Aug. 11, 1953 L. A. SMITH 2,648,372

CHAIR WITH SPRING SEAT AND BACK

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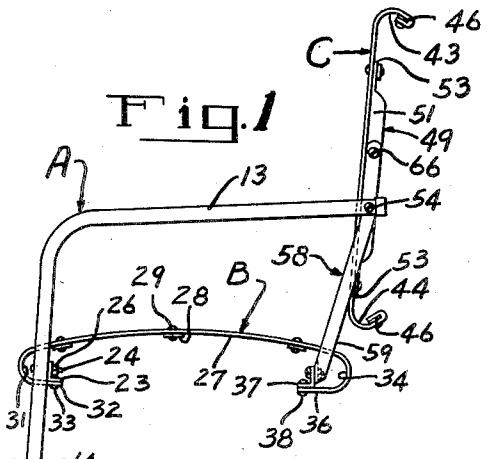



Fig. 1

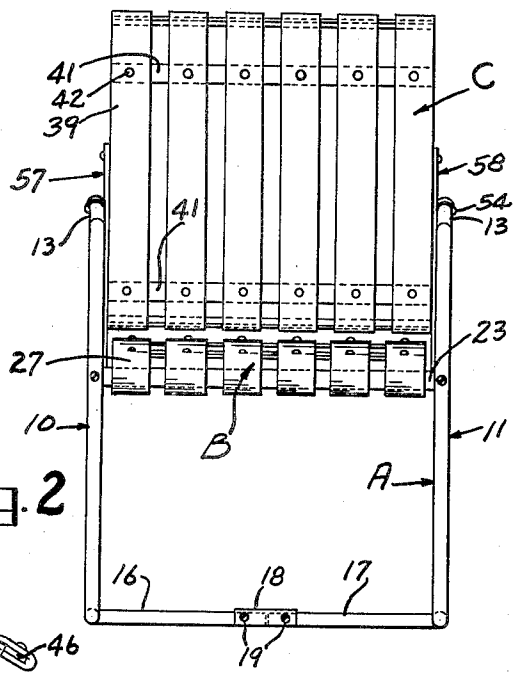



Fig. 2

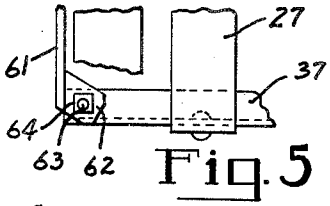



Fig. 5

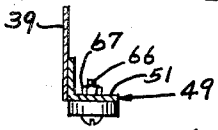



Fig. 6




Fig. 4

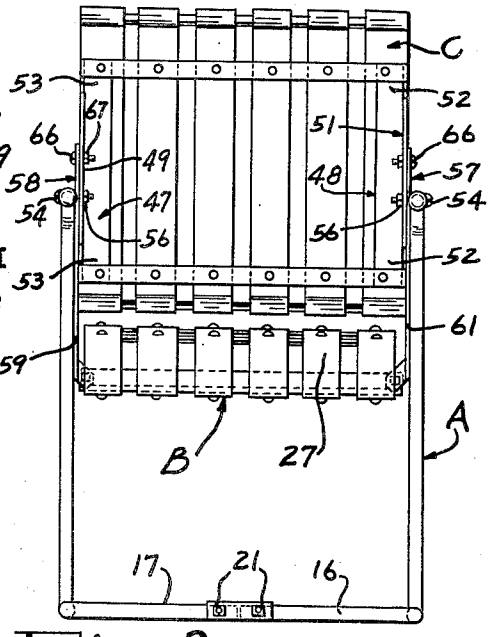



Fig. 3

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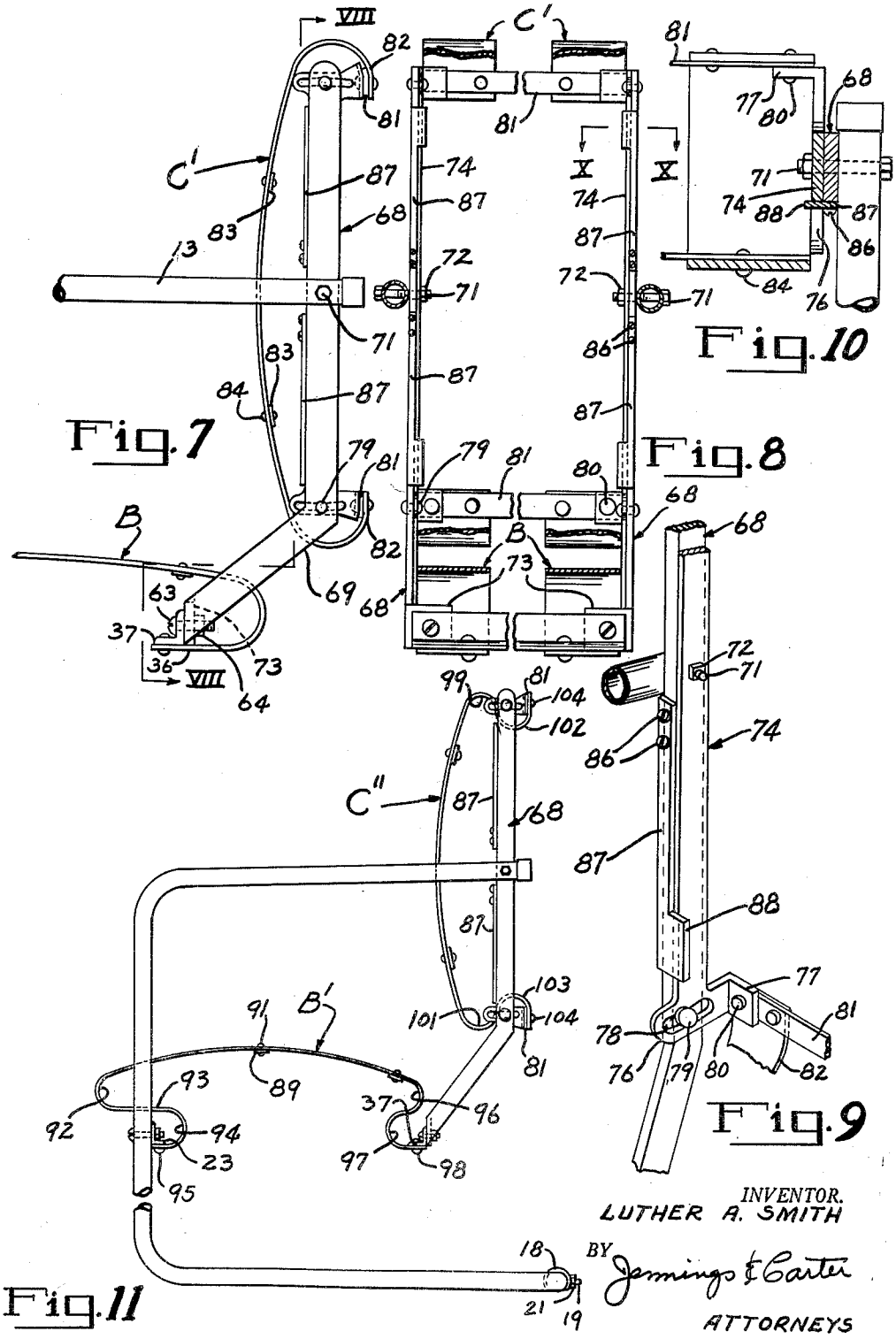



Fig. 7

Fig. 8

Fig. 10

Fig. 9

Fig. 11

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## CHAIR WITH SPRING SEAT AND BACK

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8 Claims. (Cl. 155—53)

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My present invention relates to chairs, and while not limited thereto relates to chairs having a frame of metallic tubing and a seat and back of sheet metal.

An object of my invention is to provide a chair in which the back therefor is pivotally mounted to the frame at its sides, intermediate its ends, and in which the seat is supported at its rear corners by members depending from the sides of the pivoted back.

Another object is to provide a chair embodying a frame for supporting an articulated seat and back, the seat being supported at its front edge on the frame and the back being pivotally connected to the frame, whereby when a person sits on the seat the back rocks about its pivot points, thereby providing a chair which is extremely comfortable and which is self-adjusting to fit the posture of the user.

Another object is to provide a chair of the character designated in which the seat and back are constructed and arranged so as to be somewhat inherently flexible, adding to the comfort of the chair, and affording means for securing in effect a pivoted connection between the seat and back at the rear of the seat, which together with the pivotal connection between the back and frame results in a self-adjusting, form fitting chair.

A further object is to provide a chair of the character designated in which the back of the chair embodies side members pivotally mounted to the chair frame, and in which the back proper is carried in an auxiliary frame pivoted to the side members, whereby the back as a whole is pivotally connected to the rear of the chair frame and at the same time the back proper is free to move about its pivot points relative to the side members, thus to accommodate itself to the back of a person using the chair.

A further object is to provide the back of the chair just described with springs for biasing the back toward centered position relative to its frame, and to provide means for limiting the pivotal movement of the auxiliary frame relative to the back supporting frame.

A still further object is to provide a chair of the character designated in which the seat and back, or either of them, are formed of sheet metal strips bent under at each end, and in which the seat and back are supported from such bent ends, providing in effect a spring supported seat or back.

Chairs embodying the features of my invention are illustrated in the accompanying drawings forming a part of this application in which:

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Fig. 1 is a side elevational view of one modification;

Fig. 2 is a front elevational view of the chair shown in Fig. 1;

Fig. 3 is a rear elevational view of the same;

Fig. 4 is a fragmental enlarged side view of the back and rear portion of the seat and illustrating the action of the seat and back when a person sits in the chair;

Fig. 5 is a fragmental detail view illustrating the method of joining one of the connecting members depending from the back to a rear corner of the seat;

Fig. 6 is a detail sectional view taken generally along line VI—VI of Fig. 4;

Fig. 7 is a view corresponding substantially to Fig. 4 and showing a modified form of my invention;

Fig. 8 is a detail sectional view taken generally along line VIII—VIII of Fig. 7;

Fig. 9 is a fragmental, sectional, isometric view looking at the inside of one of the links connecting the back to a corner of the seat;

Fig. 10 is a detail sectional view taken generally along line X—X of Fig. 8 and drawn to an enlarged scale; and

Fig. 11 is a side elevational view of a chair similar to the one shown in Figs. 7 to 9 inclusive, and embodying a slightly modified form of seat and back.

Referring now more particularly to Figs. 1 to 6 inclusive of the drawings, my improved chair embodies generally a supporting frame A, a seat B, and a back C. The frame A preferably is formed of metallic tubing bent to the shape shown and to be described, while the seat B and back C preferably are formed of strips of spring steel, cross braced and supported as will be described.

The frame A preferably comprises a pair of side frames 10 and 11, each of which embodies a floor engaging member 12 and an upper rearwardly extending member 13 constructed and arranged to provide arms for the chair. The members 12 and 13 are joined by a section of the tubing extending upwardly as at 14. Each of the members 12 at their rear ends are bent inwardly to provide transverse sections 16 and 17 of the tubing. These sections are joined in abutting relation by means of a sleeve 18 and screws 19 and nuts 21 therefor. The sleeve 18 preferably is cut away on its under side indicated at 22, whereby the members 16 and 17 engage evenly with the floor on which the chair rests. The ob-

ject of the divided frame is to facilitate packing and storing the chairs in knock down condition.

Joining the members 14 of the side portions 10 and 11 of the frame is an angle 23. The angle is disposed below the level of the arms 13, and is secured to the members 14 by means of screws 24 and nuts 26 therefor.

The seat B comprises a plurality of strips of sheet spring steel 27 which extend from front to rear of the chair. The strips are cross connected by means of straps 28, secured thereto by means of flat head rivets 29. At their forward ends each of the strips forming the seat is bent under as at 31, to provide a U-shaped front edge for the seat, and the free ends 32 of the underbent legs are secured to the angle 23 by means of rivets 33. The rear edge of the seat is formed by bending under the strips as indicated at 34, the free legs 36 extending forwardly as indicated. Cross connecting the free legs 36 of the strips at the rear is a second angle 37, secured to the strips by means of rivets 38.

The back for the chair comprises a plurality of vertically disposed strips of spring steel, similar to the strips 27, and held in spaced relation by means of cross straps 41 and rivets 42. The upper and lower ends may be bent over rearwardly of the back as indicated at 43 and 44. The strips may be folded flat upon a relatively thin bar 46, and the bent ends of each strip may be secured thereto by stitching in the manner understood in the art. At the sides of the back are angled members 47 and 48 having flanges 49 and 51 turned at right angles to the surface of the back to lie immediately at the sides thereof. The angles 47 and 48 may be secured to the remainder of the back structure by means of projecting ends 52 and 53 riveted to the upper and lower cross straps 41.

Pivotally mounted by means of screws 54 and nuts 56 to the rear end of the arms 13 are a pair of links 57 and 58. The ends 59 and 61 depend below the pivot points formed by the screws 54. On the lower end of each of the sections 59 and 61 is an inturned lug 62. The lugs 62 are secured to the rear cross angle 37 by means of screws 63 and nuts 64 therefor. The upper ends of the links 57 and 58 extend past the pivot points provided by the screws 54, and are secured to the side angles 49 and 51 by means of screws 66 and nuts 67 therefor.

As best shown in the side elevational views, Figs. 1 and 4, the seat B preferably is bowed upwardly whereby the same elongates from front to rear when a person sits therein. The links 57 and 58, being connected to the rear corners of the seat structure, are thus moved slightly to the rear when a person sits in the seat as shown in the dotted line position, Fig. 4. Rearward elongation of the seat therefore causes the back C to pivot about the screws 54, thus accommodating the back to the back of the person using the chair. The seat and back are thus articulated with respect to each other, and the seat is resiliently supported from the U-shaped bent ends of the strips and at its front and rear edges by the cross member 23 and the lugs 62 carried by the links 57 and 58. The seat is effectively tied to the lugs 62 across its entire rear edge through the angle 37, and the rear of the seat is in effect pivotally connected to the lower end of members 57 and 58, since the inherent resiliency of the metal of which the seat is formed permits a certain amount of flexing at the U-shaped bends 34.



Referring now more particularly to Figs. 7 to 10 inclusive, I show a modified form of my invention in which the back, while being pivotally mounted as a whole to the arms of the chair, is also pivotally mounted for movement relative to the pivoted links carrying at their lower ends the rear of the seat. As shown, I pivotally mount to the arms 13 of the supporting frame A a pair of link members 68, substantially similar to the links 57 and 58, except that the lower ends 69 thereof preferably are directed forwardly of the chair at a greater angle than the lower ends of the links 57 and 58. These links are pivotally connected to the arms 13 by means of bolts 71 and nuts 72 therefore, substantially in the manner by which the members 57 and 58 are connected to the arms by the bolts 54. The lower ends 69 of the links 68 are turned in as at 73, and are secured to the cross angle 37 by means of the screws 63 and nuts 64. The seat B is identical with the one previously described, the under turned legs 36 of the U-shaped bends 34 being secured to the angle by the rivets in the manner already mentioned.

As best shown in Fig. 9 of the drawings, I pivotally mount on the bolts 71 vertically disposed auxiliary frame members 74. The upper and lower ends each of the frame members 74 are widened as indicated at 76, and have an inwardly directed lug 77 bent from the rear end of the widened section. Each elongated portion 76 has therein a closed ended slot 78, preferably struck on a radius from the center of the pivot point provided by the bolt 71. Secured to the links and slidably disposed in slots 78 are rivets or pins 79. Secured to the upper and lower pairs of lugs 77 by rivets 80 are the ends of bars 81 to which in turn are secured the rearward free legs 82 of the upper and lower U-shaped ends of the back structure C'. The back proper is preferably formed of steel strips in the manner already explained, and these strips are secured together by cross bars 83 and rivets 84.

Secured to the forward edges of the links 68 as by screws 86 are a pair of flat springs 87 having their free ends oppositely directed, to lie above and below the pivot points formed by the bolts 71. On the free ends of the springs 87 are widened portions 88 adapted to overlie the frame members 74.

It will be apparent that the back structure C' is supported by its auxiliary frame members 74 for relative pivotal movement with respect to the links 68, and that the springs 87 tend to bias the same toward a central pivoted position relative to the links. The pins 79 in the notches 78 serve to guide the back in its pivotal movement, and to limit the extent of this pivotal movement. Thus, when a person sits in a chair of the character just described, the seat B, being upwardly bowed as already explained elongates slightly to the rear, pivoting the links 68 about the bolts 71. Upon leaning back in the chair, the person's back contacts the back structure C', and the same rocks to adjust itself to the posture of the person by pivoting about the bolts 71, independently of the links 68. This pivotal movement is limited by the upper and lower arcuate slots 78 in the elongated portions 76. The back C' preferably is outwardly bowed, adding further to the comfort of the chair. The springs 87 bias the auxiliary back supporting frame to a position preferably with the pins 79 midway between the ends of the slots 78.

Referring now to Fig. 11 of the drawings, I show

a chair which embodies the construction just described in connection with the second modification, and which additionally embodies a different type of seat and back. In this case, the seat B' embodies the strips of flexible steel material, cross braced by straps 89 and rivets 91. The forward edge of the seat is formed by bending over and under each of the strips of material, as at 92, thereby providing a substantially horizontal section 93, which in turn is bent under and forwardly as at 94. The horizontal free end of each strip is secured by rivets 95 to the cross angle 23 at the front of the chair. Similarly, the rear of the seat is provided with downwardly bent U-shaped sections 96, which are bent again rearwardly as at 97, and the free ends thereof are secured to the cross angle 37 by rivets 98. The front and rear edges of the seat are thus S-shaped, and the free ends of the strips are supported on the angles 23 and 37.

The back structure C'' is formed of strips of steel, suitably cross braced as already mentioned, and provided on the upper and lower ends with U-shaped bends 99 and 101. These bent portions are again bent upwardly at the upper end of the back and downwardly at the lower end of the back as indicated at 102 and 103, respectively, forming S-shaped upper and lower ends for the seat. The free ends of the strips are secured to the cross bars 81 by rivets 104.

It will be seen that the upwardly bowed seat and outwardly bowed back of the last described modification results in a seat and back which are more resiliently supported adjacent their ends or edges than in the previous modifications, thus adding further to the comfort of the chair. In combination with the pivotally supported links, and independently supported back frame, the latter type chair is extremely flexible and comfortable, and is self-adjusting to the posture of the user.

From the foregoing it will be apparent that I have devised an improved chair which is simple of construction and manufacture and which is both flexible and self-adjusting to the posture of the user. With either modification of my invention I provide a secure and yet flexible tie between the rear of the seat and back. Chairs made in accordance with my invention are characterized by the absence of complicated structural parts, and hence may be produced economically and lend themselves readily to mass production.

While I have shown my invention as embodied in a chair having a floor engaging supporting frame, it will be apparent that the same may be swingably supported in a suitable frame, thereby to form a glider chair. Thus the expression "supporting frame" is intended to cover such an arrangement. Likewise, my invention is equally applicable to elongated chairs or seats such as glider swings and the like.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a chair, a supporting frame embodying a front cross member and a pair of rearwardly extending members raised above the level of the front cross member, an upwardly bowed seat formed of strips of spring steel supported adjacent its front edge from the front cross member, a rear cross member secured to the rear edge of the seat, a back embodying side members disposed between the rearwardly extending members, and links pivotally connecting the side members intermediate the ends thereof to the adjacent rearwardly extending members, said links being secured at their upper ends to the sides of the back and at their lower ends to the rear cross member.



2. A chair as defined in claim 1 in which the seat is formed of strips of spring steel having U-shaped bends at the front and rear edges, and in which the free ends of the U-shaped bends at the front and rear are secured to the front and rear cross members respectively.

3. In a chair embodying a tubular supporting frame comprising a pair of U-shaped sides having vertically disposed front members and upper and lower pairs of horizontally disposed rearwardly extending members, said lower members being floor engaging members and the uppermost ones being constructed and arranged to form arms for the chair, the combination of front and rear cross members connecting the front vertical members and lower horizontal members respectively, a spring steel seat having underturned U-shaped bends along its front and rear edges with the legs of the U-shaped bends directed toward each other, means securing the legs of the U-shaped bends along the front edges thereof to the front cross member, a cross member secured to the legs of the U-shaped bends at the rear edges of the seat, a pair of links connected at their lower ends to said last mentioned cross member and pivotally connected to the rearmost ends of the arms, and a back structure disposed between the arms and secured at its sides to said links.

4. In a chair, a supporting frame embodying a cross member at the front and a pair of rearwardly extending arms, a seat supported at the front edge thereof from said cross member, a pair of links pivotally connected to the arms and with their lower ends secured to the rear of the seat, a back frame pivoted intermediate its upper and lower ends to the links, a back in said frame, mechanism limiting the relative pivotal movement between the back frame and links, and springs constructed and arranged to bias said back frame toward an intermediate pivoted position relative to the links.

5. A chair as defined in claim 3 in which the back structure comprises a plurality of vertically disposed spaced steel strips secured together by cross members, and flanges at the sides of said back to which the links are connected.

6. A chair as defined in claim 4 in which the means to limit the relative pivotal movement between the back frame and links comprises closed ended slots in the back frame on either side of the pivot point thereof, and members carried by the links and projecting into said slots.

7. In a chair, a supporting frame having a front cross member and rearwardly extending arms raised above the level of the cross member, a resilient seat formed of strips of sheet metal extending from front to rear of the chair and bowed upwardly, under bent portions on the front and rear ends of said strips forming U-shaped front and rear edges for the seat, means to secure the legs of the U-shaped front edge of the seat to the front cross member, a rear cross member secured to the legs of the U-shaped rear edge of the seat, a pair of vertically disposed links pivotally connected to the arms, means connecting the

lower ends of the links to the rear cross member, a back frame embodying side members disposed between the upper ends of the links and mounted for pivotal movement relative to the links about the same points as the links are connected to the arms, a back embodying resilient strips of metal having U-shaped upper and lower ends, and means securing the free ends of the U-shaped upper and lower ends of the back to the upper and lower ends of the back frame.

8. In a chair, a supporting frame embodying a front cross member and a pair of arms, a seat formed of strips of spring steel bent to provide S-shaped front and rear edges for the seat, means securing the free ends of the S-shaped front of the seat to the front cross member, a rear cross member secured to the free ends of the S-shaped rear of the seat, a pair of vertically disposed links positioned between the arms and pivoted at each side to the adjacent arm, a back formed of strips



of spring steel bent to provide S-shaped upper and lower ends for the back, a back frame embodying side members mounted for pivotal movement relative to the links about the pivot points on which the links are mounted, means securing the free ends of the upper and lower ends of the back to the back frame, and means connecting the rear cross member to the lower ends of said links.

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