Nov. 24, 1959 W. E. MIZE 2,914,111

FOLDING WHEEL CHAIR

Filed March 6, 1958

Fig. 1

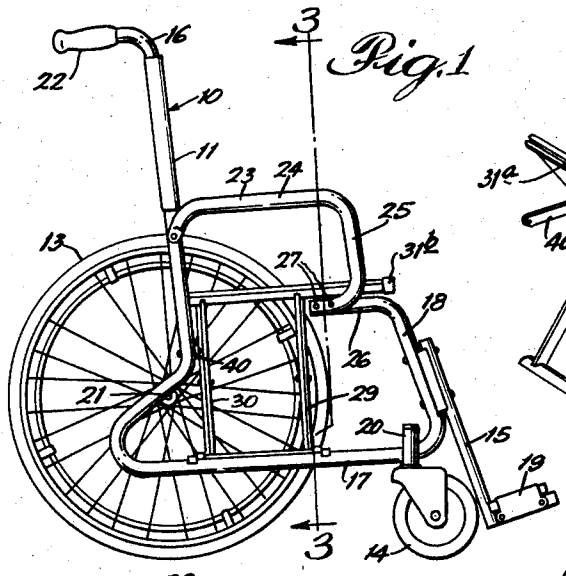


Fig. 2

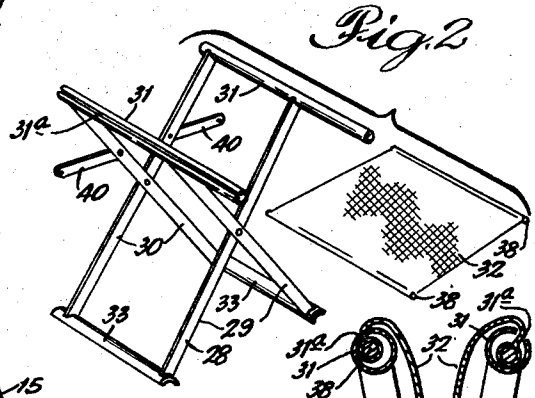


Fig. 5

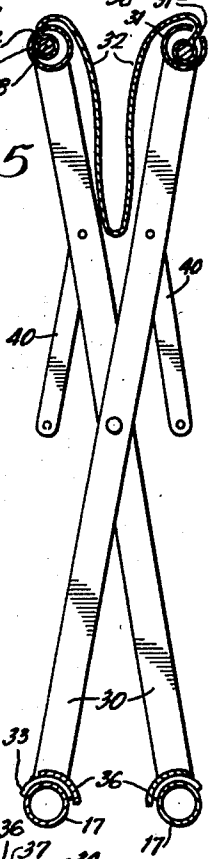


Fig. 3

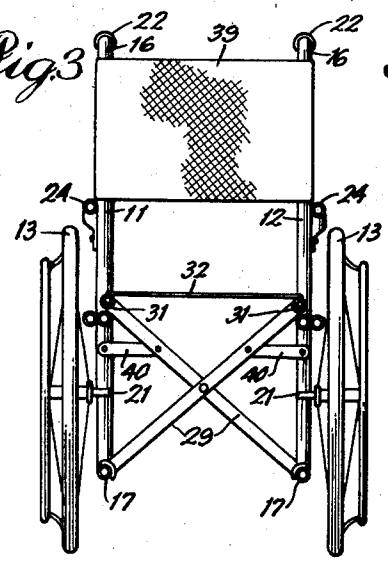


Fig. 4

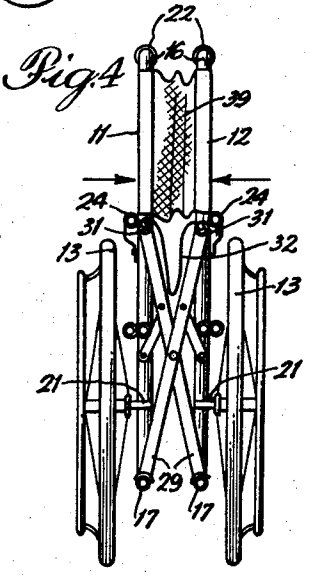


Fig. 6

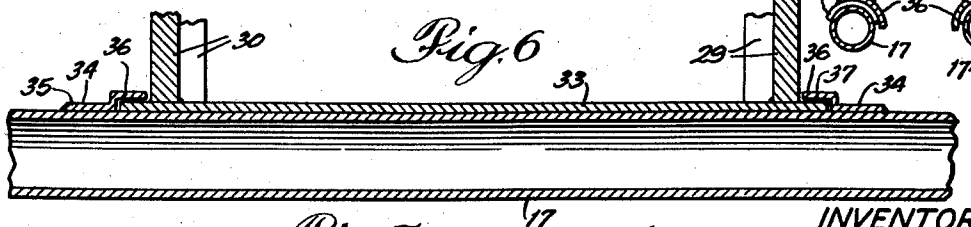
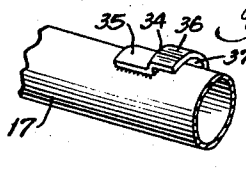


Fig. 7



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FOLDING WHEEL CHAIR

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7 Claims. (Cl. 155—28)

This invention relates to wheel chairs, and more specifically, to an improvement in folding or collapsible wheel chair construction.

One of the principal objects of the present invention is to provide a folding wheel chair of relatively simple construction which has considerably fewer parts than conventional wheel chairs and which may be easily assembled and disassembled. In this connection, it is a specific object to provide a folding wheel chair having a pair of side frames each being of unit tubular construction while also being adapted for pivotal connection to a folding mechanism. Consequently, the side frames of the chair may be disconnected from the folding mechanism to which they are coupled without the necessity as in existing constructions of disassembling the side frames themselves.

Another object is to provide a folding wheel chair having an improved folding mechanism which, in combination with the side frames, provides a tractable chair which will traverse uneven ground with a minimum of effort on the part of the occupant and which, at the same time, is extremely sturdy and durable. A further object is to provide a folding mechanism which supports a "floating" seat, the simplicity of connection between the folding mechanism and the side frames facilitating the interchange of such mechanisms of different sizes to provide seats of various dimensions. A still further object is to provide an improved connection between the fabric seat and the linkage mechanism so that the seat may be easily and quickly removed and replaced.

Other objects will appear from the specification and drawings in which:

Figure 1 is a side elevation of a wheel chair embodying the present invention, the chair being shown with the large right hand drive wheel removed therefrom for clarity of illustration,

Figure 2 is a perspective view showing the seat and folding mechanism in disassembled condition.

Figure 3 is a vertical sectional view taken along line 3—3 of Figure 1 and showing the chair in operative condition.

Figure 4 is a vertical sectional view similar to Figure 3 but showing the chair in collapsed or folded condition.

Figure 5 is an enlarged vertical section of the folding mechanism illustrating the manner in which the fabric seat is secured thereto.

Figure 6 is an enlarged longitudinal section through the tubular base portion of a side frame showing the manner in which the linkage assembly is connected thereto.

Figure 7 is a broken enlarged perspective view of the lower tubular portion of a side frame showing structural details of the linkage connecting means.

In the embodiment of the invention illustrated in the drawings, the numeral 10 generally designates a folding wheel chair equipped with a pair of tubular side frames 11 and 12, spoked drive wheels 13, pivotal front wheels 14 and foot rests 15. Each frame comprises a single piece of tubing formed to provide an upstanding rear leg or back portion 16, a lower horizontal base portion 17, and an upwardly and rearwardly inclined front leg portion 18. The leg rests 15 are bolted or otherwise connected to the inclined front portion of each tubular side frame and slope downwardly and forwardly, terminating in footrest panels 19 disposed in front of the pivotal caster wheels 14. The wheels 14 are attached to the front ends of the horizontal frame portions 17 by vertical sleeves 20 which may be welded thereto and which rotatably receive the upstanding pintles of the front wheel units.

The rear drive wheels 13 are independently mounted upon separate axles 21 which are secured to the respective side frames 11 and 12. In Figure 1 it will be seen that the lower part of rear frame portions 16 slope downwardly and rearwardly and that the axles 21 are secured to the lower surfaces thereof. At their upper ends, the upstanding tubular rear portions 16 curve rearwardly and receive a pair of resilient handle grips 22.

Preferably, a one-piece tubular armrest 23 is secured to each of the side frames. In the illustration given, each of the armrests has a horizontal upper portion 24 and a depending front portion 25 formed integrally therewith. The rear end of the horizontal upper portion angles downwardly and is bolted or otherwise secured to the rear portion of a side frame. The lower end of the depending portion 25 curves rearwardly and lies alongside the rearwardly turned horizontal portion 26 of the frame to which it is rigidly secured by transversely extending bolts 27.

The two side frames are connected for movement towards and away from each other by a cross linkage assembly generally designated by the numeral 28. This assembly includes front and rear pairs of cross bars 29 and 30, the bars of each pair being intermediately connected for pivotal scissor operation. To the upper ends of the paired cross-bars are secured a pair of horizontal and parallel seat-supporting members 31 which are adapted for detachably holding opposite side edges of a flexible seat 32. The lower ends of the crossbars are welded or otherwise secured to a pair of horizontal and parallel hinge members 33. A shown most clearly in Figures 2, 5 and 6, each of the hinge members is horizontally elongated and has an arcuate cross section providing a concave lower surface of substantially the same curvature as the periphery of the side frames' lower tubular portions 17. The lower ends of the cross bars are fixed to the convex upper surfaces of the arcuate hinge members with opposite ends of the horizontal members projecting forwardly and rearwardly therebeyond.

When the chair is in assembled condition hinge members 33 rests upon the straight tubular lower portions 17 of the side frames and, because of the concentric relationship of the parts, the hinge members may slide circumferentially over tubes 17. However, longitudinal sliding movement of the parts is prevented by a pair of retaining members 34 fixed to the upper surface of each frame portion 17. Like the hinge members, the retaining members are arcuate and are concentric with the cylindrical tube upon which they are mounted. Each retaining member has an outer portion 35 which is in surface engagement with tube portion 17 and is preferably welded thereto. The inner portion 36 of each retaining member is stepped upwardly to define an arcuate space 37 between it and the periphery of the tubular frame. When the retaining members are fixed in spaced opposing relation upon each of the lower frame portions 17, as shown in Figure 6, spaces 37 receive the end portions of the hinge members 33 which project beyond the front and rear sets of crossbars. Therefore, the retaining members restrain longitudinal movement of the elongated

hinge members and, at the same time, hold the hinge members in surface contact with the lower sections of the tubular side frames.

From Figure 5 it will be seen that the angular cross sectional dimensions of the hinge members and retaining members are substantially the same, about 45°. Thus, by rotating the hinge members **33** sufficient distances about the periphery of tubular portions **17**, the cross linkage assembly **28** may be disengaged or uncoupled from the side frames. However, such disengagement is possible only by spreading or expanding the linkage assembly since the retaining members are mounted on top of the horizontal frame portions **17** and overlap the hinged members in increasing amounts as the crossbars **29** and **30** approach vertical positions.

Although the folding mechanism may be detached from the side frames (after the horizontal link members and the backrest have been disconnected from the frames, as hereinafter explained) by spreading the crossbars until the hinge members **33** clear the overlapping portions **36** of the retaining members, such a degree of spreading movement can be accomplished only when seat **32** is removed from the upper members of the linkage assembly because the lateral dimensions of the flexible seat permit only a limited range of movement. Referring to Figures 2 and 5, it will be seen that each of the horizontal seat-supporting members **31** is tubular in configuration and is provided with a longitudinally-extending slit **31***a*. These slits face upwardly and outwardly and receive the side portions of the flexible seat **32**. Rods **38** of smaller diameter than the inside diameter of tubes **31** are securely attached to the lateral edge portions of the seat and effectively hold the seat's edge portions within the tubes. In the illustration given, the side edge portions of the seat are wrapped about the locking rods **38** to hold the elements together. The seat proper may be formed from a fabric such as canvas or any other suitable material having the properties of strength, flexibility and durability. End caps **31***b* are threaded or otherwise detachably secured to the ends of seat supporting tubes to hold the rods **38** and the removable seat in place.

When detachment of seat **32** from the linkage assembly is desired, the terminal caps **31***b* are removed and the seat is simply drawn forwardly to withdraw covered rods **38** from the tubular seat supporting members **31**. It will be noted that such detachment will not occur when the chair is in use or when a weight of sufficient magnitude is imposed upon the fabric seat because of the surface contact between the fabric and the upper outer surfaces of the supporting tubes **31**, as well as the frictional resistance produced between the tubes' inner surfaces and the covered rods.

The same material used for the seat **32** may be used in forming a flexible backrest **39** which is attached to the upstanding rear portions **16** of the side frames. Preferably, the side portions of the backrest are reversely turned and stitched to provide sleeves for slidably receiving the upstanding frame portions.

Aside from hinge members **33**, the only positive connection between the side frames and the folding mechanism consists of a pair of links **40** which extend between the upper portions of rear crossbars **30** and the lower portions of the upstanding frame members **16**. Preferably, the links are detachably secured to the side frames by bolts to facilitate assembly and disassembly of the wheel chair. Since the seat supporting members **31** are not directly connected to the chair's side frames, the seat may be characterized as a "floating" seat capable of limited independent movement. Conversely, the paired side frames are capable of limited movement with reference to each other and with reference to the seat. The flexibility inherent in this construction not only tends to cushion shocks and provide greater comfort for an occupant, but also makes it easier for the invalid to move the chain over bumps, ridges, etc. in a floor or ground surface. At the same time, the tubular unit frame construction is responsible for providing a folding wheel chair which is extremely strong and sturdy for its weight.

When the chair is to be readied for use, the side frames are separated to the extent permitted by the folding assembly **28** connected thereto by pivotal links **40**, and by the width of the backrest panel **39** (Figure 3). When the chair is to be stored, the frames are pushed together, as illustrated in Figure 4, so that the folded structure will occupy a minimum amount of space.

From the foregoing, it is believed evident that the seat **32** and backrest **39** may be easily and quickly removed from the wheel chair for cleaning, repair or replacement. If desired, the side frames may be completely disconnected from the linkage assembly (after the seat and backrest have been removed) by simply unbolting links **40** from the frames and then opening the scissors linkage until hinge members **33** have rotated free from overlapping portions **36** of retaining members **34**. Such ease of disassembly is important not only for purposes of repair but also in instances where it is desirable to interchange the cross linkage assembly with an assembly having crossbars of different length. For example, where a patient or customer requires a wheel chair having a seat of greater than average width, the linkage assembly may be replaced with one having crossbars **29** and **30** of greater length so that a wider seat **32** may be substituted without varying the height of that seat when the chair is in expanded or unfolded condition. In this manner, folding wheel chairs of a variety of lateral dimensions may be provided by simply interchanging cross linkage assemblies, seats and backrests of different sizes.

While in the foregoing I have disclosed an embodiment of the present invention in considerable detail for purposes of illustration, it will be understood by those skilled in the art that many of these details may be varied widely without departing from the spirit and scope of the invention.

I claim:

1. A folding wheel chair comprising a pair of side frames each having a lower horizontal tubular portion, a cross-linkage assembly connecting said side frames and having crossbars provided at their lower ends with horizontal hinge members, said hinge members being mounted upon said horizontal tubular portions for circumferential sliding movement thereon when said frames are moved towards and away from each other, and retaining members provided by said horizontal tubular portions for preventing axial movement of said hinge members therealong and for holding said hinge members in surface contact with the outer surfaces of said horizontal portions.

2. The structure of claim 1 in which each of said hinge members is elongated and has an arcuate cross section providing a concave lower surface for engaging the upper surface of a horizontal tubular frame portion.

3. The structure of claim 1 in which said crossbars are equipped at their upper ends with parallel and substantially horizontal seat-supporting tubes, said tubes being provided with longitudinally extending slits, and a flexible seat having side portions extending into said tubes through the slits thereof and being longitudinally slidable therealong, and means provided by said seat and disposed within said tubes for preventing outward radial movement of said side portions through said slits.

4. A folding wheel chair comprising a pair of tubular side frames extending along parallel vertical planes, each of said side frames having a substantially horizontal lower frame portion, a cross-linkage connecting said side frames for movement towards and away from each other comprising a pair of cross members pivotally connected to each other intermediate their ends and hingedly supported upon said horizontal frame portions at their lower ends, a pair of parallel and substantially horizontal seat-supporting members fixed to the upper ends of said cross

members, a flexible seat extending between said seat-supporting members, said cross members of said cross-linkage being provided at their lower ends with a pair of parallel hinge members, said hinge members being horizontally elongated and being supported upon said horizontal frame portions for circumferential sliding movement thereon, and retaining means provided by said horizontal frame portions for restraining movement of said hinge members along the axis thereof and for holding said hinge members in surface contact with the horizontal frame portions.

5. The structure of claim 4 in which said hinge members have arcuate cross sections and are concentrically disposed upon said horizontal frame portions, said restraining means comprising a pair of members longitudinally spaced upon each of said horizontal frame portions and having arcuate portions overlapping the opposite ends of the hinge members.

6. The structure of claim 2 in which said retaining members are arranged in spaced-apart pairs on each of said horizontal tubular portions, said retaining members

being provided with arcuate portions overlapping the opposite ends hinge members.

7. The structure of claim 4 in which said seat-supporting members are tubular and are longitudinally slitted, said flexible seat having side portions extending into said tubular seat-supporting members through the slits thereof and being longitudinally slidable along said members for removal and replacement of said seat, and means provided by said seat and disposed within said tubular seat-supporting members for preventing outward radial movement of said side portions through said slit.

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CERTIFICATE OF CORRECTION

Patent No. 2,914,111 November 24, 1959

William E. Mize

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 2, after "ends" insert -- of the --.

Signed and sealed this 10th day of May 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents