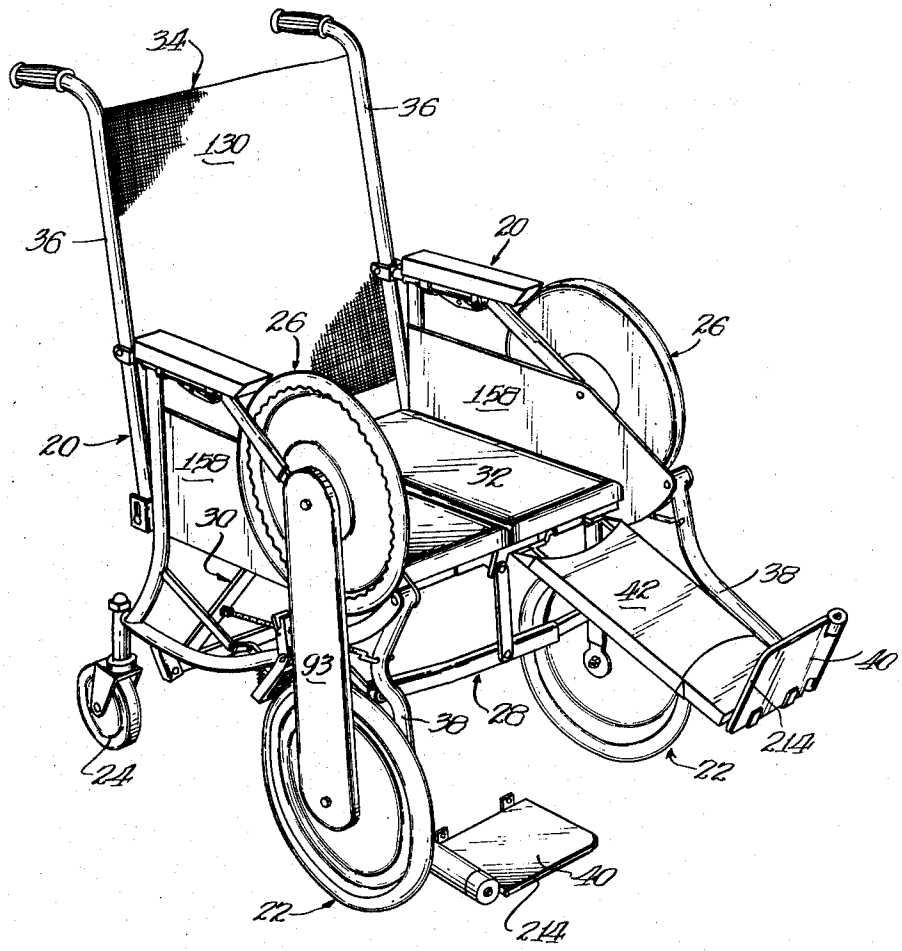
Aug. 12, 1958 R. E. LEE 2,847,058

FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 1

Fig. 1.



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Aug. 12, 1958 R. E. LEE 2,847,058

FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 2

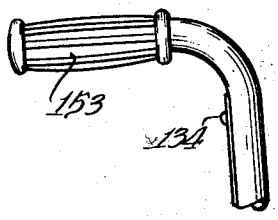
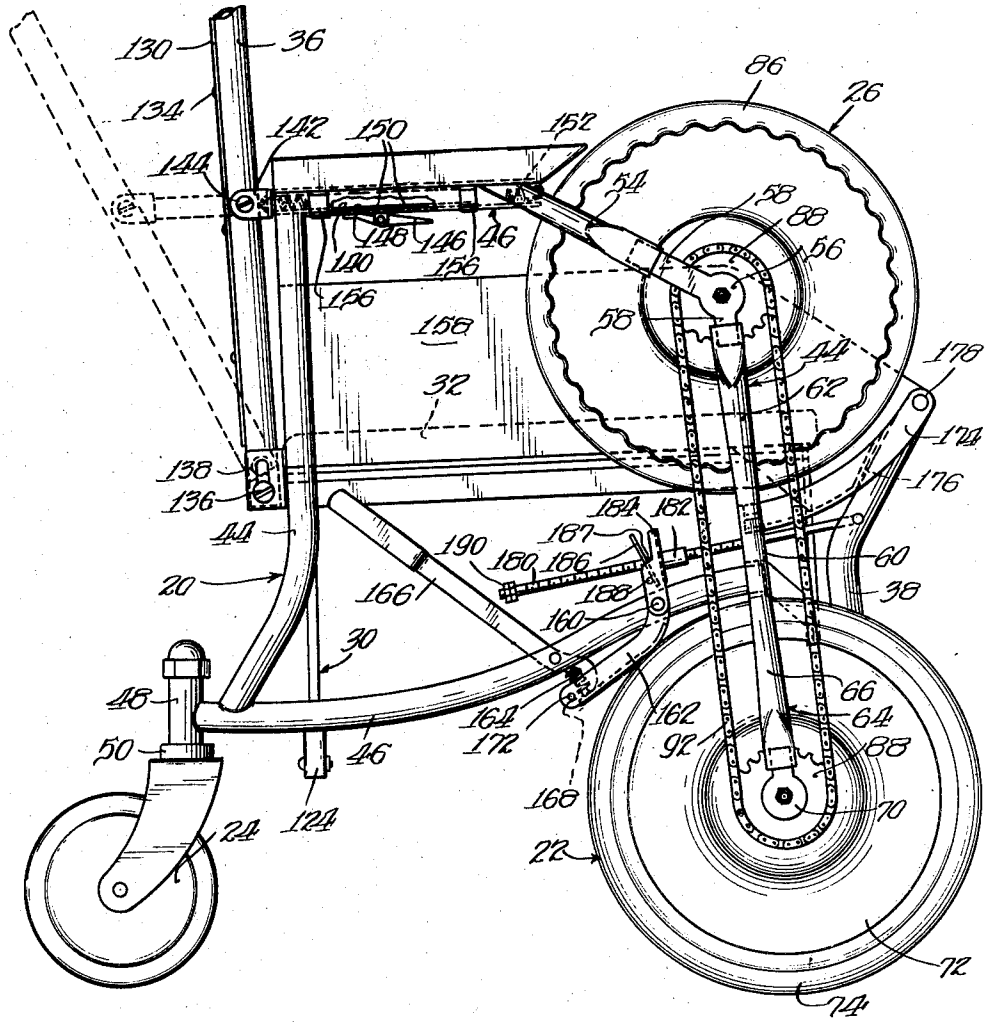


Fig. 2.



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FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 3

Fig. 3.

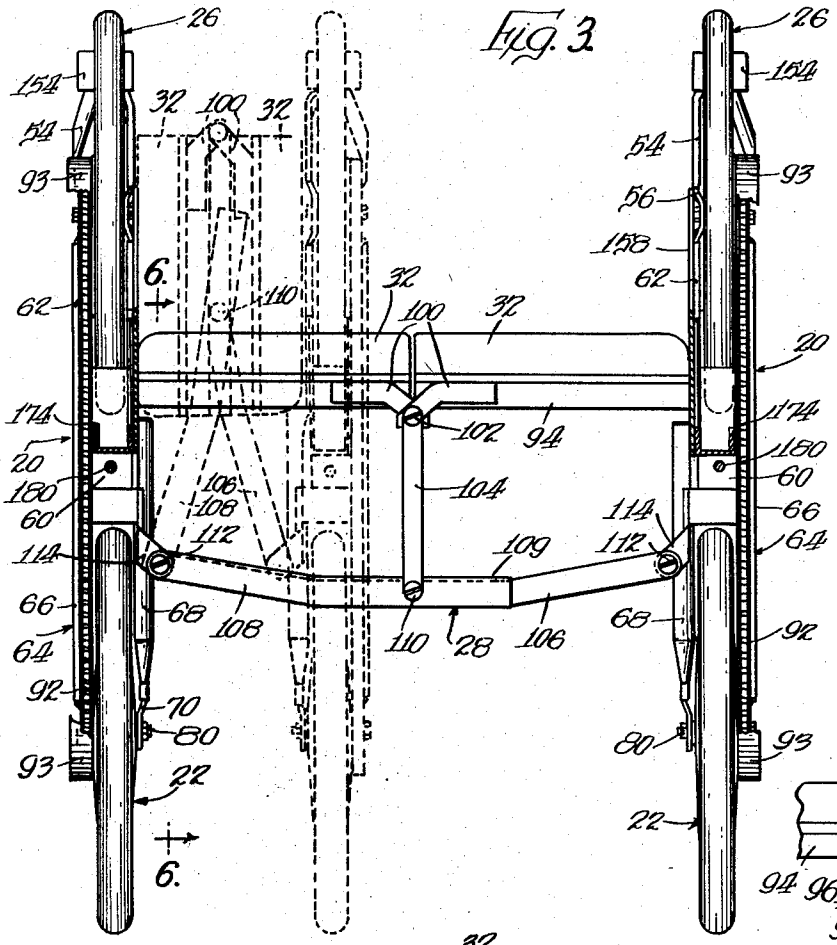


Fig. 4.

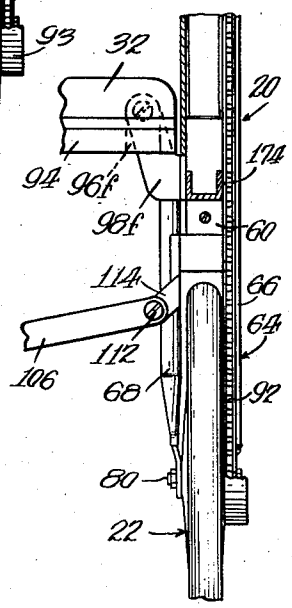
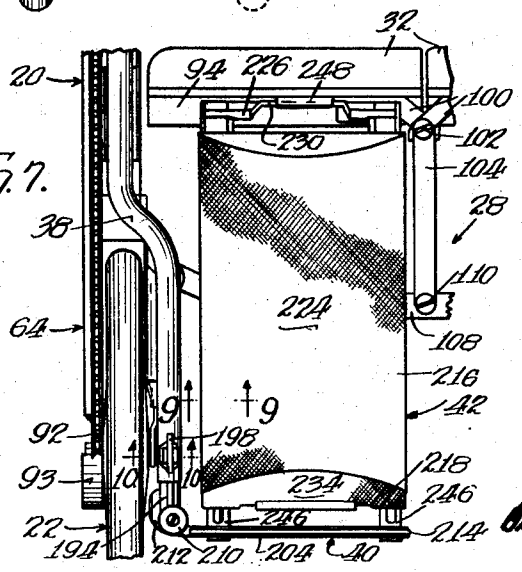


Fig. 7.



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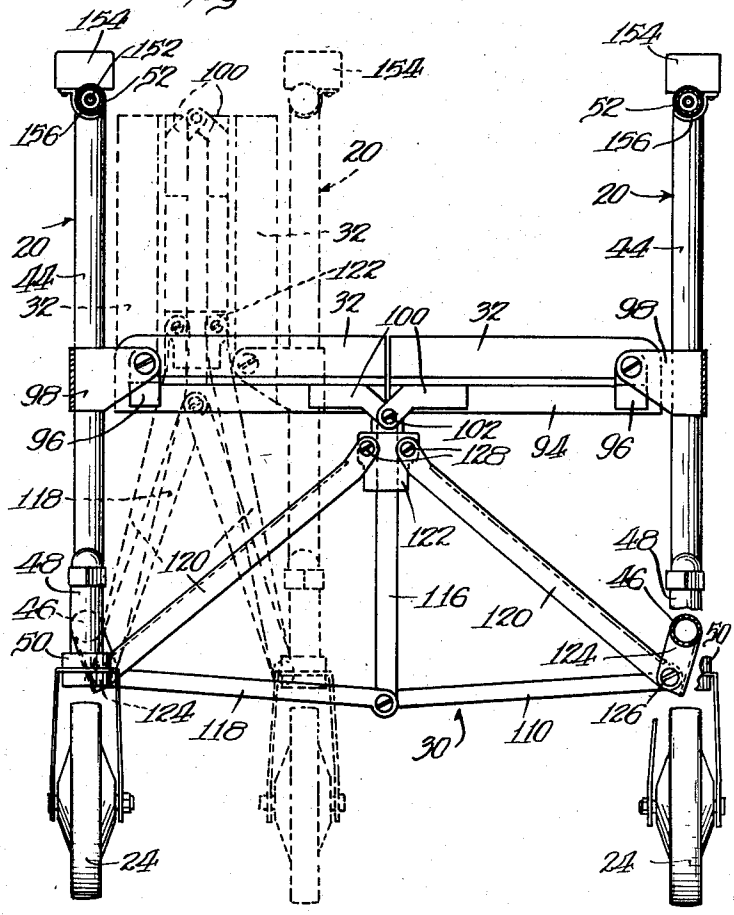
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Aug. 12, 1958 R. E. LEE 2,847,058

FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 4

Fig. 5.



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Aug. 12, 1958 R. E. LEE 2,847,058

FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 5

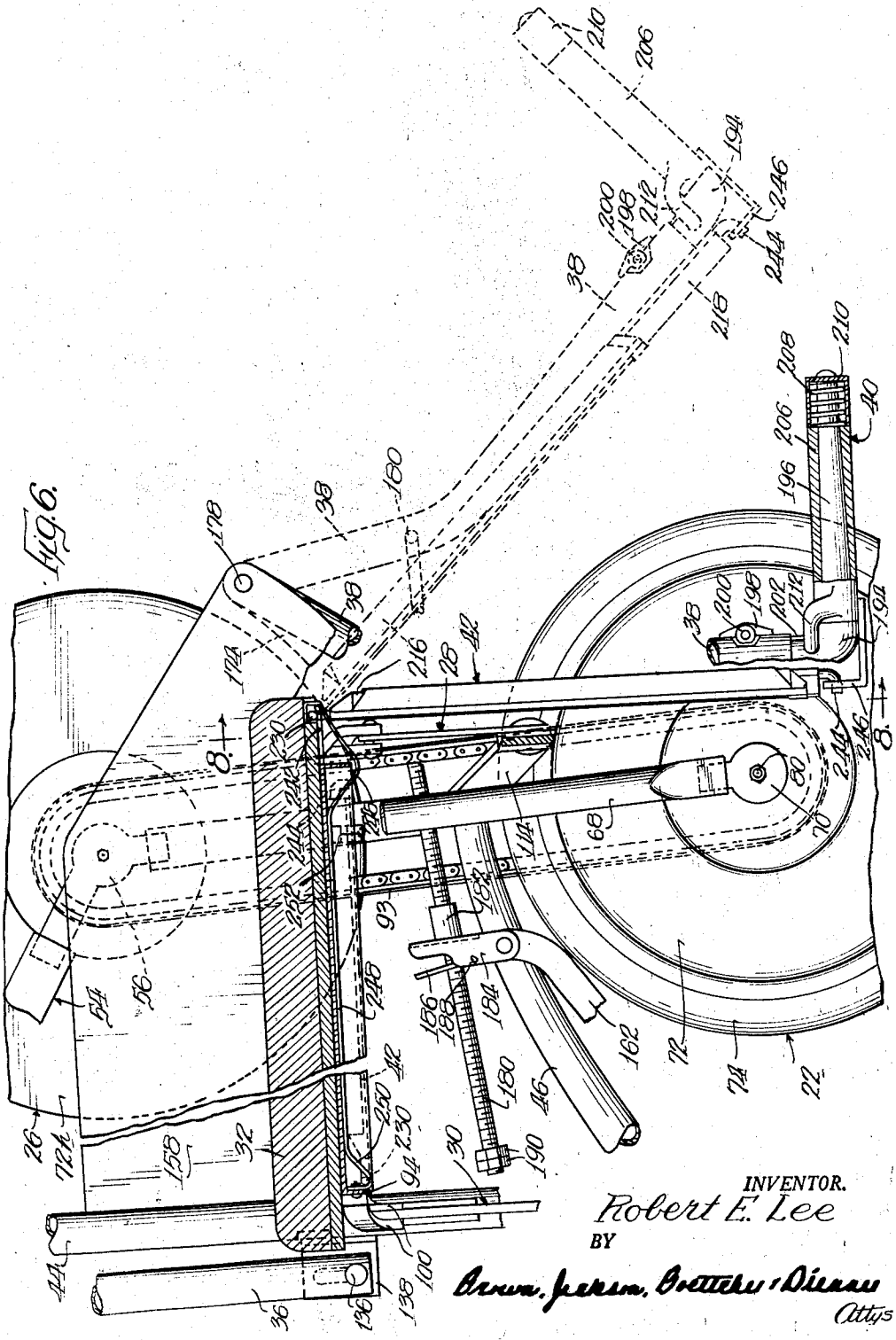


Fig. 6.

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Aug. 12, 1958 R. E. LEE 2,847,058

FOLDING WHEEL CHAIR

Filed Sept. 10, 1953 6 Sheets-Sheet 6

Fig. 8.

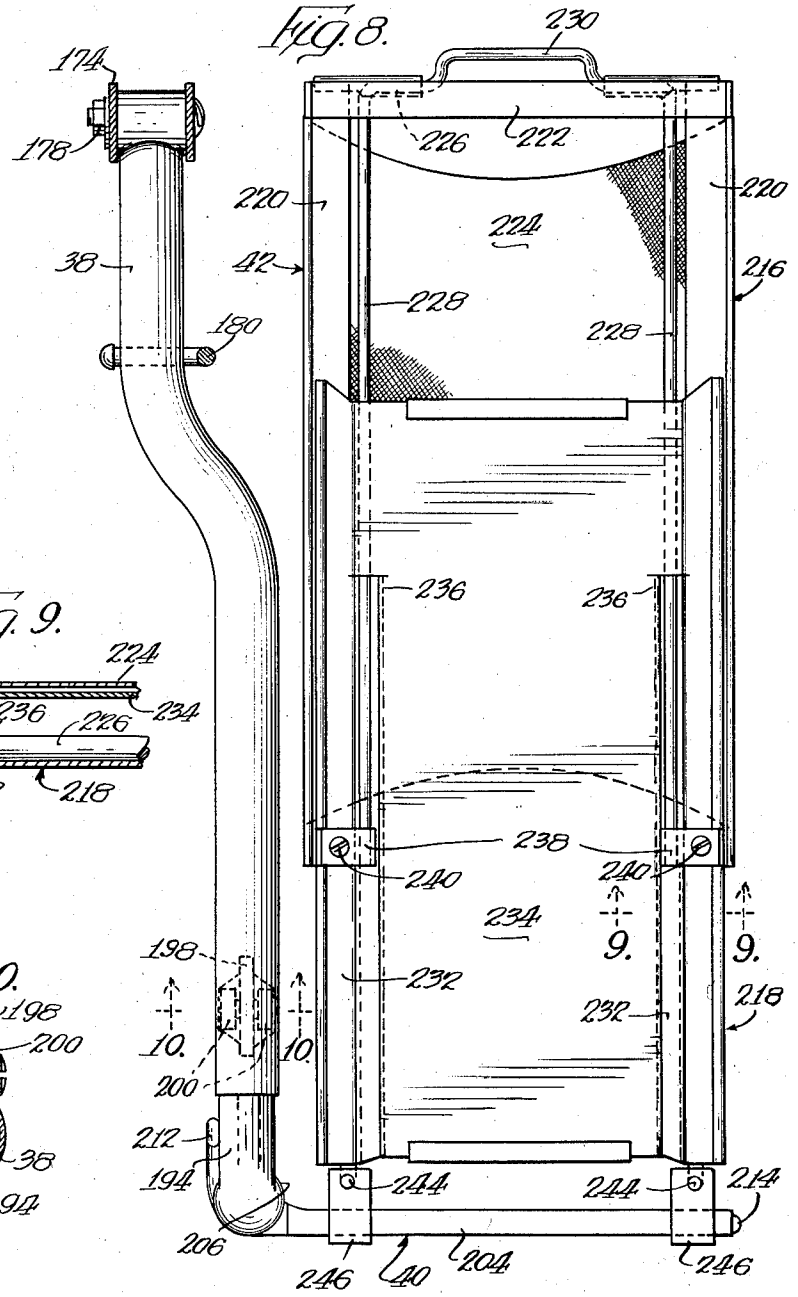


Fig. 9.

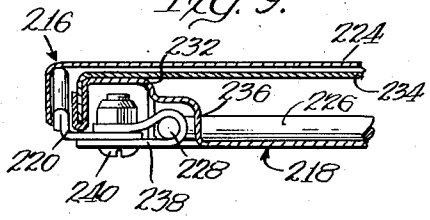
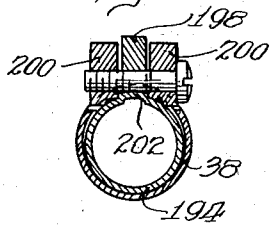


Fig. 10.



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United States Patent Office 2,847,058 Patented Aug. 12, 1958

2,847,058

FOLDING WHEEL CHAIR

Robert E. Lee, Alexandria, Va., assignor to Anthony G. Allison, Chicago, Ill.

Application September 10, 1953, Serial No. 379,361

10 Claims. (Cl. 155—30)

The present invention relates to wheel chairs and, particularly, to improvements in folding or collapsible wheel chairs.

Various devices have been proposed for centuries past to provide a conveyance for the physically disabled, which devices have evolved into the relatively modern wheel chair. Wheel chairs may be classified into two broad categories, namely, rigid and folding. Generally, however, both types comprise a chair including a pair of side frames, a seat and a back rest extending between the side frames, and a plurality of ground engaging wheels movably supporting the chair, at least some of the wheels being adapted to be motivated by the chair occupant to effect propulsion of the chair. In the rigid type, the side frames are permanently disposed in spaced parallel relation and the seat and back rest are usually rigid members. In the folding or collapsible type, a collapsible linkage is utilized to connect the side frames, and the seat and back rest are formed of flexible material or the like, whereby the side frames are adapted to be moved from a folded position adjacent one another to a normal position in spaced parallel relation with the seat and back rest extending substantially tautly therebetween.

Despite the long history and high degree of activity in the wheel chair art, conventional wheel chairs, both of the rigid and folding types, suffer a great many disadvantages.

While wheel chairs of the rigid type have performed an invaluable service in the past, particularly in hospitals and the like where the building was designed to accommodate wheel chairs, wheeled emergency tables and the like, and where the chairs were used only in the hospital, the same are rapidly falling out of demand due to their lack of adaptability to varying environs, their bulk, the extreme inconvenience of transporting the same, and so on. Folding or collapsible wheel chairs are taking over the market due to their relatively light weight, relatively less bulk, and their ability to be transported in a folded position and set up for use wherever desired. However, even the most recent developments in folding wheel chairs suffer many disadvantages, especially with respect to the collapsible linkage. Two general types are employed commercially. With one, the chair is adapted to be collapsed to a position wherein the side frames are closely adjacent one another, but wherein the seat portion of the chair is elevated a substantial extent to increase the overall height of the chair. With the other, the height of the chair is not increased, but then the side frames cannot be moved closely adjacent one another. Accordingly, conventional wheel chairs in their collapsed position comprise a bulky and unwieldy package.

It is an object of the present invention to provide improved collapsible linkage means for folding wheel chairs accommodating collapsing or folding of the chair to a compact package wherein the height of the chair is not increased over that of the chair in its extended position and wherein the side frames are disposed closely adjacent one another.

One particular advantage of folding wheel chairs is

that the same are adapted to be moved or propelled from indoors to outdoor whereby a disabled person using the chair is not confined to a restricted orbit of activity. However, when in use outdoors, the wheel chair is required to travel over bumpy sidewalks and the like, the bumps in which impart undesirable shock to the person using the chair. Certain collapsible linkages which have been proposed heretofore for wheel chairs allegedly provide a "knee action" support for the chair seat to absorb such shock. However, such linkages do not provide true knee action but only a degree of flexibility that is accomplished by a sacrifice of adequate support for the seat.

An object of the present invention is to provision of an improved collapsible linkage for folding wheel chairs adapted to connect the side frames of the chair and to support the side frames in such manner as to accommodate independent movement of each frame in a vertical plane whereby each ground engaging wheel of the chair, in practical effect, is independently suspended.

A further object of the invention is the provision of improved seat means for folding wheel chairs comprising a pair of rigid seat parts pivotally connected together at their inner longitudinal edges, centrally of the chair, to provide a rigid, substantially horizontal seat in the extended position of the chair, whereby the chair occupant is firmly and comfortably supported.

A still further object of the invention is the provision of the improved linkage means and the improved seat means above referred to in combination, wherein the seat has limited connection to the side frames and is otherwise supported by the linkage, and wherein the linkage accommodates independent movement of the side frames, the structure being such that the two seat portions or parts, in the extended position of use of the chair, are constantly maintained in a common substantially horizontal plane, despite independent movement of the side frames, whereby the chair occupant is supported on the stabilized seat and shock is absorbed by the knee action of the side frames to provide an easy and comfortable ride for the chair occupant despite irregularities and bumps in the surface traversed.

To provide for the comfort of the physically disabled and, particularly, to provide supporting surfaces for the legs of persons afflicted with disability of the leg, wheel chairs should be equipped with leg rests. Leg rests are readily provided in rigid wheel chairs, but such rests have conventionally taken the form of board-like members affording little if any comfort. The provision of adequate leg rests in folding wheel chairs is somewhat difficult of accomplishment since the rests normally would interfere with folding of the chair. It is an object of the present invention to provide improved leg rests for wheel chairs that firmly support and comfortably rest the legs of the chair occupant and that readily accommodate collapsing or folding of the chair.

In accordance with the above object, and as further objects of the invention, I provide improved leg rests comprising side frames over which a flexible fabric is tautly stretched to provide a firm yet comfortable support for the legs. Each rest is adapted to support one leg and comprises a pair of similar sections formed as described and telescopically associated with one another to provide an extensible leg rest adjustable to the particular requirements of the user. The leg rest is adapted to be supported at one end of one section thereof adjacent the front edge of the seat of the chair and the other section at the opposite end thereof is adapted to be detachably connected to the adjacent one of a pair of foot rests provided on my improved wheel chair. The foot rests are adjustable to the length of the user's legs, so that disposition of the foot rest in adjusted position automatically results in adjustment of the leg rest to proper length. At the end

thereof adjacent the front end of the seat, each leg rest is associated with one of the two parts of the seat and is releasably supported with respect to the front edge of the seat part. In its collapsed or non-extended position, the leg rest is substantially rectangular and of dimensions less than those of the seat part, whereby the leg rest is adapted to be stored beneath the seat part. To store the leg rest, the same is detached from the foot rest, collapsed and moved to a position beneath the seat. In such position, the leg rest, which is relatively thin, in no way interferes with folding and unfolding of the chair, and yet is readily accessible by the chair occupant for use when desired.

It is also an object of the invention to provide novel support and guide means disposed beneath each seat part or portion of the wheel chair to support each leg rest in its stored position, to guide the leg rest to its in-use position, and to support one end of the leg rest in its in-use position. As to other support means for the leg rest, it is an object to provide cooperable means at the outer or lower end of the leg rest and the rearward edge of the foot rest comprising a readily attachable and detachable connection adapted to be effected conveniently by the occupant of the wheel chair and adapted to afford a firm support for the leg rest regardless of the position of the foot rest, which connection will not inadvertently or accidentally become detached.

Another object of the invention is the provision of an improved folding wheel chair comprising a pair of side frames, a pair of seat parts hingedly connected at their inner sides to one another and at their outer sides to the side frames, collapsible linkage means extending between the side frames and associated with the seat parts, the linkage and seat parts accommodating movement of the side frames toward one another to a folded position, wherein the seat parts are disposed substantially vertical with their lower surfaces facing one another, and away from one another to an extended position, wherein the seat parts are disposed in a common horizontal plane, and an extensible leg rest associated with each seat part, each leg rest in its non-extended position being of a size less than that of the respective seat part and being adapted to be stored closely adjacent the lower surface of the seat part, whereby the seat parts may be moved to the said folded position without detachment of the leg rests from the chair.

A further object of the invention is the provision of an improved folding wheel chair of economical manufacture and assembly, that is highly efficient and practical in use, comfortable, easily operated, light in weight, readily transported from place to place, and that affords the physically disabled user the opportunity of escaping the confining orbit of activity customarily associated with physical disability.

Other objects and advantages of the present invention will become apparent in the following detailed description of a preferred embodiment of the invention.

Now, in order to acquaint those skilled in the art with the manner of making and using the wheel chair of my invention, I shall describe, in connection with the accompanying drawings, a preferred embodiment of my invention, and a preferred manner of making the same.

In the drawings:

Figure 1 is a perspective view of the preferred embodiment of the folding wheel chair of my invention, the view showing the chair in its extended position and showing one leg rest of the chair in its in-use position;

Figure 2 is a side elevation of the embodiment of the wheel chair shown in Figure 1;

Figure 3 is a generally frontal view of the wheel chair, with the leg rests and foot rests removed, disclosing the collapsible linkage at the front of the chair only, the view showing the extended position of the chair in solid lines, and the folded position thereof in dotted lines;

Figure 4 is a fragmentary frontal view of the chair showing a modification of the seat hanging;

Figure 5 is a view somewhat similar to Figure 3 taken from the rear of the wheel chair, with the back rest removed, showing the collapsible linkage at the rear of the chair only, the view showing the extended position of the chair in solid lines and the folded position thereof in dotted lines;

Figure 6 is a fragmentary vertical cross sectional view, on an enlarged scale, taken inwardly of one side frame of the wheel chair, as is indicated by the line **6—6** in Figure 3, showing a foot rest, a foot rest support and a leg rest, the foot rest, foot rest support and leg rest being shown in solid lines in one position of use and in dotted lines in a second position of use, and the leg rest being shown in dotted lines in its stored position;

Figure 7 is a fragmentary front elevational view of the chair showing, particularly, one leg rest, one foot rest and the associated foot rest support;

Figure 8 is a rear elevation, on an enlarged scale, of one leg rest, one foot rest and one foot rest support, the view being taken substantially on line **8—8** of Figure 6;

Figure 9 is a fragmentary cross-sectional view of one leg rest, the view being taken on an enlarged scale and substantially on line **9—9** of Figure 7 (and similar to dotted line **9—9** in Figure 8); and

Figure 10 is a cross sectional view of one foot rest support showing the locking means associated therewith for adjusting the length of the support, the view being taken on an enlarged scale and substantially on line **10—10** of Figure 7 (and similar to dotted line **10—10** in Figure 8).

Referring now to the drawings, and particularly to Figure 1, I have shown a preferred embodiment of the wheel chair of my invention as comprising a pair of side frames **20**, each providing a mounting for a ground engaging traction wheel **22**, a ground engaging caster wheel **24** and a hand wheel **26**. The two side frames **20** are disposed in spaced parallel relation in all positions thereof and are connected together by collapsible linkage means, namely, a front linkage **28** and a rear linkage **30**, whereby the side frames are movable from the extended position shown in Figure 1, wherein the same are disposed in substantially spaced relation, to a collapsed position wherein the same are disposed adjacent one another, as is shown in dotted lines in Figures 3 and 5. A two part seat **32** is disposed between the side frames, as is a back rest **34**, the back rest **34** extending between a pair of supports **36**, each of which is mounted on one of the side frames **20**. At the front of the chair, a foot rest support **38** is pivoted to each of the side frames and each support **38** carries a foot rest **40**, which in turn is adapted to provide support for a leg rest **42**.

The side frames **20** are the same as one another, with the exception that the same are of opposite hands, and each comprise a pair of generally vertical beams **44** and a pair of generally horizontal beams **46**.

The rear vertical beam **44** and the lower horizontal beam **46** are preferably formed of tubular stock, with the beams being curved at the lower and forward ends thereof, respectively, to provide a stable support and to accommodate the traction wheel **22**, respectively. At the rearward end thereof, the lower horizontal beam **46** extends beyond the rear vertical beam **44** to provide a mounting for a tubular bearing portion **48** within which the mounting means **50** of the caster wheel **24** is journaled. The upper generally horizontal beam **46** includes a horizontal arm rest portion **52** formed of tubular stock that is secured to the top of the rear vertical beam **44** and extends forwardly therefrom to terminate short of the front vertical beam **44**. Forwardly of the arm rest portion **52** thereof, the upper generally horizontal beam **46** includes a fork portion **54** extending forwardly and downwardly of the arm rest portion **52**. The fork portion **54** may suitably comprise a tube flattened at its ends and welded or otherwise secured to the outer side of the arm rest **52** at one end thereof, and a bar of generally channel form disposed to the

inner side of the frame in the same manner as the tube of the fork is secured to the outer side of the frame. Preferably, the channel-shaped inner bar of the fork is a planar member and extends forwardly from the arm rest portion **52** in parallel relation thereto, while the outer tubular member of the fork first extends outwardly of the arm rest tube **52** and then forwardly therefrom in slightly spaced relation to the vertical plane of the tube **52** to provide the said fork portion **54**. At the outer or forward end thereof, the bar and tube of the fork portion **54** each carry a wheel mount **56** for the hand wheel **24**, each wheel mount comprising a member formed of sheet stock and including a circular central portion and a pair of radially extending legs **58**. As will be appreciated from Figure 2, one leg **58** of each mount **56** enters into and is secured within the flattened end portion of the outside tube of the fork and the channel of the inside bar of the fork, respectively. The other leg **58** of each mount **56** extends in the direction of the front generally vertical beam **44**.

The front vertical beam of each side frame includes a relatively short central section **60** of tubular form to which the forward end of the lower horizontal beam **46** is secured, as by welding. To the upper side of the section **60** thereof, the front vertical beam **44** includes a fork portion **62** of the same general character as the fork portion **54**, the members of which are secured at the upper end thereof to the said other leg **58** of the respective wheel mounts **56** and at the lower end thereof to opposite sides of the central section **60**. Below the central section **60**, the front vertical beam includes a second fork portion **64** comprising a first tubular member **66** disposed to the outside of the frame and a second tubular member **68** secured to the inside of the frame. Preferably, the tubular member **66** comprises an integral continuation of the outer member of the fork portion **62**, and the second tubular member **68** is preferably a separate member fixedly secured to the inside of the central section **60** on top of the inside channel bar of the fork portion **62**, the member **68** at its upper end defining an abutment adjacent the level of the lower surface of the seat **32** for a purpose to be described. At the lower end thereof, each of the tubular members **66** and **68** is flattened for the conformable reception and securement therein of the single leg of a mounting member **70** for the traction wheel **22**.

In construction, all of the members of each side frame **20** are preferably formed of light weight yet sturdy stock, such as aluminum, and are rigidly secured together to provide a frame affording a first fork **64**, comprising the members **66**, **68** and **70**, opening to the bottom of the frame for the reception of the traction wheel **22**, a second fork, comprising the fork portions **54** and **62** and the wheel mounts **56**, opening to the top and front of the frame for the reception of the hand wheel **26**, and a bearing portion **48** for the reception of the caster wheel **24**. In such construction, as will be apparent, the three wheels **22**, **24** and **26** are disposed in alignment with the frame, particularly the rear vertical beam **44**, the lower horizontal beam **46** and the arm rest portion **52** thereof, whereby the complete assembly of wheels and frame is not of substantially greater width than the frame alone of a conventional wheel chair. In such assembly, the three wheels are disposed in spaced relation in a common vertical plane.

The traction wheel **22** preferably comprises a pair of spun metal discs **72** which are dished oppositely of each other adjacent the center of the wheel and are brought and secured together along a circular line spaced inwardly of the periphery of the wheel, the portions of the disc outwardly of the circular line of securement thereof being oppositely curved to define a substantially semicylindrical recess for the reception of a conventional rubber tire **74**. Adjacent the center thereof, the discs are turned inwardly to define a hub mounted by means of bearings on an axle **80** comprising a bolt extending through the two wheel mounting members **70** and the bearings, the assembly being secured together by a nut threaded to one end of the bolt.

The hand wheel **26** is preferably formed and mounted in much the same manner as the traction wheel **22**. However, to provide a wheel optimumly gripped and manipulated by the chair occupant, the inner disc of the wheel, as indicated at **72*h***, preferably is a planar member, only the outer disc being dished, and the two discs themselves provide a generally cylindrical rim portion for engagement by the chair occupant. Preferably, the radially inward surface of the said rim portion to the outside of the wheel is provided with finger indentations, and a rubber sheath **86** is provided on the said rim portion to afford an optimum hand gripping surface.

As will be appreciated, the hand wheel **26** is disposed immediately forward of the arm rest portion **52** of the side frame whereby the same is adapted readily to be manipulated by the chair occupant for the purpose of motivating the ground engaging traction wheel **22** to propel the chair. To establish driving connection between the wheels **22** and **26**, a toothed sprocket **88** is secured to the exterior surface of each wheel, and a drive chain **92** is trained over the two sprockets. The chain drive is positive and thus preferred. However, other conventional drives may be employed. If desired, the sprockets **88** may be of different sizes, as may the wheels **22** and **26**, to provide various speed ratios. However, I have found it preferable to provide sprockets **88** of the same size and wheels **22** and **26** of the same size. A suitable wheel size is 10 inches in diameter, while a suitable sprocket is 3¾ inches in diameter and provided with 22 teeth. With wheels of the size stated, a suitable caster wheel size is 6 inches in diameter, the assembly thus formed providing a stable support for the chair occupant. As will be appreciated, the sprockets **88** are disposed inwardly of the adjacent fork member whereby the sprockets, the chain and the two wheels of the drive mechanism are disposed entirely within the lateral limits of the side frame. Preferably, the sprockets **88** and chain **92** are shielded, for esthetic purposes as well as to prevent injury as a result of entanglement in the chain, by a guard **93** which may suitably be secured to the frame by screws passed through the guard and threaded into a tapped portion of the axial bore in each of the axle bolts of the two wheels.

Referring now to Figures 3 and 5, the linkage means connecting the two side frames **20** is shown as comprising the front linkage **28** (Figure 3), the rear linkage **30** (Figure 5) and the seat **32**. As shown, the seat **32** comprises two parts each including a generally rectangular base **94** formed of angle members, a seat board rested upon and secured to the horizontal legs of the angle members, with the vertical legs of the angle members extending downwardly from the seat board, a cushion for the seat board and a long wearing cover for the cushion, such as leather or the like. At the rear of the wheel chair, each seat part carries a tab **96**, secured to the vertical leg of one of the angle members of the base **94**, adapted for the reception of a pivot pin by means of which each seat part is pivotally connected to a lug **98** secured to one of the side frames, whereby each seat part is pivoted at the rearward edge thereof to a side frame. As shown, the tabs **96** and lugs **98** are so constructed and arranged as to dispose the pivotal axis of the seat in spaced parallel relation to the respective side frame to accommodate movement of the seat cushion and cover into the space between the pivot and the side frame. Preferably the seats are supported by the side frames only at the rearward portion thereof, as thus far described. However, if desired and for a purpose to be described,

a similar pivot mounting may be provided adjacent the front of the seat as is indicated at **96***f* and **98***f* in the Figure 4 showing of the thus modified form of the chair.

The two parts of the seat **32** are pivotally connected at the inner side thereof, centrally of the side frames **20**, by means of arms **100** secured to the vertical leg of the end angle members of the respective seat base **94** at the front and rear of each part of the seat, the arms being curved downwardly to provide a pivot spaced below the level of the seat and being there connected by a pin or bolt **102**. Accordingly, it will be appreciated that the two seat parts are pivotally associated for movement from a horizontal in line position, as shown in solid lines in Figures 3 and 5, to a vertical position wherein the bottom surfaces of the two seat parts are substantially in engagement, as is shown in dotted lines in Figures 3 and 5.

The front collapsible linkage **28** of the chair is disposed adjacent the front of the seat **32**, forwardly of the front vertical beams **44** of the side frames and rearwardly of the front of the seat, and comprises a vertical link **104** pivotally mounted at its upper end on the central pivot **102** of the seat parts and pivotally connected at its lower end centrally of the side frames to a pair of pivotally connected horizontal links **106** and **108**, the pivotal connection of the three links being accomplished by means of a pivot pin or bolt **110**. One of the horizontal links, the link **106**, is preferably a strap-like member of a length only slightly greater than one-half the spacing between the side frames in the extended position thereof, whereas the other horizontal link **108** is of channel form, with the channel opening downwardly, and of a length substantially greater than one-half the spacing between side frames. In assembly, the vertical link **104** is pivoted to the outside of the channel link **108** while the horizontal link **106** is received within the channel link **108** and is adapted to abut against the base wall of the portion, indicated at **109**, of the channel **108** extending beyond the pivot **110** in the horizontal position of the links **106** and **108**, whereby a stop is provided to prevent collapsing of the linkage in a downward direction. Each of the links **106** and **108** is pivotally connected at the outer end thereof, with respect to the side frames **20**, by means of a pivot pin or bolt **112** to a suitable strap or bracket **114** secured to the front vertical beam **44** of the respective side frame. In use, as will be apparent, the linkage **28** is movable, with the two parts of the seat **32**, from the extended position shown in solid lines to the collapsed position shown in dotted lines to accommodate collapsing of the cart. In the extended position thereof, the linkage **28** provides a firm support for the seat and side frames and the extending portion **109** of the link **108** affords a stop defining a limit of downward movement, in a manner to be described more fully hereinafter, whereby collapsing of the linkage in a downward direction is prevented.

The rear collapsible linkage **30**, as shown in Figure 5, is disposed approximately in alignment with the rear vertical beams **44** of the side frames **20** and comprises a vertical link **116**, a pair of horizontal links **118**, a pair of diagonal links **120** and a guide block **122**. As shown, the vertical link **116** is pivotally mounted at the upper end thereof on the central pivot **102** of the seat parts at the rear of the chair. At the lower end of the vertical link, the vertical link **116** and the horizontal links **118**, which are identical, are pivotally connected together centrally of the side frames. At the outer end thereof, each of the horizontal links **118** is pivotally connected, with respect to the side frames, to a bracket **124** secured to the respective side frame by means of a pivot pin or bolt **126**. The diagonal links **120** are also pivotally mounted at the outer ends thereof on the pins **126** and, in the extended position of the chair, extend diagonally upwardly and inwardly toward the central pivot **102** of the seat parts. The guide block **122** is provided with a passage therein adapted for the comformable reception of the vertical link **116** whereby the block is slidably mounted on the link **116** for movement with respect thereto. The block also includes a pair of pivot pins or bolts **128** disposed to opposite sides of the link **116**, upon each of which the inner end of one of the diagonal links **120** is mounted. Preferably, the diagonal links **120** are of downwardly open channel form and the block **120** and horizontal links **118** are received within the channel. As will be appreciated from a consideration of Figure 5, the rear linkage **30** is movable from an extended position, as shown in solid lines, to a collapsed position, as is shown in dotted lines, wherein the vertical link **116** is moved upwardly through the block **122** to elevate the central pivot of the two seat parts and accommodate collapsing of the chair. In addition, the vertical link, at its upper end, is enlarged to present an abutment engageable with the block **22** to prevent downward collapsing of the linkage.

The assembly of the two collapsible linkages **28** and **30**, the two parts of the seat **32** and the two side frames **20** affords a particularly advantageous collapsible or folding chair assembly in that the two side frames are adapted to be moved from an extended position in spaced parallel relation, in which the same are firmly braced by the linkages, to a collapsed position, as shown in dotted lines in Figures 3 and 5, wherein the side frames are disposed closely adjacent one another and the seat parts are folded to a position wherein the same do not increase the overall height of the chair, that is, the same are disposed below the arm rest portions **52** of the side frames. In the collapsed position, the chair is a very compact and readily handled package adapted for convenient transportation from place to place. The linkage means facilitates an extremely simple and convenient folding and unfolding of the chair. For example, when extending the chair from the collapsed position thereof, it is merely necessary that a slight separating force be exerted on the side frames, whereupon the side frames are readily moved apart to their fully extended position. To collapse the chair, it is merely necessary to exert a slight upward pull at the central connection of the two seat parts, whereby the linkage means and seat parts are conditioned to accommodate ready movement of the side frames into a position closely adjacent one another. In either position thereof, however, the linkage means retains the side frames in the intended disposition in parallel relation until force is exerted thereon in a given direction to change the spacing between the side frames. Accordingly, it will be appreciated that the present invention provides an improved and readily manipulated folding or collapsible wheel chair as has been pointed out hereinbefore.

In addition to the foregoing, the said assembly affords a highly efficient and practical "knee action" shock absorbing function, particularly when the seat is connected to the side frames only at the rear thereof. In such assembly, the two collapsible linkages, and especially the rear linkage, accommodate relative movement in vertical planes of the two side frames, and the seat mounting accommodates pivotal movement in a vertical plane of each side frame with respect to the seat. In view of the accommodation afforded by the assembly for the defined relative movements, it will be appreciated that to a practical effect each of the ground engaging wheels **22** and **24** is independently suspended, thus to afford true shock absorbing characteristics. Obviously, some limit of relative movement must be afforded to prevent complete collapse of the chair. These limits comprise the stop portion **109** of the front linkage **28**, the provision of the abutment portion at the upper end of the tubular member **68** of the traction wheel fork portion **64** of each side frame, which abutment is adapted to be engaged by the lower surface of the seat at the front thereof, and the disposition of the

guide block **122** for engagement with an enlarged portion at the top of the vertical link **116** of the rear linkage **30**. These limit stops, however, are not normally engaged when the chair is in use because of the particular disposition of the links, seat parts, and so on. Accordingly, the relative movements defined above will be accommodated, to the limits defined by the above stop means, to afford a true knee action and shock absorbing function. In view of this fact, each ground engaging wheel of the chair, in use of the chair, effectively is movable in a substantially vertical plane itself to absorb any shock occasioned in traversing an irregular or bumpy surface. The accommodation of the relative movements as defined prevents transmission of shock or wheel movement to the seat of the chair, thus to provide a stabilized, comfortable ride for the person occupying the seat **32**.

When the seat hanging is rigidified, as shown in Figure 4, by the addition of pivotal mountings for the seat parts to the side frames at the front as well as at the rear, the shock absorbing function is diminished. However, such modified seat hanging may prove advantageous for very heavy persons to afford greater seat support. In particular, the rigidified seat hanging will assure uniformity of collapsing of the chair and, in cases of failure of proper side frame alignment, will prevent toeing in or out of the front wheels when the chair is wheeled about in its collapsed position. As shown, the seat hanging at the front is substantially the same as that at the rear, except that the tab **96***f* and lug **98***f* are spaced rearwardly of the front of the seat, to avoid obstruction of the seat, and are disposed in the region of the seat cushion, the lug **98***f* being turned downwardly and secured to the central section **60** of the front vertical beam **44** of the respective side frame.

I have shown the back rest **34** of the wheel chair of my invention as comprising a sheet of flexible material **130**, preferably the same material as employed for the cushion cover of the seat, extending between the back rest supports **36**. Preferably, the sheet of material **130** is doubled over, or is hemmed at the longitudinal edges thereof, whereby a mounting bar is adapted to be inserted between the two layers of material at each edge of the back rest. As thus assembled, the material **130** and the respective bar are secured to the respective back rest support **36** by screws **134** passing through both layers of the material at the edge and the bar and threaded into the respective support **36**. As will be appreciated, the material is thus firmly and securely attached to each of the supports **36** to prevent tearing and rupture of the material.

Each of the supports **36** preferably comprises a tube of the same character as employed in the side frames. Adjacent the lower end thereof, each support **36** is adapted for the passage therethrough of a bolt **136**, which bolt also passes through a vertical slot provided in a bracket **138**. The bracket **138** is rigidly secured, as by welding, to the rear vertical beam **44** of the respective side frame **20** adjacent the lower surface of the seat **32**, as is shown in Figure 2. The bolt **136** and the bracket **138** serve to connect the support **36** to the respective side frame for pivotal and vertical sliding movement with respect to the side frame. The bracket **138** is so disposed as to effect substantial vertical alignment between the rear beam **44** of the side frame and the support **36**, whereby the axis of the support intersects the axis of the tubular arm rest portion **52** of the respective side frame. The arm rest portion **52** of each side frame is adapted for the slidable reception of a tubular rod **140** or the like, which rod extends through the rearward open end of the portion **52** and at its outer end carries a clevis **142** adapted for the reception of the back rest support, the clevis and the support being pivotally connected by means of a bolt or pin **144**. The rod **140** is guided for movement in a given path by the arm rest portion **52** of the side frame to accommodate angular variation in the disposition of the back rest support with respect to the seat **32** and the side frames **20**, which variation is accommodated by the pivotal and sliding connection at the bracket **138** and the pivotal connection at the clevis **142**. To retain the back rest supports **38** and thus the back rest material **130** in a desired position, a detent or latch **146** is mounted on the arm rest portion **52**, to the lower side thereof, of each side frame. In particular, the latch **146** is pivotally mounted intermediate its ends on the portion **52** and to one side of the pivot presents a handle portion and to the opposite side of the pivot presents a finger portion **148** adapted to pass through a hole provided in the tube **52** and into any one of a plurality of longitudinally spaced holes **150** provided in the rod **140**. To afford automatic adjustment of the back rest, at least to the extent that adjustment is entirely under the control of the chair occupant, a coiled tension spring **152** is disposed within the rod **140** and attached to the clevis **142** at one end thereof and to the arm rest portion **52** at the other end thereof normally to bias the back rest support to a substantially vertical position, as is shown in solid lines in Figure 2. As will be appreciated, each side frame is equipped with the back rest support assembly described, whereby the back rest **34** is readily moved to any one of a plurality of inclined positions, as defined by the holes **150** in the rod **140**, by the occupant of the chair. Rearward inclination of the back rest is accomplished by the chair occupant merely by releasing the latches **146**, leaning against the material **130** and releasing the latches, which are spring biased to latched position, when the back rest is in a comfortable position. To return the back rest to its substantially vertical position, it is merely necessary that the latches be released and that pressure on the back rest be removed, by leaning forwardly in the chair, whereupon the springs **152** effect the return. Preferably, a maximum degree of inclination of approximately 28 degrees, as indicated in dotted lines in Figure 2, is defined by the length of the slot in the bracket **138**. From the foregoing, it will be appreciated that the improved back rest assembly provided by the present invention accommodates complete adjustment of the back rest by the chair occupant, whereby the occupant can attend to his own comfort without assistance.

As will be appreciated, the flexible sheet of material **130** extends freely between the back rest supports **36**, and thus between the side frames **20**, whereby the same does not in any way interfere with ready collapsing of the chair. Also, the back rest supports **36** extend upwardly above the material **130** and are turned rearwardly at the upper ends thereof to provide hand grips **153**. The hand grips **153** facilitate pushing of the chair by a nurse, and, due to the connection of the supports **36** to the side frames, such pushing will in no way result in discomfort to the chair occupant, since the force is transmitted directly to the side frames rather than to the back rest itself.

To complete the upholstery of the chair proper, a cushioned arm rest **154** is disposed on the upper surface of the arm rest portion **52** of each side frame, the same being suitably secured to the tubular portion **52** by brackets **156**. As shown in Figure 2, each arm rest **154** extends forwardly of the arm rest portion **52** to overlie a portion of the hand wheel fork **54**. Preferably, each arm rest **154** is provided with an inclined front edge to accommodate disposition of the arm rest immediately adjacent the rim **84** of the hand wheel, whereby the chair occupant may rest his arms on the arm rests even when effecting propulsion of the chair. In addition to the upholstered portions thereof, each side frame preferably is provided with an ornamental metallic shield **158** extending along the inside of each side frame from a level below the upper surface of the seat **32** and extending upwardly therefrom and forwardly of the hand wheel **26** to provide an enclosed seat portion and to protect the chair

occupant from any possible entanglement in the hand wheel or associated apparatus.

To insure perfect safety of operation of the chair, and thus to induce a sense of complete self-reliance on the part of the chair occupant, a brake mechanism is preferably provided for each of the traction wheels whereby the chair may be parked by its occupant without concern. As shown in Figure 2, each side frame **20**, at the lower horizontal beam **46** thereof, provides a pivotal mounting, as indicated at **160**, adjacent the periphery of the traction wheel **22**, for a brake shoe **162**. The brake shoe **162** is preferably of channel form in cross section and includes a bifurcated end portion adapted for association with the pivot **160**, the bifurcated portion engaging opposite sides of the beam **46**, whereby the brake shoe is disposed in vertical alignment with the beam **46** and the traction wheel **22**. As will be appreciated, the base wall of the channel shaped brake shoe is adapted for engagement with the periphery of the wheel **22** to effect a braking action. To insure long wear and a firm braking action, the brake shoe may suitably be provided, on the external surface of the base wall thereof, with a friction plate having a roughened surface or the like, for engagement with the periphery of the rubber tire **74** provided on the traction wheel. Adjacent the end of the brake shoe opposite the pivotal mounting thereof, the shoe includes a stud projecting laterally from the base wall thereof and adapted for the reception of one end of a coiled compression spring **164**. The other end of the spring may suitably engage about a similar stud provided on the lower surface of the beam **46**, whereby the same is confined between the beam **46** and the brake shoe to bias the shoe into engagement with the periphery of the wheel **22**. The spring **164** according to the present invention is especially strong to insure forcible braking engagement of the brake shoe and the wheel tire. To actuate the brake shoe, a brake lever **166** is provided, the same being pivoted to the beam **46** and extending upwardly toward the seat **32** of the chair. The lever **166** is mounted to provide a long lever arm to the handle side of the pivot thereof, and a short lever arm to the brake shoe side of the pivot thereof, whereby the brake is readily actuated despite the particular strength of the spring **164** by the lever advantage afforded at the handle end of the lever. The lever **166** is preferably mounted to the inside of the beam **46** and is offset laterally above the beam to dispose the handle immediately outside of the seat **32**. At the lower end thereof, the brake lever **166** includes a cam portion comprising a cam surface **168** leading from the edge of the lever to the locking recess. The brake shoe, at the free end thereof, carries a pin **172** extending laterally inwardly of the side frame into the path of the cam portion of the lever **166**, whereby the said pin is adapted to be engaged by the cam surface **168** to cam the brake shoe out of engagement with the tire of the wheel **22**, and thereafter to move the pin into the said recess to lock the brake in its released position. To reengage the brake, it is merely necessary for the chair occupant to move the handle of the lever **166** rearwardly to move the cam **168** away from the pin **172**, whereupon the spring **164** forces the brake shoe against the wheel tire. As will be appreciated, each brake is thus adapted for independent actuation, not only to accommodate parking of the chair in a stationary position, but also to assist in negotiating turns if so desired by the chair occupant.

With reference to Figures 2 and 6 to 10, the foot rests and leg rests provided according to the present invention for the wheel chair first include a support bracket **174** secured to each side frame **20** and extending forwardly thereof. Preferably, each bracket **174** is of generally U-shape in cross section adjacent the front vertical beam **44** of the respective side frame and is secured, as by welding, to the upper portion of the central section **60** of the said beam. The bracket, in side elevation, is of a configuration corresponding to the periphery of the hand wheel **26** and closely circumscribes the lower forward portion of the periphery of the hand wheel, as is seen in Figure 2. At the outer end thereof, the bracket **174** is bifurcated, as by removal of the base wall of the U, and the said bifurcated portion is preferably reinforced by extending a portion of the base wall of the bracket diagonally across the legs of the U, as is indicated at **176** in Figure 2. The said bifurcated portion of each bracket **174** is adapted for the reception therein of one foot rest support **38**, the foot rest support being pivoted to the bracket **174** by means of a pivot pin or bolt **178**. As will be appreciated, each bracket **174** is disposed in the vertical plane defined by the hand and traction wheels on the respective side frame, whereby the bracket and foot rest support in no way obstruct the seat of the chair. From the pivot mounting **178** thereof, the foot rest support **38**, as is shown in Figure 2 and as is shown in solid lines in Figure 6, extends rearwardly and downwardly toward the peripheral surface of the traction wheel **22** on the respective side frame. Just above the wheel **22**, the support **38** is curved laterally inwardly of the chair, as is shown in Figure 7, to clear the wheel, and then extends downwardly to a point below the axle of the wheel.

The mounting provided at **178** for the foot rest support **38** accommodates swinging or pivotal movement of the support from the position shown in solid lines in Figure 6 to the position shown in dotted lines in that figure. To effect control of such movement, an actuating rod **180** is pivotally connected to the support **38** adjacent the lateral bend or curve therein. Preferably, the pivotal connection is accomplished merely by providing a lateral extension on the rod **180** and extending the same freely through a diametrical hole provided in the support **38**. The rod **180** extends rearwardly and slightly downwardly from the support **38** and passes slidably through the central section **60** of the front vertical beam **44** of the respective side frame. A guide for the rod **180** is provided rearwardly of the front vertical beam on the lower horizontal beam **46** of the respective side frame. Specifically, a guide tube **182** is secured to a mounting bracket **184**, which in turn is attached to the beam **46**, preferably by the pivot **160** for the brake shoe **162**. The bracket **184** also provides and comprises part of a lock for the actuating rod **180**, the lock preferably being in the form of a transom lock and including a movable lock plate **186** disposed within a channel portion of the bracket **184** and confined therein by a pin **188** and passage of the rod **180** through the lock plate. The lock plate **186** is movable from the piston shown in Figure 2 to a position wherein the hole therein, through which the rod **180** passes, is aligned with the guide tube **182** to accommodate free sliding movement of the rod therethrough. Upon release of the lock plate **186**, the same returns to the canted position shown, in which position the portions of the plate defining the boundary of the hole therein grasp the rod to lock the same in adjusted position. If desired, a spring **187** may be confined between the bracket **184** and the plate **186** to bias the plate to locking position.

Preferably, the arrangement of the transom lock, and particularly the lock plate **186**, is such, due to the angular positioning of the lock plate, that the lock provided thereby only prevents movement of the rod **180** in one direction, namely rearwardly of the chair. Due to such arrangement, the rod **180** may be moved forwardly of the lock without necessity for releasing the lock plate **186** to increase the inclination of the foot rest support to the vertical. Upon manual actuation of the lock plate, by moving the upper edge thereof toward the guide tube **182**, the rod **180** is released whereupon return of the support **38** is automatically effected due to its own weight. To insure positive locking of the rod **180**, the same is preferably provided with a roughened surface, suitably a screw thread as is shown. At the inner end thereof, the rod **180** carries a pair of nuts **190**, adapted to lock against one another, to prevent inadvertent disassembly of the

rod and guide tube. Also, the nuts **190** serve to define a maximum angle of inclination for the foot rest support **38**, the limits of movement of the support **38** as thus defined suitably comprising an angular path of 75 degrees, within which path the foot rest support may be locked at any desired position.

Due to the disposition of the actuating rod **180** and transom lock **184—186** above the lower horizontal beam **46** of each side frame, the foot rest supports **38** are readily adjustable by the chair occupant himself without having to call upon someone to assist him. To move the supports forwardly, the chair occupant need only move the rod **180** forwardly, and to move the supports rearwardly, he need only release the transom lock. Also, as will be appreciated, each support is individually adjustable to afford various occupants of the chair a variety of adjustments for each foot rest support to afford complete comfort.

To insure proper positioning of the foot rest supports when the same are disposed in the vertical or down position thereof, each support may suitably carry a cam lug extending rearwardly thereof and adapted to engage the tubular member **68** of the fork portion **64** of the respective side frame. The cam lug would normally engage the member **68** in such manner that a slight amount of force would have to be exerted to cam the support **38** inwardly of the frame to space the same an adequate distance from the traction wheel. Such camming action also affords a detent lock between the support **38** and the member **68** whereby the support is retained in a desired position adjacent the side frame. Such lock is particularly advantageous in maintaining the foot rest supports in proper position when the chair is collapsed.

Each foot rest support **38** is hollow, and preferably formed of tubular stock, and at the lower end thereof defines a socket accommodating mounting of one foot rest **40** thereon. In particular, each foot rest **40** includes an L-shaped rod **194** including a vertical leg and a substantially horizontal leg defining a pintle **196** as will be described. The vertical leg of the foot rest rod **194** is of a size to be conformably received within the tubular foot rest support **38**, the rod **194** being adjustable longitudinally of the support **38** to vary the length of the foot rest according to the needs of various users of the chair. To lock the rod **194** in an adjusted position in the tube **38**, the tube is provided with a peripheral opening which is bridged by a mounting bar **198**, see Figure 10, adapted for the passage of a bolt carrying a pair of locking lugs **200**, which lugs are adapted forcibly to engage opposite sides of a radially raised longitudinally extending rib **202** provided on the vertical leg **194**. The lock thus provided is positive in action and assures proper positioning of the rod in the tube, particularly with respect to proper disposition of the pintle pin **196** in forwardly extending relation. Such disposition of the pintle pin **196** is insured as a result of a predetermined relation between the rib **202** on the rod **194**, the pintle **196** and the lugs **200** on the foot rest support **38**. Once the foot rest support, as including the tube **38** and the vertical leg of the rod **194**, is properly adjusted for a given user, no further adjustments thereof will be required and the lugs **200** positively lock the two members in desired position, that is, at a proper length.

The pintle **196** defined by the horizontal leg of the rod **194** preferably comprises a tapered pintle pin, as shown in Figure 9, adapted to provide a pivotal mounting for a platform portion **204** of the foot rest **40**. In particular, the platform portion or member **204** includes a planar platform surface and an enlarged tubular housing **206** provided at the outer side edge of the platform surface. The housing **206** is of a length less than the corresponding dimension of the platform surface and is disposed intermediately thereof. The housing **206** is provided with a tapered bore therein to receive the pintle pin **196**, the rearward edge of the housing rotatably abutting an enlarged portion of the horizontal leg of the rod **194**. Due to the disposition of the housing **206**, the platform surface of the foot rest normally extends in a horizontal plane coextensive with the full horizontal dimension of the rod **194**. As shown in Figure 6, the pintle **196** is of a length greater than the housing **206** and extends beyond the same to the forward side of the platform surface. This freely extending portion of the pintle serves as a guide for a coiled compression spring **208**, which in effect is compressed between the outer end of the pintle **196** and the front edge of the housing **206** to exert a friction load on the pivotal mounting of the housing on the pintle. Specifically, the spring **208** is disposed within a cup-shaped housing **210** which is secured, at the bottom wall thereof, to the end of the pintle **196** by a screw or the like. As will be appreciated, the spring **208** exerts a friction load on the housing **206**, at the abutting edges of the housing **206** and the rod **194**, to retain the platform member **204** in adjusted position. However, such friction load alone would not be adequate to support the weight of the foot of the occupant of the chair and for this reason a positive stop is provided to maintain the platform surface in its horizontal foot supporting position. In particular, an integral stop member **212** is formed on the exterior of the pintle housing **206** of the foot rest, the stop member including a finger engageable with the vertical leg of the foot rest rod **194** when the platform surface is in its horizontal position. From such horizontal position, the platform is adapted to be pivoted on the pintle **196** to a substantially vertical out-of-the-way position wherein the rearward portions of the platform engage the foot rest support **38**, the platform being retained in such position by the friction load of the spring **208**. As will be appreciated, movement of the two foot rests to the vertical position thereof accommodates collapsing of the chair in the manner described hereinbefore.

To prevent damage to furniture and the like which may inadvertently be bumped by the chair occupant, the foot rests **40** are each preferably provided in the front and side edges thereof with a rubber bumper **214**, Figure 7, which may suitably be set in a recess or groove provided in the said edges of the foot rest.

Adapted for use with the foot rest supports **38** and the foot rests **40**, as thus described, are a pair of leg rests **42**. Considering first the structure of each leg rest, reference is made to Figures 7, 8 and 9, wherein each leg rest is shown as comprising, with respect to the seat **32** of the chair, an inner section **216** and an outer section **218**, the two sections being telescopically associated with one another for relative longitudinal movement. The inner section **216** comprises a pair of spaced parallel longitudinal frame members or side rails **220** formed of angle members, which angle members each include an upstanding vertical leg having a portion thereof bent back upon itself. The two side rails are joined at one end thereof, the end thereof adjacent the seat **32**, by a frame member or cross rail **222** to maintain the same in spaced parallel relation, the generally rectangular frame defined by the members **220** and **222** being of a size smaller than the interior dimensions of the rectangular seat base **94** for a purpose to be described. A sheet **224** of flexible but strong material, preferably the same as that used for the seat cushion cover and the back rest, is stretched tautly between the side rails **220**, the same extending from the upper edges of the vertical legs of the rails **220** in spaced relation to the horizontal legs thereof, and being secured to the vertical legs by bringing the edges of the sheet of the material over the edges of the side rails and confining the same between the bent portions of the vertical legs of the side rails, as by clipping the said portions together. The inner leg rest section also includes an integral U-shaped member **226** formed of cylindrical stock that is secured at the bight portion thereof to the cross rail **222** of the rectangular frame. The two legs of

the member 226 extend in inwardly spaced parallel relation to the side rails 220 adjacent and substantially in the plane of the horizontal legs thereof to define a pair of guide rails 228. At the bight portion thereof, the member 226 includes a secondary portion of U-shape, indicated at 230, for a purpose to be described.

The outer section 218 of each leg rest comprises a generally rectangular metallic plate of a size slightly smaller than that of the inner section 216. The metallic plate is formed at the side edges thereof to provide a pair of spaced parallel upstanding side rails 232 of generally inverted U-shape in cross section, the outer vertical legs of the side rails being bent upon themselves in somewhat the same manner and for the same purpose as the vertical legs of the side rails 220 of the inner section 216. Specifically, a sheet of material 234 is caught at its edges by the bent portions of the side rails 232 and is stretched tautly between the rails 232 in spaced relation to the plate portion of the outer leg rest frame. As shown in Figures 8 and 9, the side rails 232 of the outer section 218 are each formed to comprise, for a distance adjacent the inner end thereof, a regular inverted U, but throughout the major portion of the length thereof present a distorted inside leg of the U which is first bent laterally toward the center of the frame and then downwardly to the base wall of the frame, as is indicated at 236.

In assembly, the outer section 218 of the leg rest is telescopically received within the inner section 216, with the side rails 232 of the outer section being confined between the sheet of material 224 and the horizontal legs of the side rails 220 of the inner frame or section. In effecting such assembly, the guide rails 228 of the inner section are disposed against the inner surface of the inner leg of the regular U portion of the side rails of the outer section 218 and against the outer surface of the inner leg of the irregular portion 236 of that section, said guide rails at the free end thereof being connected to the side rails 220 of the inner section 216 by suitable clamps 238 and bolts 240. As will be appreciated from such assembly, the guide rails 228 and the side rails 220 and 232 of the two sections effect a slidable association of the two sections whereby the assembly is extensible and contractible to the various requirements of users of the wheel chair of the present invention. In the assembly, the side rails of the two sections comprise longitudinal guide means, and the side rails 232 of the outer section comprise guide tracks for the guide rails 228. A limit to collapsing movement is provided by the cross rail 222 of the inner section and a limit of extending movement is provided by the clamps 238 when engaged by the wall portion of the side rails of the outer section at the separation of the two inner leg portions of that section.

In use, the tautly stretched sheets of leg rest material 224 and 234 will provide a firm yet cushiony support for the legs of the occupant of the chair. Since the sheets of material are spaced from the base portions of the frames 216 and 218, comfort of the user is insured.

Each leg rest 42, when in the position of use thereof, is pivotally supported at the inner or upper end thereof, the inner end of the inner section 216, adjacent the front edge of the seat 32 by a relatively narrow ledge member or support 242 secured to the lower surface of the respective seat part. The ledge 242 is curved slightly upwardly at the front thereof partially to define a cylindrical recess adapted for the reception of the U or handle portion 230 of the guide rail member 226, whereby each leg rest is pivotally mounted at the front central portion of a part of the seat 32. At the lower or outer end thereof, the outer end of the outer section 218, the leg rest is attached to and supported by the foot rest 40 for movement with the foot rest and support both as to longitudinal and pivotal adjustment. To accommodate attachment, the outer section of the leg rest at each side rail 232 thereof is provided with a hook or hooked finger portion 244 adapted to be fitted into a suitable hole provided in an angle bracket 246 secured to the respective foot rest. As shown, the hook 244 extends laterally rearwardly of the leg rest to fit in and rest upon the bracket 246. Thus, in all positions of inclination of the foot rest supports, the leg rest is firmly supported by the brackets 246 against inadvertent disassociation of the leg rest and foot rest.

As will be appreciated, the leg rest 42 need not be in constant use for many chair occupants, and also in their in-use position, will prevent collapsing of the chair. In view of these factors, I provide means for storing the leg rests in an out-of-the-way position on the chair when the same are not in use and when the chair is to be collapsed. As pointed out hereinbefore, the outer leg rest section 218 is of a size smaller than the inner leg rest section 216 and is adapted to be received within the confines of the same, while the inner leg rest section 216 is of a size smaller than the base 94 of each part of the seat 32. Due to such arrangement, each leg rest 42 is adapted to be collapsed and stored under one part of the seat 32, and due to the telescopic association of the two sections thereof, each leg rest is of a minimum thickness so as to be storable substantially within the confines of a seat base 94, in which position the same will not obstruct or interfere with collapsing of the chair. To mount each leg rest for movement to and from the stored and in-use positions thereof, I provide an elongate strap or leaf spring 248 beneath each seat part, the spring being secured to the lower surface of the seat at the rear base member of the seat part and being slidably mounted at the front of the seat. At the rearward end thereof, the spring is bent downwardly to define a recess 250, but throughout the major portion of its length, the same engages the lower surface of the seat. Adjacent the forward end of the seat, the spring is bent downwardly to clear the front base member of the seat part, and then is bent upwardly toward the ledge member or support 242. The spring extends upwardly in front of the ledge member and then extends rearwardly over the ledge member and is slidably mounted against the lower surface of the seat. The spring or strap 248 is of a width slightly less than that of the handle portion 230 of the guide rail member and in the path of extension thereof passes freely through the said portion 230 whereby the portion 230 is slidably mounted on the spring.

To move the leg rest from its in use position, as shown in solid lines in Figure 6, to the stored position thereof, as shown in dotted lines, the lower end of the leg rest is disassociated from the foot rest by swinging the same forwardly of the foot rest, after which the leg rest is collapsed. Then, a slight forward pull on both sections of the leg rest will move the handle portion 230 of the inner section off of the ledge 242, which movement is accommodated by the resiliency and slidable mounting of the spring 248. Thereafter, the handle portion may be moved rearwardly along the spring 248 until the same enters the recess 250, at which point the leg rest may be pivoted about the handle portion 230 thereof into a position engaging the lower surface of the seat within the confines of the base 94. Since the spring 248 rests flat against the bottom of the seat part, the spring will not interfere with movement of the sheet 224 of the leg rest material into engagement with the lower surface of the seat. To retain the leg rest in its stored position, lock means, such as spring clips 252, may be provided adjacent the front of the seat on each side of the leg rest. In either position thereof, the leg rests are disposed to be manipulated by the chair occupant, whereby the occupant himself may attend to his own comfort.

From the foregoing, it will be appreciated that each of the component parts of the wheel chair of my invention is formed in a highly efficient, practical and economical manner. Also, the assembly of the various components into the completed wheel chair, as shown in Figure 1, is readily effected to provide an improved wheel chair

that has a very pleasing appearance, and that is sturdy and reliable in use.

A particular advantage of the wheel chair of the present invention resides in the collapsible linkage means incorporated therein accommodating folding of the chair to a collapsed position wherein the same comprises a very compact and easily handled package. The linkage means is extremely easy to operate and readily accommodates folding of the chair to and from its collapsed and extended positions. In the extended position of use, the collapsible linkage means affords a very firm and reliable support for the side frames and the seat of the chair. Also, the said collapsible linkage leads to the provision of knee action and shock absorbing functions, wherein the support is such that each wheel in practical effect is individually suspended to insure optimum shock absorbing characteristics, while the seat of the chair is constantly maintained in a given substantially horizontal plane to insure the complete comfort of the chair occupant.

Other features leading to the complete comfort of the chair occupant are the provision of the improved back rest, foot rests and leg rests of the present invention. These features also lead to the accomplishment of substantially complete self-reliance on the part of the chair occupant for the reason that all chair adjustments affecting the comfort and motivation of the chair occupant are within his ready reach and are conveniently actuated by him. Contributing to the spirit of self-reliance is the provision of the improved brake means of the present invention whereby the chair occupant is always assured of perfect control of the chair.

In view of the above, it will be appreciated that the present invention provides an improved wheel chair that not only exhibits advantageous structural qualities over prior developments in the art, but that also provides the further advantage that all components thereof are readily operated and used by the chair occupant himself, whereby his feeling of self-reliance and independence is appreciably enhanced, thus rendering his life and the lives of those about him more enjoyable. Also, the wheel chair of the present invention accommodates convenient travel in a substantially non-restricted orbit, whereby the mental anguish heretofore caused by the confining restrictions of invalidity is at least substantially reduced if not entirely eliminated.

The described collapsible linkage and improved foot and leg rest means are also directly adapted to folding wheel chairs of modified form, such as one having its traction wheels at the rear of the chair (which would be particularly advantageous for outdoor use), and to folding wheel chairs having different forms of side frames, traction means, etc., without diminution of the advantages above observed.

Thus, while I have described what I regard to be preferred embodiment of my invention, it will be appreciated that various changes, rearrangements and modifications may be made therein without departing from the spirit and scope of the invention, as defined in the appended claims.

I claim:

1. A wheel chair comprising a pair of spaced parallel side frames, a seat extending between said side frames, and a linkage extending between said side frames, said seat comprising two parts pivotally connected together centrally between said side frames and each pivotally connected adjacent its outer side to one of said side frames, said linkage comprising a pair of horizontal links each pivotally connected adjacent its outer end to one of said side frames, said links being pivotally connected to one another centrally between said side frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links and pivotally connected at its upper end to said seat parts centrally between said side frames, a block slidably mounted on said vertical link, and a pair of diagonal links each pivotally connected at its inner end to said block and at its outer end adjacent the outer end of one of said horizontal links.

2. A wheel chair comprising a pair of spaced parallel side frames, a seat extending between said side frames, said seat comprising two parts pivotally connected together centrally between said side frames and each pivotally connected adjacent its outer side to one of said side frames, and linkage means extending between said side frames, said linkage means including a front linkage and a rear linkage, each comprising a pair of horizontal links each pivotally connected to one of said side frames, said links being pivotally connected to one another centrally between said frames, and a vertical link pivotally connected at its lower end to the central connection of said horizontal links and pivotally supported at its upper end by said seat parts centrally between said side frames, the horizontal links of one of said linkages including cooperable portions preventing movement thereof downwardly beyond a substantially horizontal position, the other of said linkages including a block slidably mounted on the vertical link thereof and a pair of diagonal links each pivotally connected at its inner end to said block and at its outer end adjacent the outer end of one of the horizontal links of said other linkage.

3. A folding wheel chair comprising a pair of spaced substantially parallel side frames, a seat extending between said side frames, said seat comprising a pair of similar rigid parts pivotally connected together centrally between said side frames and each being pivotally connected adjacent its outer side and adjacent one end thereof to one of said side frames, and a collapsible linkage extending between said side frames, said linkage comprising a pair of horizontal links each pivotally connected at its outer end to one of said side frames beneath said seat parts, said links being pivotally connected to one another at the inner ends thereof centrally between said side frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links and at its upper end to the central connection of said seat parts, a block slidably mounted on said vertical link normally adjacent the upper end thereof, and a pair of diagonal links of a length greater than said horizontal links each pivotally connected at its outer end to the outer end of one of said horizontal links and at its inner end to said block.

4. A folding wheel chair comprising a pair of spaced substantially parallel side frames, a seat extending between said side frames, said seat comprising a pair of similar parts pivotally connected together centrally between said side frames and each being pivotally connected adjacent its outer side and at least one end thereof to one of said side frames, and a pair of collapsible linkages extending between said side frames, one adjacent the front and one adjacent the rear thereof, said front linkage comprising a first horizontal link of a length equal approximately to one-half the spacing between said side frames pivotally connected at the outer end thereof to one of said side frames, a second horizontal link comprising a downwardly open channel of a length greater than that of said first link pivotally connected at the outer end thereof to the other of said side frames, said first link being positioned within said second link and being pivotally connected to said second link centrally between said side frames, and a vertical link pivotally connected at its lower end to the central connection of said horizontal links and at its upper end to the central connection of said seat parts, said rear linkage comprising a pair of horizontal links pivotally connected to one another at the inner ends thereof centrally between said side frames and each pivotally connected at its outer end to one of said side frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links of said rear

linkage and at its upper end to the central connection of said seat parts, a block slidably mounted on said vertical link of said rear linkage, and a pair of diagonal links of a length greater than said horizontal links of said rear linkage each pivotally connected at its outer end to the outer end of one of said horizontal links of said rear linkage and at its inner end to said block.

5. A wheel chair comprising a pair of spaced parallel side frames, a seat extending between said side frames, a relatively narrow elongate leaf type spring attached to the lower surface of said seat and extending from adjacent the front of said seat rearwardly beneath said seat, an extensible leg rest including a pair of telescopically associated frame members, one of said frame members including a U-shaped portion at the outer end thereof defining an opening adapted for the reception and passage of said spring, said U-shaped portion being slidably mounted on said spring to support the outer end of said one frame member, and a support secured to said seat adjacent the front thereof within the confines of said spring, said spring accommodating positioning of said U-shaped portion of said one frame on said support to dispose said leg rest in an in-use position, said spring accommodating disassociation of said U-shaped portion and said support and sliding of said U-shaped portion toward the rear of said seat, said frame members of said leg rest being movable to a position defining a width and length less than the corresponding dimensions of said seat, whereby said leg rest is adapted to be stored in an out-of-the-way position beneath said seat.

6. A wheel chair comprising a pair of spaced parallel side frames, a seat extending between said side frames, a relatively narrow elongate leaf type spring secured to the lower surface of said seat adjacent the front and rear thereof and extending beneath said seat, a leg rest comprising a pair of generally rectangular frames each including side rails and a sheet of flexible material stretched tautly between and connected to said side rails, one of said frames being of a width greater than the other frame and telescopically receiving said other frame, said side rails of both frames defining cooperating longitudinal guide means accommodating telescopic association of said frames and relative longitudinal movement of said frames, one of said frames at the outer end thereof defining an opening adapted for the reception and passage of said spring, said spring being received within said opening slidably to support said one frame on said seat, said one frame being movable to an in-use position adjacent the front of said seat and being slidable on said spring to a position adjacent the rear of said seat, said frames of said leg rest being movable to a collapsed position wherein said leg rest is of a size smaller than said seat, whereby said leg rest is adapted to be stored immediately beneath said seat, and means for retaining said leg rest in its stored position.

7. A wheel chair comprising a pair of side frames, a seat extending between said side frame, a foot rest support pivotally mounted on one of said frames at the front of the chair, means for adjustably positioning said support with respect to said seat, a foot rest mounted on said support for adjustment longitudinally of said support, a strap positioned beneath said seat and extending from adjacent the front of said seat rearwardly beneath said seat, and an extensible leg rest slidably supported at one end thereof on said strap and adapted at the other end thereof to be detachably connected to said foot rest, said leg rest being slidable on said strap to an in-use position wherein said one end thereof is supported by said strap adjacent the front of said seat and said other end thereof is detachably connected to said foot rest, said leg rest being detachable from said foot rest and slidable on said strap to a stored position beneath said seat.

8. A folding wheel chair comprising a pair of spaced substantially parallel side frames, a seat extending between said side frames, said seat comprising a pair of similar parts pivotally connected together centrally between said side frames and each being pivotally connected adjacent its outer end with respect to one of said side frames, a collapsible linkage extending between said side frames, said linkage comprising a pair of horizontal links each pivotally connected to one of said side frames, said links being pivotally connected to one another centrally between said frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links and pivotally connected at its upper end to the central connection of said seat parts, a relatively narrow elongate strap positioned closely beneath each of said seat parts and extending from adjacent the front of the respective seat part rearwardly beneath said seat part, a pair of leg rests each associated with one of said seat parts and including a frame of a width less than that of each seat part having an opening in the inner end thereof complementary to the respective strap, said strap being received within the said opening in said frame of the respective leg rest slidably to support said inner end of the leg rest, each of said frames being slidably mounted on the respective strap whereby said inner end of each leg rest is movable on the respective strap from an in-use position of the leg rest wherein said inner end is supported on said strap adjacent the front of said seat and the leg rest depends therefrom, to a stored position of the leg rest, wherein said inner end is supported on said strap adjacent the rear of said seat and the leg rest is adapted to be disposed beneath the respective seat part closely adjacent thereto, and means for retaining the outer end of each leg rest closely adjacent the respective seat part in said stored position, said leg rests when in their stored position accommodating collapsing of said linkage and folding of said seat parts to accommodate movement of said side frames into closely adjacent relation.

9. A folding wheel chair comprising a pair of spaced substantially parallel side frames, a seat extending between said side frames, said seat comprising a pair of similar parts pivotally connected together centrally between said side frames and each being pivotally connected adjacent its outer side with respect to one of said side frames, collapsible linkage means extending between said side frames, said linkage means including a front linkage and a rear linkage each comprising a pair of horizontal links each pivotally connected to one of said side frames, said links being pivotally connected to one another centrally between said side frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links and pivotally connected at its upper end to the central connection of said seat parts, a foot rest support pivotally mounted on each of said side frames at the front of the chair, a foot rest adjustably mounted on each of said supports, a strap positioned beneath each of said seat parts and extending from adjacent the front of the respective seat part rearwardly beneath said seat part, and a pair of extensible leg rests each associated with one of said seat parts, each of said leg rests being slidably supported at one end thereof on the respective strap and being adapted at the other end thereof to be detachably connected to the foot rest on the respective side of the chair, each of said leg rests being slidable on the respective strap to an in-use position wherein said one end thereof is supported by said strap adjacent the front of said seat part and said other end thereof is detachably connected to the respective foot rest, each of said leg rests being detachable from the respective foot rest and slidable on the respective strap to a stored position beneath said seat, said leg rests in the stored position thereof accommodating collapsing of said linkage means and folding of said seat parts to move said side frames closely adjacent one another.

10. A folding wheel chair comprising a pair of spaced substantially parallel side frames, a seat extending be-

tween said side frames, said seat comprising a pair of similar parts pivotally connected together centrally between said side frames and each being pivotally connected adjacent its outer side and at at least one end thereof with respect to one of said side frames, a pair of collapsible linkages extending between said side frames, one adjacent the front and one adjacent the rear thereof, said front linkage comprising a pair of horizontal links each pivotally connected to one of said side frames, said links being pivotally connected to one another centrally between said frames, and a vertical link pivotally connected at its lower end to the central connection of said horizontal links and pivotally connected at its upper end to the central connection of said seat parts, said rear linkage comprising a pair of horizontal links, each pivotally connected to one of said side frames, said links being pivotally connected to one another centrally between said side frames, a vertical link pivotally connected at its lower end to the central connection of said horizontal links of said rear linkage and pivotally connected at its upper end to the central connection of said seat parts, a block slidably mounted on said vertical link of said rear linkage, and a pair of diagonal links each pivotally connected at its inner end to said block and at its outer end adjacent the outer end of one of said horizontal links of said rear linkage, a foot rest support pivotally mounted on each of said side frames at the front of the chair, means for adjustably positioning each of said supports with respect to the respective side frame, a foot rest mounted on each of said supports for adjustment longitudinally of the respective support, each of said foot rests being pivotally supported for movement from a horizontal in-use position to a vertical position, a relatively narrow elongate leaf type spring secured to the lower surface of each of said seat parts adjacent the front and rear thereof and extending beneath the respective seat part, a pair of leg rests each associated with one of said seat parts, each leg rest comprising a pair of generally rectangular frames each including side rails and a sheet of flexible material stretched between and connected to said side rails, one of said frames being of a width greater than the other frame and telescopically receiving said other frame, said side rails of both frames defining cooperating longitudinal guide means accommodating telescopic association and relative longitudinal movement of said frames, one of the frames of each of said leg rests at the outer end thereof defining an opening adapted for the reception and passage of the respective spring, each of said springs being received within the opening in the respective frame slidably to support the respective frame on the respective seat part, said one frame of each of said leg rests being movable on the respective spring to an in-use position adjacent the front of the respective seat part, the other frame of each of said leg rests at the outer end thereof having means adapted for detachable connection to the respective foot rest, each of said leg rests being detachable from the respective foot rest and slidable on the respective spring to a stored position beneath the respective seat part, the frames of each of said leg rests being movable to a collapsed position wherein the respective leg rest is of a size smaller than the respective seat part, and means for retaining each of said leg rests in its stored position beneath the respective seat part, said foot rests in the vertical position thereof and said leg rests in the stored position thereof accommodating collapsing of said linkages and folding of said seat parts, whereby the wheel chair may be moved to a collapsed position wherein said side frames are disposed closely adjacent one another.

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