March 29, 1960 W. E. MIZE 2,930,429

FRAME STRUCTURE FOR FOLDING WHEEL CHAIR

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Fig. 5.

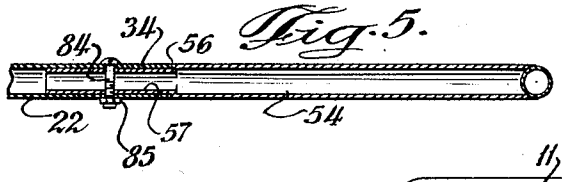


Fig. 1.

Fig. 6.

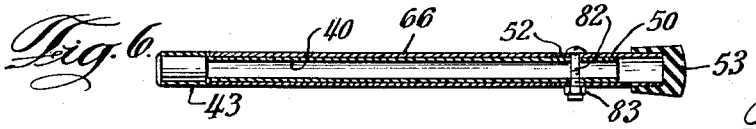


Fig. 4.

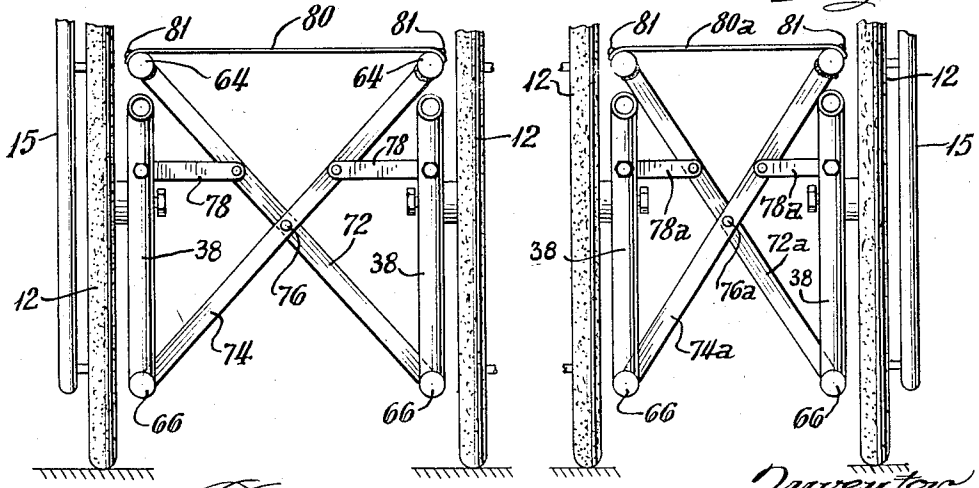


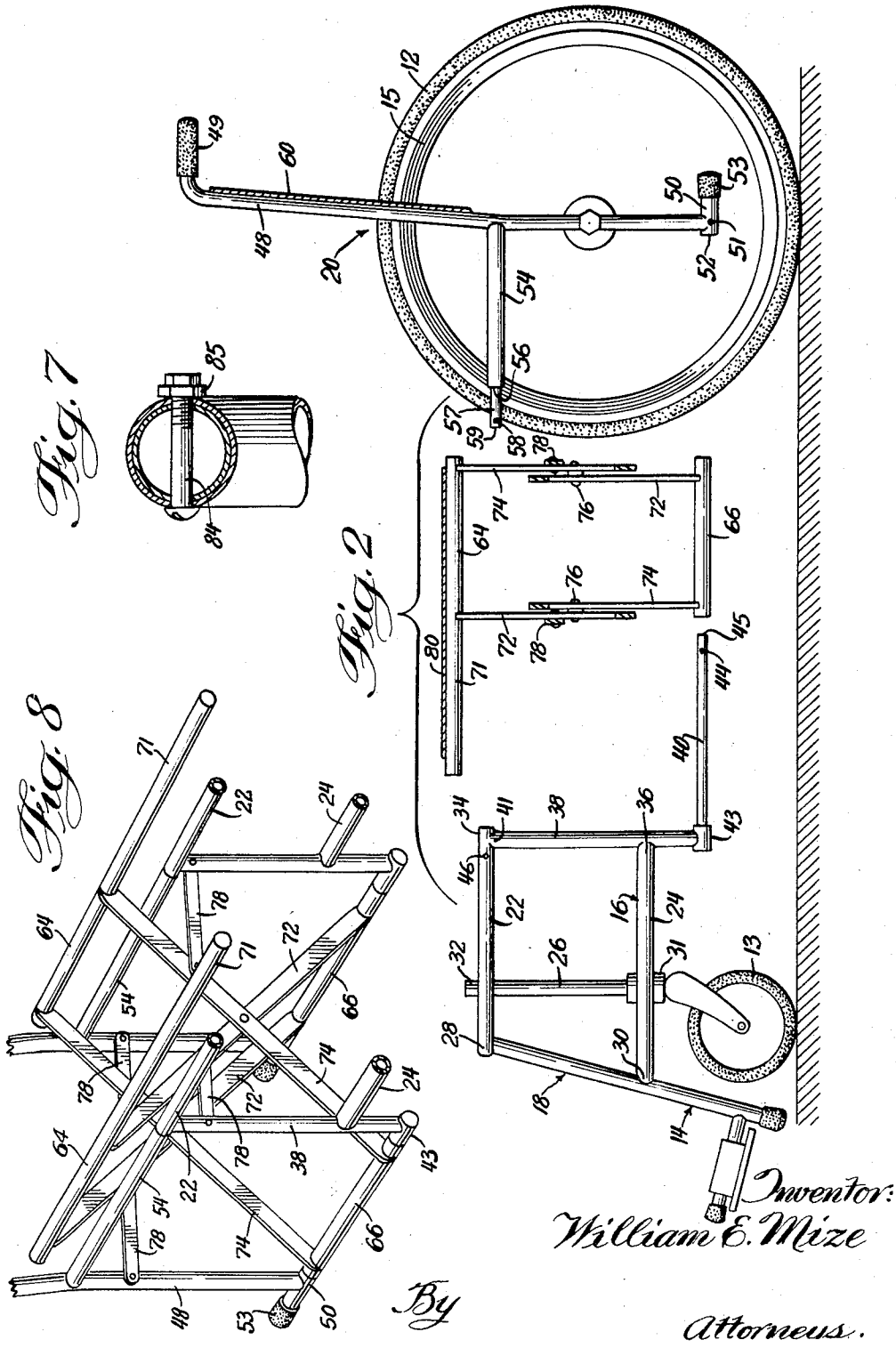
Fig. 3.

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FRAME STRUCTURE FOR FOLDING WHEEL CHAIR

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FRAME STRUCTURE FOR FOLDING WHEEL CHAIR

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Application March 26, 1956, Serial No. 573,811

3 Claims. (Cl. 155—30)

This invention relates generally to folding wheel chairs for invalids and more particularly is concerned with a novel frame structure for such wheel chairs.

The conventional folding wheel chair consists of a pair of vertically arranged, laterally spaced side frames fabricated from tubular metal and permanently interconnected by a collapsible cross-linkage or brace which permits lateral movement of one side frame relative to the other. The distance between side frames when the chair is unfolded or what contributes to the width of the chair seat, is determined by the length of the cross-members forming said folding linkage or brace. A manufacturer may be required to provide a great variety of models, such as chairs having different widths for the chair seat, or chairs having variations in the side frame structure such as to mount the drive wheels at the front instead of the rear of the chair or to support different types of leg and foot rest supports. Such variations in chair models require the manufacturer to have different tools, dies, jigs and the like for assembling the different models, and of course, the cost of manufacturing the wheel chairs in a complete line capable of satisfying such varying public demand will be substantially increased.

It is therefore a principal object of the invention to provide a novel frame structure for folding wheel chairs which includes a side frame formed of two separate units and a folding linkage capable of being detachably assembled in a manner substantially eliminating the disadvantages hereinabove mentioned.

Another object of the invention is to provide a frame structure of the character described which will enable advantageous interchanging of said side frames and folding linkage to achieve a standardized assembly for such folding wheel chairs in a great variety of models.

A further object of the invention is to provide a wheel chair frame structure of the character described which enables the same side frames to be employed in manufacturing folding wheel chairs of different width, and the same cross-linkage to be used where variations in side frames are required.

Another object of the invention is to provide a frame structure for folding wheel chairs of the character described which is characterized by a small number of parts; which is simple and economical to construct and assemble, and which may be knocked down and reassembled if the need should arise; and which is durable and strong.

These and other objects of the invention will become apparent as the description thereof evolves, in connection with which a preferred embodiment of the invention has been described in detail in the specification and illustrated in the accompanying drawings. It is contemplated that minor variations may be made in the size, arrangement, proportion and construction of the several parts of the invention without departing from the scope or sacrificing any of the advantages thereof.

In the drawings, wherein the same reference characters

have been employed to designate the same or equivalent parts throughout the several figures thereof:

Fig. 1 is a side elevational view of an assembled folding wheel chair embodying the principles of the invention.

Fig. 2 is an exploded elevational view showing the relationship of the folding cross-linkage of the invention with respect to one of the side frames of the chair, this relationship being identical for the other side frame.

Fig. 3 is a fragmentary front elevational view of a said chair and Fig. 4 is a similar view of the same chair of different width.

Fig. 5 is a sectional view taken through said chair along the line 5—5 of Fig. 1 and in the direction indicated.

Fig. 6 is a sectional view taken through the chair along the line 6—6 of Fig. 1 and in the direction indicated.

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 1 and in the direction indicated.

Fig. 8 is a perspective view of the foldable cross-linkage or brace employed in the invention, the cross-linkage being shown in combination with the side frame members of a wheel chair to which it is normally connected.

Referring to the drawings, the wheel chair embodying the invention has been designated generally by the reference character **10**. Same resembles a conventional wheel chair in external appearance to include a pair of vertically arranged, laterally spaced side frames interconnected by a folding cross-linkage which is novel in construction to permit achievement of the advantages herein enumerated. The side frames each include a side arm support **11** and each mounts a drive wheel **12** and smaller caster wheel **13**. A leg rest assembly **14** is installed at the front of the chair. The hand rim **15** for propelling and steering chair **10** is associated with drive wheel **12** in a well known manner.

The width of the seat of the chair is determined by the size of the folding linkage interconnecting the side frames. Heretofore, the side frames each comprised tubular metal members interconnected to form a unitary structure and variations in construction of the side frames required different assembly techniques and equipment. The same applied in the case of different chair models for providing variations in the width of the chair seat. These problems are entirely eliminated by means of the novel frame structure for folding wheel chairs hereinafter described.

The novel assembled side frame embodying the invention has been designated generally **16** in Fig. 1. A pair of side frames **16** are employed in each completed chair, the frames being identical so that description of one will suffice. Referring to Fig. 2, said side frame **16** is comprised of two principal units designated **18** and **20** respectively, the unit **18** being positioned at the front of the chair and unit **20** at the rear thereof. Each of the said units preferably is formed of hollow tubular metal members connected together advantageously to provide vertically arranged assemblages.

The unit **18** is comprised of a pair of vertically spaced, horizontal straight sections **22** and **24** rigidly secured as by welding intermediate the ends thereof to a vertical post **26**. Secured to the forward or front ends **28** and **30** respectively of said sections is a leg rest assembly **14**, said assembly being angularly offset relative to said sections. In the embodiment shown, the leg rest assembly **14** is of the non-adjustable type, however, an adjustable leg rest assembly may also be pivotally connected at the end **28** of section **22**, in which the section **24** will not be attached to the leg rest assembly. Thus, it will be apparent that front unit **18** may be fabricated with a suitable

leg rest assembly installed either to provide an adjustable or non-adjustable assembly without varying the basic structure of the unit.

The vertical post **26** comprises the front vertical support post of the chair. The lower end thereof mounts the caster wheel **13** by means of the bearing **31** attached on said lower end in a well known manner. The upper end **32** of said post **26** extends above the horizontal section **22** a short distance and it is preferred said end **32** be open so as to provide a socket for mounting the arm support **11** in accordance with the disclosure of my co-pending application for an invention entitled, Removable Side Arm Support for Wheel Chairs, filed March 26, 1956 and bearing Serial No. 573,810, now abandoned.

Rigidly secured between the rear ends **34** and **36** respectively of sections **22** and **24** is one leg **38** of an L-shaped member, the second leg **40** being disposed offset below the section **24** and extending outwardly of said unit **18** or toward the rear of the assembled chair. The leg **38** is secured at its end **41** to the bottom edge of said section **22** so that the end **34** of section **22** is clear and open. The opposite extremity of the leg **38** mounts a hollow fitting **43** in which leg **40** is secured at an end thereof. The outside diameter of leg **40** is less than the outside diameter of leg **38** or section **22**. The leg or shaft **40** will be seen to be arranged in a horizontal plane and has a transverse opening **44** therethrough adjacent its free end **45**. Likewise a transverse opening **46** is provided through section **22** spaced inwardly of the juncture between section **22** and leg **38**. As explained, the unit **18** is arranged in a vertical plane at the front of the chair, so that the leg **40** actually extends rearwardly and the end **34** of section **22** opens towards the rear of the completed chair.

The unit **20** comprises an elongate vertical post **48** which comprises the rear vertical support post of the chair. Said post is bent at its upper end to provide a handle **49**, the lower end being attached to a hollow fitting **50** perpendicular thereto. The fitting **50** is open at its forward end **52** or toward the front of the chair and closed at its rear end by a resilient shoe or bumper **53**. It will be noted that the fitting **50** has the major portion thereof extending rearward from the post **48** to provide a socket opening toward the front of the chair.

Secured intermediate the extremities of said post **48** is a tubular bar **54**, the bar **54** being secured at one end thereof in a substantially horizontal plane and extending oppositely from fitting **50** or toward the front of the chair. Secured to the free end face **56** of said bar is a reduced diameter shank **57** having a transverse opening **58** therethrough adjacent the free extremity **59** thereof.

The vertical distances between the longitudinal axes of the bar **54** and fitting **50** and between the longitudinal axes of the leg **40** and section **22** are equal. The diameter of the shank **57** is sufficient to permit insertion into open end **34** of the section **22** while the diameter of the leg **40** is sufficient to permit insertion into fitting **50**. The dimensions of the various parts of said units **18** and **20** are such that upon mating engagement of leg **40** and fitting **50**, the respective openings **44** and **51** therein will be aligned one with the other, and upon mating engagement of shank **57** with hollow section **22** through open end **34**, openings **46** and **58** will be aligned one with the other. Thus, the units **18** and **20** each have inwardly facing sockets and complemental inserts which are capable of being telescopically and detachably connected together to complete the side frames of the chair.

The rear unit **20** has been shown mounting the drive wheel on the vertical support post **48**. The upper portion of said post **48** has secured thereto one end of a bracket support member **60**, the other end being secured to the post of the opposite side frame in a well known manner. In addition, means may be provided on a said post **48** for detachably connecting the arm support **11** at its end opposite to its connection in socket **32** as explained in my said co-pending patent application. Such means have been deemed unnecessary to illustrate in this application. Other means for securing the arm supports are suitable within the scope of the invention.

Referring to Fig. 8, the cross-linkage employed in the invention has been designated generally **62**. Same includes a pair of identical laterally spaced end frames of generally rectangular configuration, each end frame providing a pair of horizontally arranged, vertically spaced sections **64** and **66**. The members **66**, **66** are each hollow and open at opposite ends thereof, the inside diameter of each being slightly larger than the diameter of the leg **40**. The sections **64** are each substantially longer than its opposite section **66** to provide an outwardly or forwardly directed horizontal extension **71**. The vertical distance between the longitudinal axes of said sections **64** and **66** is greater than the distance between the longitudinal axes of section **22** and leg **40** and bar **54** and fitting **50**.

The end frames of said linkage **62** are rigidly secured to the extremities of a pair of cross-braces **72** and **74**, said braces **72** and **74** of each said pair being pivotally connected together at their point of crossing by bolts **76** shown in Fig. 2. The cross-braces **72** and **74** are so secured spaced one from the other and short brace members **78** are connected by suitable fasteners between said cross braces **72** and **74** and the vertical struts or posts **60** and **38** of each side frame as seen in Fig. 8. Between each of the top horizontal sections **64** is mounted a fabric member **80** by fasteners **81** providing the seat for the chair. The pivotal connection of said braces **72** and **74** permits lateral movement of the end frames relative to each other.

Referring to Figs. 3 and 4, Fig. 3 shows a completed chair as viewed from the front end thereof having a wider seat **80** than the seat **80***a* provided on the chair illustrated in Fig. 4, the chairs in each of said figures being otherwise identical. The difference in width of the said seats **80** and **80***a* is attained by reason of the different lengths of the cross-braces **72** and **74**. Thus, in Fig. 3, the length of cross-braces **72** and **74** is greater than the corresponding cross-braces **72***a* and **74***a* of the chair in Fig. 4. Of course, the length of fabric seat **80** is correspondingly greater than fabric seat **80***a*. It will be apparent that the cross-linkage **62** may be manufactured to provide a linkage capable of providing any desired seat width when the chair is unfolded.

To assemble the chair, the units **18** and **20** of each vertical side frame are aligned one behind the other with the unit **18** at the front. The cross-linkage **62** is interposed between the said units **18** and **20** with the extensions **71** thereof at the top and facing toward unit **20** or the front of the chair. The units and linkage **62** are moved together to pass a leg **40** throupgh each hollow section **66**, the length of the leg **40** being greater than section **66** so that the end **45** will protrude outwardly therefrom. The protruding end **45** is then inserted through open end **52** of fitting **50** until openings **44** and **51** are aligned one with the other. A threaded bolt **82** is inserted through said aligned openings **44** and **51** and fastened at its end by a nut **83** in the manner illustrated in Fig. 6. At the same time, the bar **54** will be able to clear the section **64** and extension **71** and permit insertion of shank **57** into opening **34** of section **22** until openings **46** and **58** are aligned, at which time the end face of end **34** will abut the end face **56**. A threaded bolt **84** is inserted through said aligned openings **46** and **48** and secured by a nut **85** as shown in Fig. 7. These nuts **83** and **85** may consist of lock nuts or suitable lock washers may be utilized in a well known manner not requiring specific illustration or description.

It will be understood that the cooperative assembly of the units **18** and **20** and the linkage **62** is identical for each of the vertical side frames of the chair **10**. In each case, the sections **64** and extensions **72** will each be

spaced above the adjacent detachably interconnected section 22 and bar 54 when the chair is unfolded so that said sections 64 and 72 having the fabric seat 80 suspended therebetween may be supported on said connected section 22 and bar 54 when a person is seated in the chair.

It will thus be seen that the basic structure of the separate units of the side frame and the folding linkage provides for advantageous interchanging of parts thereof so that a standardized assembly for a great variety of chair models is achieved. Chairs of varying seat widths may be manufactured using the same side frames by merely installing the proper folding linkage from a stock which has been fabricated in different sizes. Where variations in side frames are required, such as for a chair having a non-adjustable leg rest assembly or other variation, the same cross-linkage may be used for a wide variety of styles. The basic plan of the side frames and folding linkage permitting detachable assembly thereof in the manner described will remain the same. Thus, different assembly techniques and equipment as has been required heretofore where the side frames were of unitary construction and the folding linkage was permanently secured are entirely unnecessary with the accompanying savings in time and cost of manufacture.

Additionally, ease of repair, speed in replacement of parts, and ready modification of the chair are inherent in the structure.

It is believed the invention has been described in sufficient detail to enable a complete understanding of the principles thereof. It is contemplated that minor departures from the constructional features described in order to contribute to such an understanding will occur to the skilled artisan without departing from the broad principles of the invention as defined in the claims hereto appended.

What it is desired to secure by Letters Patent of the United States is:

1. A frame structure for folding wheel chairs comprising a pair of vertically arranged laterally spaced side frames, a collapsible cross-linkage unit having a flexible chair seat at the upper end thereof, said cross-linkage unit being connected between said side frames to permit lateral movement of one frame relative to the other for folding and unfolding of the chair, each side frame including separate front and rear units having cooperative fastening means for detachably securing the same together to form the said side frame, said cooperative fastening means of each side frame including a horizontal and cylindrical bottom shaft being rigidly secured at one end to one of said front and rear units and being detachably connected at the opposite end thereof to the other of said units of each side frame, said cross-linkage unit also constituting a separate unit and being provided with a pair of horizontal and parallel bottom sleeves each telescopically and rotatably receiving one of said horizontal bottom shafts, said sleeves being freely slidable off of and onto said shafts when said shafts are detached from said other unit of each of said side frames and said front and rear side frame units are separated.

2. A frame structure for folding wheel chairs comprising a pair of vertically arranged laterally spaced side frames, a collapsible cross-linkage unit having at least two pairs of cross-braces fixed adjacent their lower ends to a pair of parallel and horizontal sleeves and being provided at their upper ends with a flexible chair seat, said cross-linkage unit being removably installed between said side frames and being collapsible to enable lateral movement of one frame relative to the other for folding and erecting the chair, each side frame including a front and rear structural unit detachably connected together by upper and lower horizontal members, each of said horizontal members being fixed at one end thereof to one of said front and rear side frame units and being detachably connected at the opposite end thereof to the other of said side frame units, each of said sleeves of said cross-linkage unit telescopingly and rotatably receiving one of said horizontal members provided by one of said side frames and being slidably removable from said member upon disconnection and separation of the front and rear units thereof, whereby, said structural units and linkage units may be interchangeably assembled to form a variety of chair models.

3. A frame structure for a folding wheel chair comprising a pair of side frames each having detachable front and rear units, said side frames providing a pair of elongated and parallel lower members extending horizontally between the front and rear units thereof, each of said elongated lower members having one end thereof fixed to one of said front and rear units of a side frame and having the opposite end thereof removably received within a socket provided by the other of said front and rear units, means for releasably securing said opposite end of each member within said socket, a folding linkage unit comprising at least two pairs of pivotally connected cross braces, a pair of parallel and horizontal tubular sleeves each being securely fixed to the lower ends of corresponding braces of said respective pairs, each of said lower horizontal members extending through and rotatably suporting a single tubular sleeve of said folding linkage unit, and a pair of parallel seat-supporting members having a foldable fabric seat extending therebetween, said seat-supporting members being securely fixed only to the upper ends of said braces of the folding linkage unit, said sleeves being slidably removable from said lower horizontal members when said opposite ends of said members are released from said socket and said front and rear units are separated.

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