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Falkenberg

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[54] **COLLAPSIBLE WHEELCHAIR**

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[52] **U.S. Cl.**..... **280/42,** 280/79.2, 297/DIG. 4, 297/195

[51] **Int. Cl.**..... **B62b 3/02**

[58] **Field of Search**..... 280/36 B, 79.2, 42; 297/DIG. 4, 195

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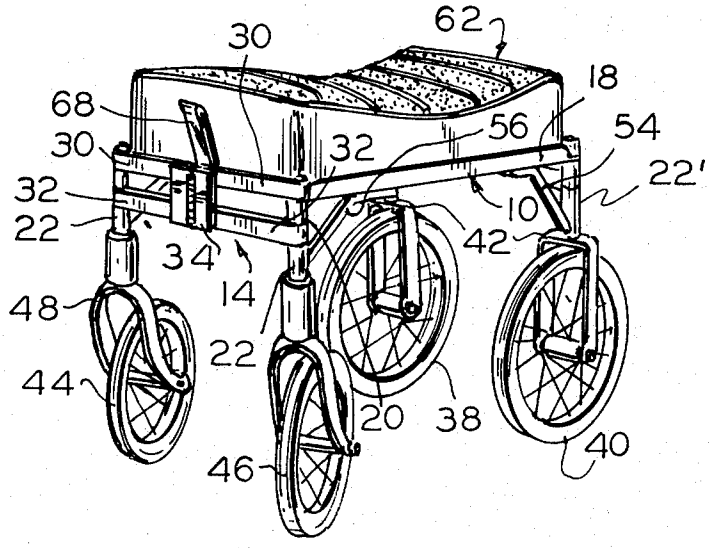
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Primary Examiner—Leo Friaglia
Assistant Examiner—David M. Mitchell

[57] **ABSTRACT**

A collapsible wheelchair for a person having at least partial use of one or both legs includes a removable cushion supported by a frame comprising a pair of side rails, and a pair of end rails which may be folded between the side rails upon removal of the cushion. The wheelchair is provided with a pair of forward swivel wheels or casters which facilitate steering by the user.

12 Claims, 6 Drawing Figures



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SHEET 1 OF 2

FIG. 1

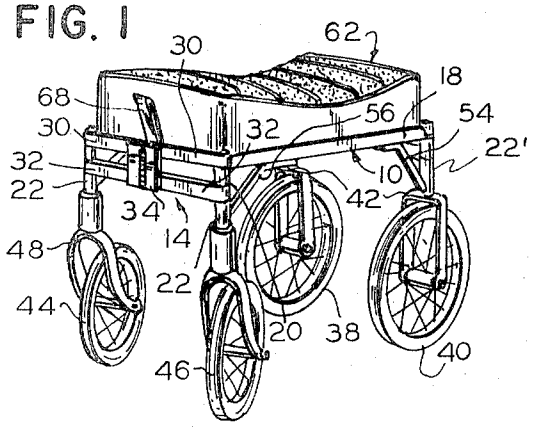


FIG. 2

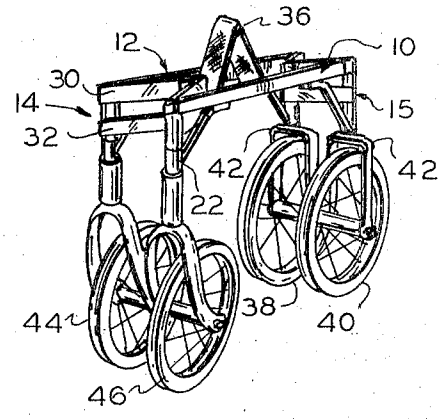
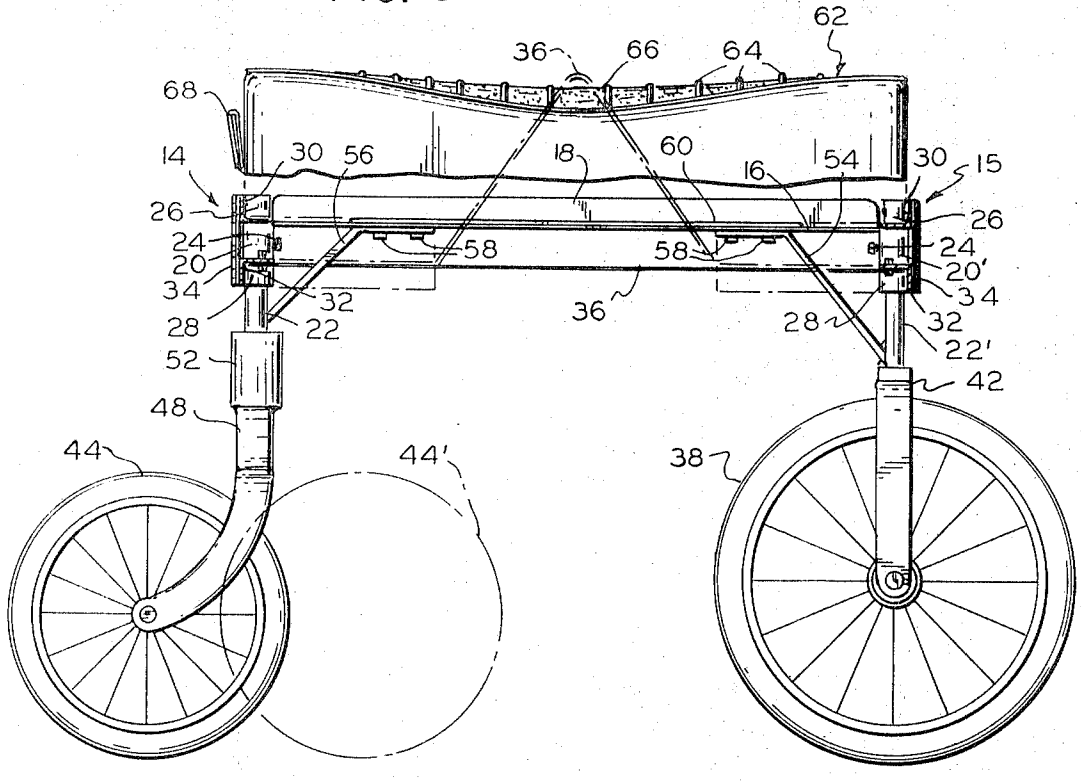


FIG. 3



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FIG. 4

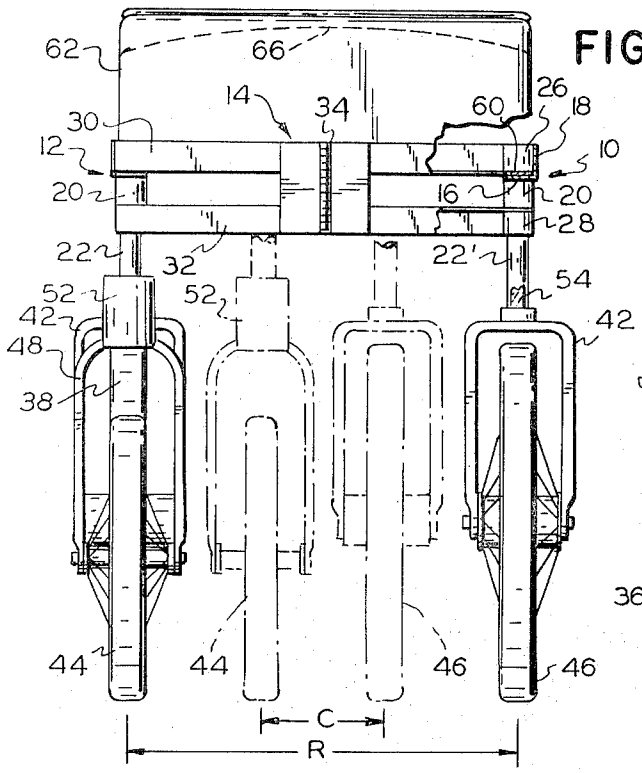


FIG. 6

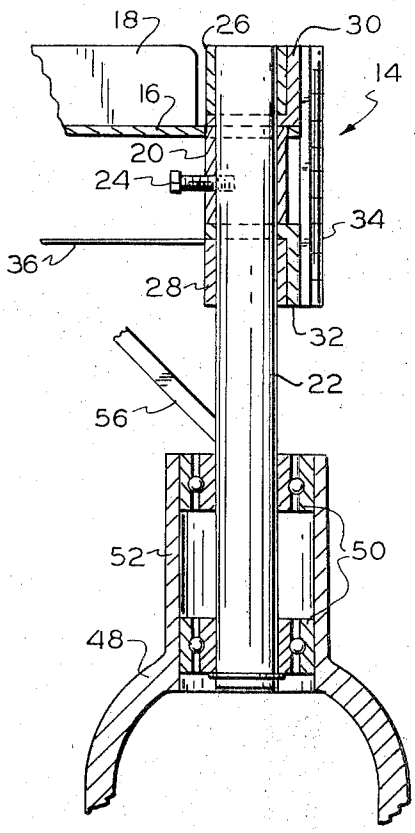
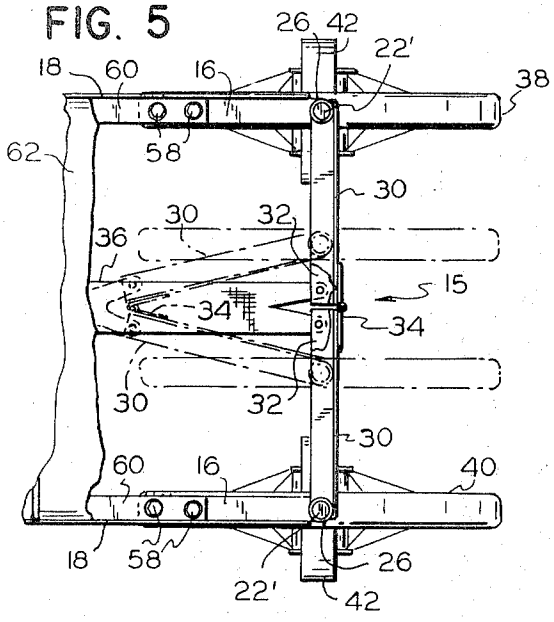


FIG. 5



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COLLAPSIBLE WHEELCHAIR

BACKGROUND OF THE INVENTION

Conventional wheelchair constructions tend to be cumbersome and restrict the user's mobility, particularly in situations where the wheelchair must be temporarily stored. Thus, in the case of vehicles for private or public transportation, public gathering places, business offices, etc., where conventional seating is provided, transfer of the individual to and from the wheelchair can be difficult. Also, convenient storage for the wheelchair is not always available.

Moreover, a conventional wheelchair is usually propelled by hand, which may result in soiling the hands of the user while also limiting the use of the hands for other purposes. Furthermore, in some instances a wheelchair user may have limited use of his hands or may have insufficient strength to propel himself in this manner.

SUMMARY OF THE INVENTION

In many cases, the individual employing a wheelchair may have limited use of one or both legs and feet, although he may not be able to walk. For instance, knee joint movement may be restricted, requiring a sitting position, but at the same time the individual may have some strength in the leg muscles allowing a certain amount of motion in this area.

According to the present invention, a wheelchair provides relatively complete mobility for an individual having at least partial use of one or both legs. The wheelchair according to the present invention includes side rail members, and end rail members therebetween, the rail members together comprising a rectangular frame upon which a seat member is supported. The frame in turn is supported by plural wheel means desirably including swivel attached wheel means. Upon removal of the seat member, the end rail members can be folded for collapsing the side rail members toward one another thereby forming a small, lightweight package.

The wheelchair seat member desirably comprises a cushion which is concavely depressed between the front and rear of the cushion, to provide a saddle-like configuration. The cushion is also formed with a raised or gripping surface assuring an over-all frictional or nonslip contact between the wheelchair's occupant and the cushion, whereby foot propulsion is facilitated. A frame carrying means is desirably located between end rail members whereby, upon removal of the cushion, the wheelchair user may raise the wheelchair for moving or storage while at the same time collapsing the wheelchair.

Accordingly, an object of the present invention is to provide an improved collapsible wheelchair adapted for foot propulsion by one having at least limited use of one or both legs.

It is a further object of the invention to provide an improved wheelchair of lightweight construction which is adapted for complete manipulation and handling by the user thereof.

It is another object of the present invention to provide an improved collapsible wheelchair of small proportions and lightweight construction which can be moved by the occupant over small rises such as curbs, shallow stairs, and the like.

It is a further object of the present invention to provide an improved collapsible wheelchair having a chair-level seat and which is adapted for facilitating the transfer of an individual between such wheelchair and other seating means.

It is another object of the present invention to provide an improved collapsible wheelchair which is leg operated or propelled, and which is easily steered by the occupant thereof.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. The invention, however, both as to organization and method of operation, together with further advantages and objects thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings wherein like reference characters refer to like elements.

DRAWINGS

FIG. **1** is a perspective view of a collapsible wheelchair according to the present invention.

FIG. **2** is a perspective view of such wheelchair in a partially collapsed condition.

FIG. **3** is a side elevational view, partly broken away, of the wheelchair according to the present invention.

FIG. **4** is an end view of a collapsible wheelchair according to the present invention, partially broken away to illustrate both front and rear wheels thereof in their collapsed and noncollapsed condition.

FIG. **5** is a partially broken away plan view of a collapsible wheelchair according to the present invention, further illustrating, in phantom, an end rail member, and wheel positions for the collapsed configuration.

FIG. **6** is a cross-sectional detail of a vertical wheel support rod or shaft which may be considered as taken from the plane of the left-hand front wheel, as viewed in FIG. **4**, looking to the right, with the wheel fork swiveled through 90°.

DETAILED DESCRIPTION

Referring to the drawings, the wheelchair according to the present invention comprises a horizontal frame including side rail members **10** and **12**, as well as end rail members generally indicated at **14** and **15**. In particular, each side rail member **10** comprises a steel angle having a horizontal flange **16** and a vertical flange **18**, with the horizontal flange being inwardly directed of the frame.

The horizontal flange **16** of each side rail member is welded to a sleeve **20** disposed upon a vertical rod or shaft **22** and secured thereto against rotation or vertical movement by means of a set screw **24**. (See FIG. **6**) Also received upon shaft **22** are sleeves **26** and **28**, pivotable upon shaft **22** above and below the sleeve **20**. These sleeves **26** and **28** are welded respectively to upper rail **30** and lower rail **32**, for example, of end rail member **14**. The horizontal flanges of end rails **30** and **32** are directed inwardly of the frame while the vertical flanges are directed respectively upwardly and downwardly. Note that sleeve **26** and rail **30** are supported for rotation above sleeve **20**, while rail **32** together with sleeve **28**, which also pivot with respect to the same shaft, provide a bracing function.

The rail members **14** and **15** each centrally include a hinge **34** secured between halves of rails **30** and **32**, rendering the rail members **14** and **15** foldable inwardly

towards one another to positions between side rail members **10** and **12.** In folding, each end rail member pivots about a shaft **22** (or **22'**) and about the axis of the hinge **34,** for collapsing or drawing together the side rail members **10** and **12.** The wheelchair with the end rail members folded inwardly is illustrated in FIG. **2.** In the folded or collapsed condition, the wheelchair is adapted to be conveniently stored in a limited space, for example, on the floor in front of an automobile seat, under an office desk, or the like. The wheelchair includes a carrying means or strap **36** in the form of a webbed belt secured at each end to the two halves of an end rail **32.** For instance, as illustrated in FIG. **5,** the strap **36** is riveted to the horizontal flange of end rail **32** on either side of the turning axis of hinge **34.** As hereinafter more fully explained, the wheelchair collapses upon being lifted via the strap **36** since the strap then pulls the end rail members **14** and **15** inwardly toward one another. Rail **32** provides a bracing function to support rail **30** and hinge **34** and support the weight above the hinge.

Each of the vertical shafts **22** (or **22'**) is provided with a fork carrying a wheel for supporting the wheelchair. In the case of the rear wheels **38** and **40,** the forks **42** are permanently welded to the supporting shafts **22'** for maintaining the plane of rotation of the wheels substantially coincident with side rail members **10** and **12.** The rear supporting shafts **22'** are also secured against rotation by means of a set screw identical to screw **24** as illustrated in FIG. **6.** The rear construction, including the end rail member **15,** the shafts **22',** and their pivotal interconnection, is in general substantially the same as shown in FIG. **6,** except for the fact that a nonpivoting fork is carried by each shaft **22'.** The horizontal axis of rotation of wheels **38** and **40** is also suitably aligned with, i.e., intersects, the vertical axis of shafts **22'** extended.

Forward wheels **44** and **46** are mounted on pivoting or swiveling forks **48** supported upon a shaft **22** in each case by means of bearings **50** having a press fit upon the shaft and within the upper barrel portion **52** of each fork **48.** Also the fork is curved from the vertical axis of the shaft **22** whereby the axis or hub of each forward wheel **44** and **46** is offset from the axis of the shaft **22** extended. The front wheels **44** and **46** operate in caster fashion whereby the direction taken by the wheelchair is easily controllable by the person seated thereon.

Each of the wheels **38, 40, 44** and **46** is suitably a rubber-tired, welded steel wheel of spoked construction. The respective forks are adapted to receive **10**-inch rear wheels and **8**-inch forward wheels illustrated in the drawings hereof. However, a smaller wheel size may be substituted if desired. Thus, **8**-inch rear wheels and **6**-inch forward wheels may be substituted.

In the case of the rear wheels, angular braces **54** are welded between shaft **22'** at the top of fork **42,** and the underside of side rail members **10** and **12.** Also, angular braces **56** are similarly disposed between shafts **22,** just above barrel portion **52,** and the underside of side rail members **10** and **12.** In each case, the braces **54** and **56** are secured to the horizontal flanges of side rail members **10** and **12** by means of metal screws **58** passing through matching holes in the horizontal flange of the side rail member and engaging a filler bar **60** which is centrally located along the top of each such horizontal flange for about two-thirds the length thereof. The filler bars **60** provide a platform for receiving a seat member at the same level as the horizontal flanges of end rails **30.**

A seat member is received upon and within the rectangular frame provided by the respective rail members in their normal or extended position. This seat member comprises a rectangular cushion **62** resting upon the filler bars **60** and the horizontal flanges of end rails **30.** The cushion is also of such size as to be just received within the vertical flanges of the side and end rail members whereby the cushion is accurately positioned and the rail members are held in their extended or noncollapsed condition. The cushion **62** is hard-backed to provide seat support, and, of course, is supplied internally with a filler material such as rubber foam located above the backing material. The cushion's upper exterior is provided with a gripping surface of a raised or pleated plastic material for optimizing the friction or traction between such cushion and the user. For instance, the top of the cushion is formed with a plurality of horizontal pleats **64,** and also in general has a raised, rivet-like, rough surface. The cushion is centrally concave or indented as illustrated at **66** approximately midway between the portions of the cushion adjacent the end rail members. This concavity starts almost immediately at the ends of the cushion and reaches the maximum depression centrally of the cushion to provide a saddle-like configuration for insuring the correct position of the user while helping avoid relative movement of the wheelchair and the user when he propels himself. The central depression of the cushion is deepest along the side edges. The cushion also suitably has a carrying loop **68** secured at one end thereof which may be employed for removing and carrying the cushion.

The wheelchair according to the present invention is primarily designed for persons having limited, but not total, use of one or both legs. With any use of one leg and one foot, the occupant can rest in a seated position, straddling cushion **62,** and propel himself forwardly (to the left as the wheelchair is viewed in FIG. **1**) by pushing rearwardly with his foot on the ground or floor. Steering is, of course, accomplished by sideways propulsion whereby the forward wheels **44** and **46** are swiveled to the degree desired. The forward wheel **44** is illustrated in FIG. **3** in its maximum reverse swiveled position, and in phantom at **49'** in its normal position. The wheelchair may be reversed and backed whereby the front wheels will take the position illustrated in full line in FIG. **3.** This mode of operation is suitable for passing over slight falls or rises, such as curbs, shallow stairs, and the like, whereby the occupant may back up to the stair and raise the rear wheel upwardly, lifting the rear portion of the wheelchair by hand up or down to the next level, while still retaining foot contact with a floor surface. The wheelchair is propelled by the use of foot and leg until the rear wheels approach the rise or fall, and then the latter are urged thereover. In normal operation, however, the wheelchair is impelled to the left as illustrated in FIG. **1,** for providing the maximum control over the direction of movement.

The occupant may easily transfer or be transferred from the wheelchair to a conventional chair, automobile seat, or the like, by shifting or sliding off of the wheelchair according to the present invention and onto the other seat. The cushion **62** is therefore disposed at conventional chair level. It is then frequently desirable and necessary that the wheelchair be collapsed for stor-

age, such as in the case of transfer to an automobile. After the occupant has transferred from the wheelchair, the cushion **62** is grasped by means of loop **68** and removed from the frame. Then, strap **36** is grasped and the wheelchair is lifted into the automobile. Since the structure is of quite light construction, the structure is easily lifted by the average person. As the strap **36** is lifted, the hinges **34** are pulled inwardly, and the end rail members are folded between the side rail members, while at the same time collapsing the side rail members toward one another as shown in FIG. **2.**

The position of strap **36** in urging the end rail members toward one another is further illustrated in phantom in FIG. **3.** The wheelchair in flattened or collapsed condition is quite small and is easily accommodated on the floor in front of the front passenger seat of an automobile while such seat is occupied by the wheelchair user. Of course, the wheelchair in collapsed condition is easily accommodated in any other location, for instance on a train or other means of public transportation, or under a desk or the like. When the wheelchair is in use, the strap **36** is pulled to a more or less level suspended condition from the hinge locations. See FIG. **6,** for example.

The relative width of the wheelchair in collapsed and uncollapsed condition is illustrated in FIG. **4** where the dimension R illustrates the full centerline-to-centerline wheel distance during normal usage while C illustrates the corresponding dimension for the wheelchair in the collapsed condition. FIG. **4** is partially broken away whereby the forward wheels are illustrated in the expanded and collapsed condition in the foreground at the left in FIG. **4,** while the rear wheels are illustrated in fully expanded and collapsed condition at the right-hand side of FIG. **4,** it being understood the wheels are aligned front to rear in this figure. The rear wheels in nonexpanded and collapsed positions are also illustrated respectively in full line and in phantom in FIG. **5.**

While I have shown and described a preferred embodiment of my invention, it will be apparent to those skilled in the art that many changes and modifications may be made without departing from my invention in its broader aspects. I therefore intend the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What is claimed is:

1. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members having a pivotal connection with said side rail members and adapted to collapse for collapsing said side rail members toward one another,

said pair of end rail members being adapted to complete a substantially rectangular frame with said side rail members in extended position,

a seat member for removable positioning upon the said side rail members and end rail members and normally holding said rail members in said extended position, said seat member when thus positioned on said frame having a low profile and an upper surface at seat height above the ground adapting the same for carrying the weight of the user and enabling the user to straddle said seat member and slide on and off said seat member, said seat member when removed allowing collapse of the said side rail members toward one another,

wheel means attached to said frame for supporting said frame in a substantially horizontal plane

and said seat member comprising a cushion concavely depressed between ends thereof whereby to provide a saddle configuration.

2. The apparatus according to claim **1** wherein said seat member is further provided with an end strap for carrying the same.

3. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members pivotally connected to said side rail members for joining said side rail members, said end rail members extending between spaced locations on one side rail member and corresponding locations on the other side rail member to complete a rectangular frame therewith,

a seat member for removable positioning within said rectangular frame composed of said side rail members and said end rail members,

said end rail members being centrally hinged for folding inwardly toward one another between said side rail members and collapsing said side rail members toward one another with said seat member removed,

wherein each end rail member comprises a first end rail pivotally connected to said side rail members, said end rail members being centrally hinged by a hinge means separating first and second portions of said first end rail, and a second end rail comprising a pair of bracing means between said hinge means and said side rail members, said bracing means being pivotable with respect to said side rail members,

and wheel means attached to ones of said rail members for supporting said frame, including a pair of swivel attached wheel means.

4. The wheelchair according to claim **3** including corner shafts secured to said side rail members and about which said first and second rails of said end rail member pivot.

5. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members pivotally connected to said side rail members for joining said side rail members, said end rail members extending between spaced locations on one side rail member and corresponding locations on the other side rail member to complete a rectangular frame therewith,

a seat member for removable positioning within said rectangular frame composed of said side rail members and said end rail members,

said end rail members being centrally hinged for folding inwardly toward one another between said side rail members and collapsing said side rail members toward one another with said seat member removed,

and wheel means attached to ones of said rail members for supporting said frame, including a pair of swivel attached wheel means,

wherein said wheel means are located at corners of said frame and have vertical support shafts joined to ends of said side rail members, said end rail members being pivotable at ends thereof upon said shafts.

6. The wheelchair according to claim **5** wherein said end rail members include a first rail pivoted upon two adjacent support shafts at the same end of the frame,

and a second rail, juxtaposed with respect to the first, pivoted upon the same two shafts,

and wherein said end rail members are centrally hinged by common hinge means joined to both said first rail and said second rail, said hinge means being provided with a vertical hinging axis parallel to the axis of said support shafts.

7. The wheelchair according to claim **6** wherein said first and second rails are pivoted upon said shafts respectively above and below the location where said shafts are joined to said side rail members.

8. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members pivotally connected to said side rail members for joining said side rail members, said end rail members extending between spaced locations on one side rail member and corresponding locations on the other side rail member to complete a rectangular frame therewith,

a seat member for removable positioning within said rectangular frame composed of said side rail members and said end rail members,

said end rail members being centrally hinged for folding inwardly toward one another between said side rail members and collapsing said side rail members toward one another with said seat member removed,

wherein said side rail members and said end rail members each comprise an inwardly facing angle comprising a vertical flange and a horizontal flange wherein said seat member is adapted to rest upon said horizontal flanges and lock said frame in its noncollapsed position,

and wheel means attached to ones of said rail members for supporting said frame, including a pair of swivel attached wheel means.

9. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members pivotally connected to said side rail members for joining said side rail members, said end rail members extending between spaced locations on one side rail member and corresponding locations on the other side rail member to complete a rectangular frame therewith,

a seat member for removable positioning within said rectangular frame composed of said side rail members and said end rail members,

said end rail members being centrally hinged for folding inwardly toward one another between said side rail members and collapsing said side rail members toward one another with said seat member removed,

and wheel means attached to ones of said rail members for supporting said frame, including a pair of swivel attached wheel means,

wherein said wheel means are located at corners of said frame and have vertical support shafts, said end rail members being rotatable about the axes of said vertical support shafts and supported for such rotation by said support shafts.

10. A collapsible wheelchair comprising:

a pair of side rail members,

a pair of end rail members having a pivotal connection with said side rail members and adapted to collapse for collapsing said rail members toward one another,

said pair of end rail members being adapted to complete a substantially rectangular frame with said side rail members in extended position,

a seat member for removable positioning upon the said side rail members and end rail members and normally holding said rail members in said extended position, said seat member when thus positioned on said frame having a low profile and an upper surface at seat height above the ground adapting the same for carrying the weight of the user and enabling the user to straddle said seat member and slide on the off said seat member, said seat member when removed allowing collapse of the said side rail members toward one another,

and wheel means attached to said frame for supporting said frame in a substantially horizontal plane,

wherein said wheel means are located at corners of said frame and have vertical support shafts, said end rail members being rotatable about the axes of said vertical support shafts and suported for such rotation by said support shafts.

11. The wheelchair according to claim **10** wherein a pair of said wheel means are pivotally attached including a pivotable fork and a wheel supported thereby, the axis of said wheel being offset from the pivoting axis of said fork to provide a caster-like configuration.

12. The wheelchair according to claim **10** further including strap means secured between said end rail members adapted for collapsing and carrying said wheelchair upon removal of said seat member by pulling said end rail members toward one another.

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