly at its rearward end away from the back frame 12. This swinging movement is about the pivot connections 72 and 72', and the links 54, 60 and 66 cause the front and back frames 10 and 12, respectively to move closer together as shown in FIGURE 5. From an inspection of this figure it will be apparent that the linkage in effect constitutes two four-bar linkages connected together by having certain links of one linkage extend into and constitute part of the links of the other linkage. For example, identifying the effective links by the pivot connections at their ends, there is one four-bar linkage 58–72; 72–62; 62–64; and 64–58. There is another four-bar linkage 64–70; 70–68; 68–56; and 56–64. Although neither of these four-bar linkages are folding parallelograms, the links are so correlated that they maintain the front frame 10 and back frame 12 substantially parallel to one another during the first part of the folding movement, as shown in FIGURE 5, and continued movement until the parts approach the positions shown in FIGURE 6.

FIGURE 6 shows the linkage more completely folded than FIGURE 5. There are abutment surfaces 76 and 77 on the front and back brackets 46 and 50, respectively. These abutment surfaces 76 and 77 come into contact with one another when the parts reach the condition shown in FIGURE 6.

The further movement of the frames 10 and 12 with respect to one another, after the abutment surfaces 76 and 77 have come together, constitutes a rocking movement about these surfaces 76 and 77 as a fulcrum. This rocking movement brings the upper part of the front frame 10 closer to the back frame 12 and moves the seat 11 closer to the back rest 28. This movement causes the lower ends of the chair legs to be spread further apart. Although the chair legs have some divergence from one another as they extend downwardly, this divergence is increased by the last part of the folding movement and when the chair is fully folded, as shown in FIGURE 7, the front legs 16 and 17 are spread some distance ahead of the back legs 22 and 24. Fronts legs 16 and 17, being more widely spaced transversely of the chair than are the back legs, permit the back legs to "nest" between the front legs when folded chairs are stored with the back of one chair against the seat of a chair behind it.

The center of gravity of the folded chair is located above the space between the front and back legs so that the chair will stand when folded as shown in FIGURE 7 and will be relatively stable.

After the front and back frames rock with respect to one another about the abutment surfaces 76 and 77 as a fulcrum, the links 54, 60 and 66 swing into the positions shown in FIGURE 7 where they are in substantially centered positions with respect to the pivots and no further folding movement is possible. It is a feature of the illustrated construction that the abutment surfaces 76 and 77 and the swinging of the links 54, 60 and 66 into their centered and fully folded condition occurs before the seat 11 contacts the upholstery of the back rest 28. The back rest is bowed so that it extends further back towards the center and this provides clearances for the clip 78.

At the upper end of the back bracket 50 there is an angularly extending flange 82 which bears against the side of the third link 66 as that link moves from the FIGURE 6 to the FIGURE 7 position.

The friction provided by this contact of the flange 82 with the link 66 holds the linkage in folded condition until a substantial force is exerted to move the seat forwardly away from the back frame 12. It will be understood that there are flanges 82 on both of the back brackets 50 and 50' (FIGURE 4) and that these flanges 82 and 82' extend in opposite directions so as to distort the links 66 and 66' slightly away from one another to provide the friction force between the linkage and the flanges 82 and 82'.

The chair is most easily unfolded by grasping the chair at the top of the back frame and at the rail 26 between the rear legs. With the chair lifted into a forwardly sloping position, a quick easy shake opens the chair. The legs are then placed on the floor and the seat is pushed down as far as it will go to lock the chair in open position.

The preferred embodiment of the invention has been illustrated and described, but changes and modifications can be made, and some features can be used in different combinations without departing from the invention as defined in the claims.

What is claimed is:

1. A folding chair including a back frame with back legs, a seat, a front frame with front legs, each of the frames having a rail at substantially the height at which the seat is located when the chair is in set up condition, said rail being rigidly connected with the legs of its frame, a seat bracket rigidly attached to the seat, a front bracket rigidly connected to the front frame and pivotally connected with a forward portion of the seat bracket, a back bracket rigidly connected to the back frame, a first link pivotally connected at one end of the back bracket and at the other end to a rearward portion of the seat bracket, a second link that is pivotally connected at one end to the front bracket at a level lower than the pivot connection of the front bracket to the seat bracket, and a third link that is pivotally connected at its forward end to the second link at a location intermediate the other pivot connections of the second link and that is pivotally connected at its rearward end to the back bracket at a level lower than the pivot connection of the back bracket to the first link, and characterized by there being two systems of brackets and links, one for each side of the chair, the pivot connections on the brackets for the links and the link systems being spaced inward from the sides of the seat and from the legs of the frames, each of the link systems having a front bracket at its forward end connected to the rail of the front frame and extending along

the rail to and across a portion of a front leg and being also connected to the front leg to secure the rail and the front leg to one another, and having a back bracket connected to the rail of the back frame and extending along the rail to and across a portion of a back leg and being also connected to the back leg to secure the rail and back leg to one another.

2. The folding chair described in claim 1 characterized by a skirt extending downward from the seat along both sides of the seat, said skirt being separate from the links and brackets of the folding system of the chair.

3. The folding chair described in claim 1 characterized by the front legs deverging from the back legs as they extend downward when the chair is in folded condition, and the center of gravity of the folded chair being above the space between the legs whereby the chair stands on its legs when in said folded condition.

4. A folding chair including a back frame with back legs, a seat, a front frame with front legs, a seat bracket attached to the seat, a front bracket connected to the front frame and pivotally connected with a forward portion of the seat bracket, a back bracket connected to the back frame, a first link pivotally connected at one end to the back bracket and at the other end to a rearward portion of the seat bracket, a second link that is pivotally connected at one end to the front bracket at a level lower than the pivot connection of the front bracket to the seat bracket, and a third link that is pivotally connected at its forward end to the second link at a location intermediate the other pivot connections of the second link and that is pivotally connected at its rearward end to the back bracket at a level lower than the pivot connection of the back bracket to the first link and characterized by the back frame including a back rest at the upper end thereof and having upholstery thereon, the seat folding upwardly about the pivot connection of the seat bracket to the front bracket and extending upwardly when folded to a level substantially above the lower end of the back rest, and abutment surfaces on the front and back brackets in position to contact with one another and to stop further folding movement of the chair before the seat strikes against the upholstery of the back rest.

5. A folding chair including a back frame with back legs, a seat, a front frame with front legs, a seat bracket attached to the seat, a front bracket connected to the front frame and pivotally connected with a forward portion of the seat bracket, a back bracket connected to the back frame, a first link pivotally connected at one end to the back bracket and at the other end to a rearward portion of the seat bracket, a second link that is pivotally connected at one end to the front bracket at a level lower than the pivot connection of the front bracket to the seat bracket, and a third link that is pivotally connected at its forward end to the second link at a location intermediate the other pivot connections of the second link and that is pivotally connected at its rearward end to the back bracket at a level lower than the pivot connection of the back bracket to the first link, and characterized by the front and back brackets having abutment surfaces thereon which contact with one another as the chair parts approach folded condition, the parts of the chair above the abutments being movable closer together about the abutments as a fulcrum to bring the seat and the upper part of the back frame closer together, and to shift the front and back legs further apart at their lower ends.

References Cited by the Examiner

UNITED STATES PATENTS

1,424,031	7/1922	Peters	297—56
2,044,473	6/1936	Geller	297—59
2,071,988	2/1937	Sasse	297—459
2,098,711	11/1937	Rastetter	297—59
2,538,637	1/1951	Wilkinson	297—59
2,613,730	10/1952	Anderson	297—42
2,679,895	6/1954	Zoercher	297—59
2,697,481	12/1954	Zoercher	297—60
2,727,564	12/1955	Gruber	108—91
3,030,141	4/1962	Geller	297—60
3,042,447	7/1962	Wilkinson	297—59

FOREIGN PATENTS

1,157,251	12/1957	France.

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