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S. A. LANE ET AL

2,810,429

INVALID FOLDING CHAIR MECHANISM

Filed May 14, 1956

3 Sheets-Sheet 1

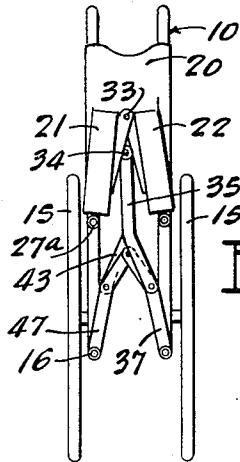
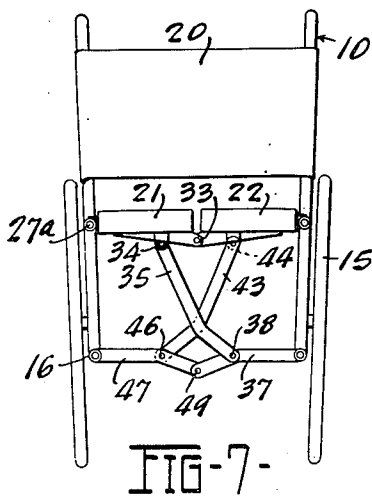
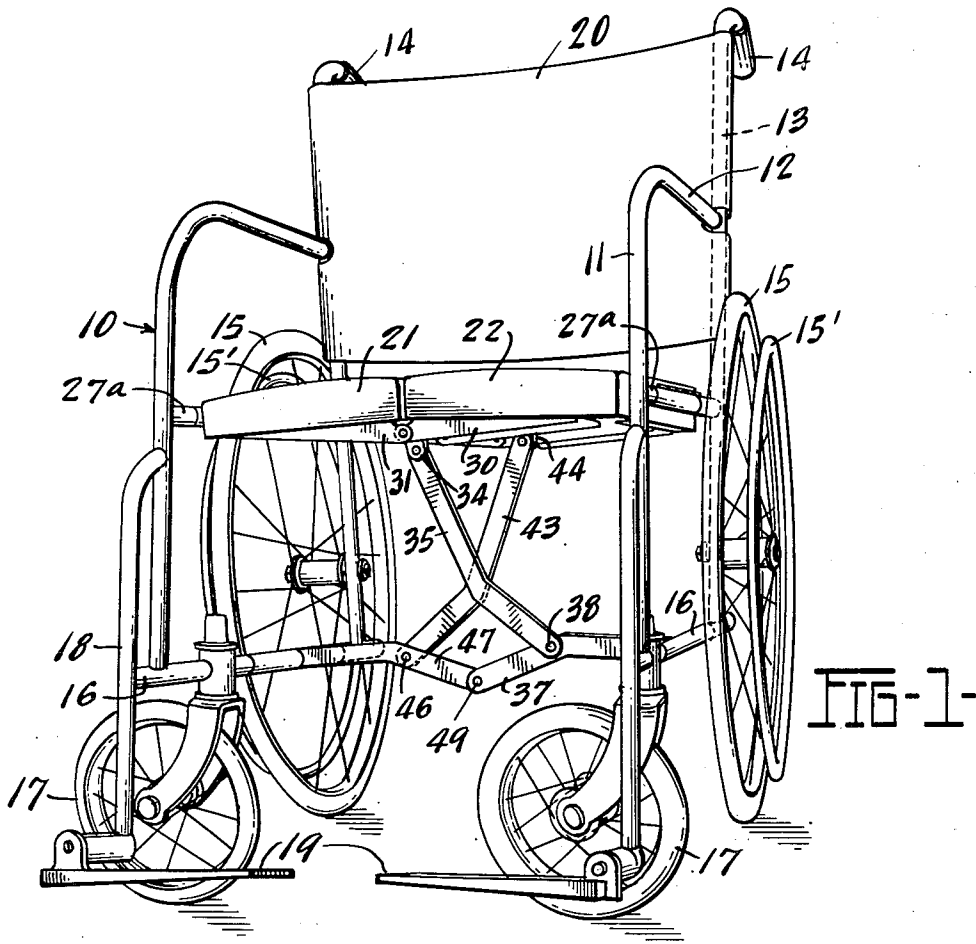


FIG-8-

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3 Sheets-Sheet 2

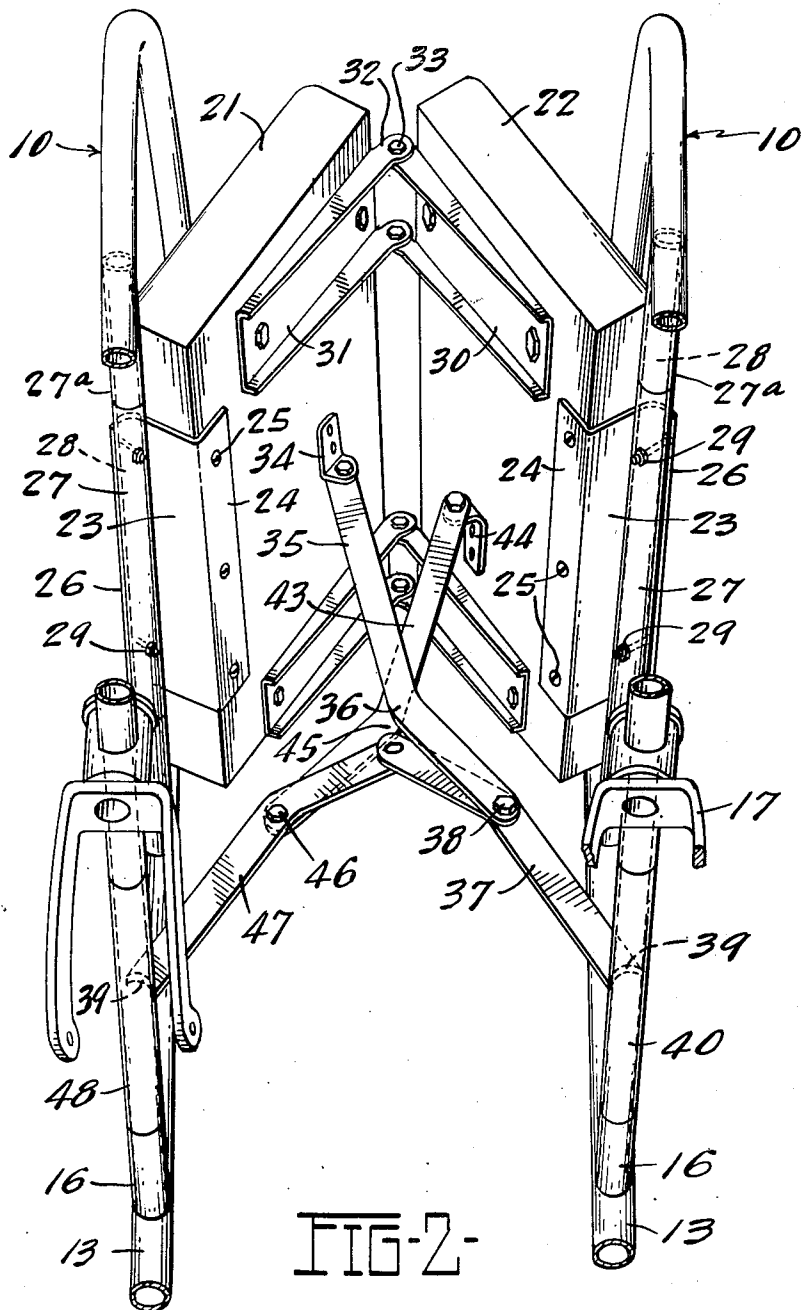


FIG-2-

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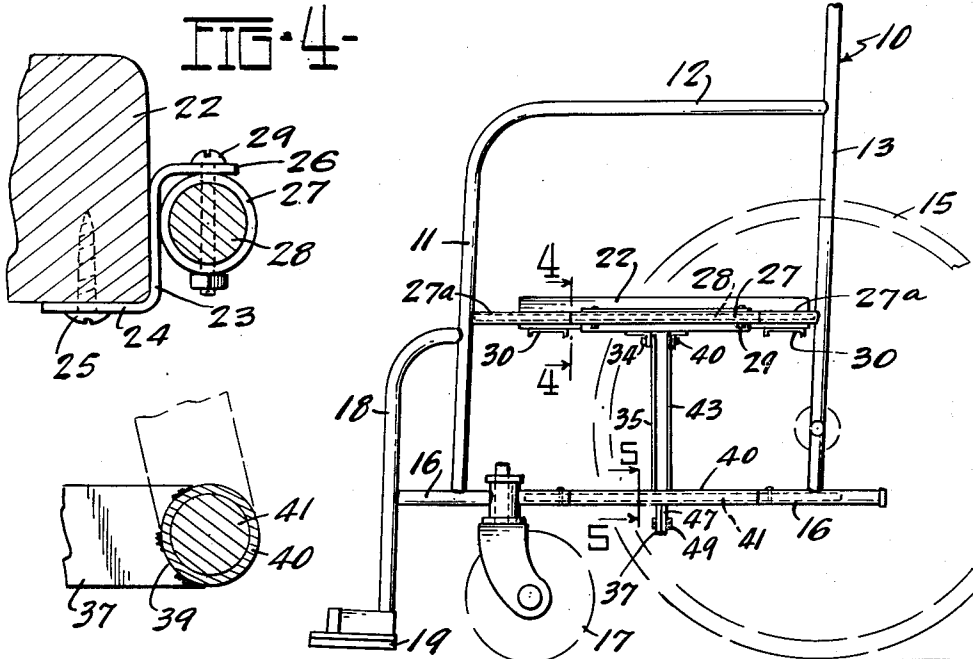


FIG. 5-

FIG. 3-

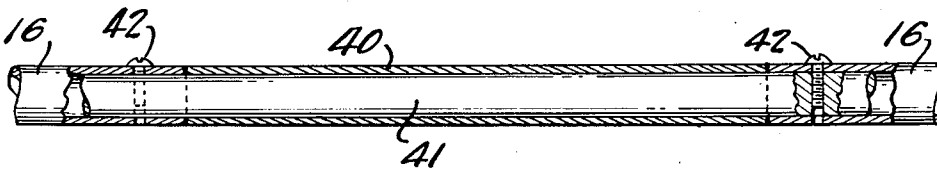


FIG. 6-

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INVALID FOLDING CHAIR MECHANISM

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Application May 14, 1956, Serial No. 584,861

12 Claims. (Cl. 155—140)

This invention relates to invalid chairs but more particularly to invalid chairs which are capable of being folded or collapsed when not in use.

It is a desideratum to produce an invalid folding chair which can be folded or collapsed with the exertion of less effort. Heretofore the flexible fabric back supporting panels for these chairs have been somewhat loose when the chair is in position of use due to the linkage employed. A loose back panel is not desirable because it detracts from the comfort of the occupant. It is therefore a desideratum to overcome this difficulty and provide a structure which has a taut back when in position of use. It is also desired that when the chair is in its collapsed form that it be stable which calls for a proper separation of the sides so that in its supported position it will not readily tip over.

Objects of the invention are to produce an invalid chair having the advantageous folding or collapsible features above recited; to produce a new and improved linkage for invalid wheel chairs which can be readily and economically manufactured and installed; and to produce a chair having the simple and efficient features of construction, arrangement and operation hereinafter described.

Other objects and advantages will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings in which:

Figure 1 is a front perspective view of an invalid wheel chair;

Figure 2 is a bottom perspective view on an enlarged scale of the wheel chair in Figure 1, in partially folded condition, some of the parts being omitted for the purpose of clarity;

Figure 3 is a side elevation of the wheel chair, the wheel and caster being shown by broken lines to enable the linkage and associated parts to be viewed more clearly;

Figure 4 is an enlarged transverse section substantially on the line 4—4 of Figure 3;

Figure 5 is an enlarged transverse section on the line 5—5 of Figure 3;

Figure 6 is an enlarged fragmentary view in longitudinal section showing a hinge tube connected to the lowermost horizontal rail of the chair; and

Figures 7 and 8 are somewhat diagrammatic front end elevations of the chair with the foot rests and casters omitted, showing the chair in unfolded position or position of use and in collapsed position respectively.

The illustrated embodiment of the invention comprises an invalid wheel chair of collapsible form and consists of a pair of vertically disposed laterally spaced side frames 10 formed from welded tubing. As shown, each side frame has a front vertical tube 11, the upper portion of which is bent rearwardly into a horizontal portion 12 constituting an arm rest. Fixed to the rear end of each arm rest is a vertically disposed rear tube 13, portions of which project above and below the arm rest. The upper

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end of each vertical tube is bent rearwardly and provided with a hand grip 14.

Suitably journaled in bearings on the lower portion of each vertical tube 13 is a relatively large wheel 15 provided with the usual annular rim 15' enabling hand propulsion of the chair by the occupant. Welded to the lower end of the front and rear vertical tubes 11 and 13 respectively are horizontally disposed tube sections 16 with which telescope a bearing rod, as will hereinafter be described, making in effect a rigid lower horizontal rail between the fore and aft vertical tubes.

Suitably fixed to the front tube section 16 of each side frame is a caster assembly 17 for supporting the front portion of the chair. Since this assembly forms no part of the present invention, detailed description thereof is not considered necessary.

Welded to an intermediate portion of each of the front vertical tubes 11 and extending forwardly and then downwardly is a tubular member constituting a bracket for a foot rest plate 19 which is pivotally mounted to swing about the horizontal axis to and from position of use. An intermediate portion of each of the tubes 18 for bracing purposes is welded to the front end of the adjacent front tube section 16.

Connected to the upper portion of the rear vertical tubes 13 in the regions above and below the arm rests 12 is a back rest panel 20 of flexible sheet material, such as canvas. Beneath the lower edge of the flexible back rest panel 20 is a pair of rigid seat panels 21 and 22, the upper sides of which are suitably upholstered for comfort.

At the outer side portion of each of the seat panels is a metal bracket plate 23 which abuts flatly against the outer side of the respective panel and has an integral inwardly turned flange 24 which engages the bottom of the respective panel, to which it is secured by a series of screws 25. At the upper end of each bracket 23 is an integral outwardly extending flange 26 which overlies a hinge tube or sleeve 27. Each sleeve 27 is mounted upon a rotatable rod 28, the ends of which telescope inside of tube sections 27a which are respectively welded to the front vertical tube 11 and rear vertical tube 13 at points approximately midway of their length. Screws 29 connect the respective bracket flange 26, hinge sleeve 27 and rod 28. Manifestly, longitudinal shifting movement of the hinge sleeves 27 is prevented by the adjacent ends of the tube sections 27a.

The seat panels 21 and 22 are hingedly connected by two pair of hinges on the undersides thereof and arranged in fore and aft relation. Each of the hinges comprises a pair of metal channel leaf elements 30 and 31 which are rigidly bolted to the underside of the seat panels. These leaf members are formed with overlapping areas 32 which have registering apertures to receive bolt and nut assemblies 33 constituting the pivotal elements. The leaves of the hinges abut in such manner that a positive stop is afforded when the seat panels are in their horizontal position or position of use, limiting the downward movement thereof and preventing sagging of the seat when loaded.

Disposed substantially centrally between the front and rear ends of the seat panel 21 on the underside thereof is an angle bracket 34 which is rigidly secured thereto. Pivoted to the bracket 34 is a brace arm 35 which inclines downwardly and laterally when the chair is in position of use as indicated on Figure 1. For a purpose hereinafter to be described, the arm 35 has a bend in it forming a dog-leg in the lower portion, as indicated at 36. The lower end of the brace arm 35 is pivotally connected to an intermediate part of a horizontal link 37 by a bolt and nut assembly 38. The outer end of the link 37 is formed with an inwardly curved or recessed portion 39 to fit the

central portion of a hinge sleeve 40 to which it is welded. As indicated on Figure 6, the sleeve 40 can work upon a rod 41, the ends of which telescope within the tube sections 16 and are secured thereto by screws 42, the ends of the sleeve 40 abutting or in close juxtaposition to the adjacent ends of the tube sections 16.

Viewing the chair from the front, a brace arm 43 is disposed in rear of and spaced from the brace arm 35. The upper end of the arm 43 is pivotally connected to an angle bracket 44 which is rigidly fixed to a central portion of the underside of the seat panel 22. The arm 43 is also of dog-leg form with a bend 45 extending in a direction opposite to that of the arm 35. The lower end of the brace arm 43 is pivoted at 46 by a bolt and nut assembly to a horizontal link 47 which at its outer end has a similar curved or recessed end welded to a hinge sleeve 48. The hinged sleeve 48 is mounted similar to the hinged sleeve 40 above described. The adjacent ends of the horizontal links 37 and 47 are pivotally connected at 49, and it will be observed that from the pivots 38 and 46, the links 37 and 47 incline downwardly so that the pivot 49 is spaced below the pivots 38 and 46.

It is important to the proper functioning of the folding linkage that when the chair is in position of use, the center pivot 49 of the horizontal links 37 and 47 be below the pivots 40 and 48 by which these links are connected to the side frames. It is further important that the pivot 38 be located above a theoretical straight line passing through the pivot 49 and the pivot sleeve 40. Similarly the pivot 46 must be located above a theoretical straight line passing through the pivot 49 and the pivot sleeve 48. It is also important that the pivot of the bracket 34 be located below a theoretical straight line passing through the pivot 33 and the sleeve 27. A similar positioning must be observed with respect to the pivot of the bracket 44. If these pivot locations are adhered to, the linkage produces the desired end positions and folding motion in the chair. Such linkage has the added advantage of militating against the lower parts of the side frames from spreading farther apart, even after extended and abusive use.

Assuming the chair is in its position of use, such as shown in Figure 1, it may be readily collapsed by lifting on a central portion of the divided seat. As the center hinges of the divided seat and the center hinge 49 of the transverse links move upward simultaneously, the first resultant action is that the side frames 10 move outward slightly, both at the elevation of the seat and at the elevation of the links. This outward movement is small and its effect is to stretch the cloth chair back 20 just a little tighter, the increased tension being negligible. The outward movement of the side frames ceases at the elevation of the seat when the center seat hinges have reached a position level with the side hinges of the seat, and ceases at the elevation of the transverse links at a similar time. Continued upward movement of the center hinges then causes the side frames to approach each other. The brace arms 35 and 36 not only transfer motion from the seat panels to the horizontal links 37 and 47, but, by virtue of their length, rigidity, and precisely located pivoted ends, cause the links to have almost the identical motion of the seat panels, and at the same time provide continual stability for the chair from its position of use to its completely folded position.

The chair is locked in position and will not collapse from sideway thrust, regardless of whether the chair is occupied or not. It can be collapsed only by deliberately raising the center of the divided seat. This is due to positioning the center seat hinges below the side seat hinges when in position of use, and the positive overtravel stop on the center hinges.

It will be manifest that the chair, and particularly the linkage employed, can be manufactured economically and assembly of the parts can be effected without difficulty.

Thus the chair lends itself admirably to large quantity production on an efficient basis.

It is to be understood that numerous changes in details of constructions, arrangement and operation may be effected without departing from the spirit of the invention, especially as defined in the appended claims.

What we claim is:

1. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

2. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter, the pivotal connection between said links being at a point lower than the pivotal connections between said brace arms and links.

3. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, said brace arms being spaced from each other, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter, the pivotal connection between said links being at a point lower than the pivotal connections between said brace arms and links.

4. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, the lower end portions of said brace arms being bent in dog leg fashion and in opposite directions, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

5. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, the adjacent end portions of said links inclining downwardly toward each other, a hinge connection between the outer end of each link and the

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adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

6. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, the bottom surfaces of said seat panels being disposed slightly below the upper rails, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

7. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, the pivotal connection between said links being below the hinge connections between the links and the lower rails, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

8. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter, said last pivotal connections being located above a theoretical straight line passing through the pivotal connection between said links and the hinge connections between the links and the lower rails.

9. A folding chair comprising a pair of laterally spaced upright side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, the pivotal connection between said links being below the hinge connections between the links and the lower rails, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter, said last pivotal connections being located above a theoretical straight line passing through the pivotal connection between said links and

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the hinge connections between the links and the lower rails.

10. A folding chair comprising a pair of laterally spaced upright side frames, a flexible fabric back connected to said side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively and located below a theoretical straight line passing through such pivotal connections and the hinge connections between said seat panels and the upper rails, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

11. A folding chair comprising a pair of laterally spaced upright side frames, a flexible fabric back connected to said side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and adjacent lower rail, the pivotal connection between said links being below the hinge connections between the links and the lower rails, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively and located below a theoretical straight line passing through such pivotal connections and the hinge connections between said seat panels and the upper rails, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter.

12. A folding chair comprising a pair of laterally spaced upright side frames, a flexible fabric back connected to said side frames, each side frame having a pair of vertically spaced parallel horizontally disposed rails, a seat including a pair of relatively rigid seat panels hingedly connected, a hinge connection between each seat panel and the adjacent upper rail, a pair of links pivoted together at the adjacent ends, a hinge connection between the outer end of each link and the adjacent lower rail, the pivotal connection between said links being below the hinge connections between the links and the lower rails, a pair of crossed brace arms, pivotal connections between the upper ends of said brace arms and the said seat panels respectively and located below a theoretical straight line passing through such pivotal connections and the hinge connections between said seat panels and the upper rails, and pivotal connections between the lower ends of said brace arms and said links respectively intermediate the ends of the latter, said last pivotal connections being located above a theoretical straight line passing through the pivotal connections between said links and the hinge connections between the links and the lower rails.

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