Sept. 22, 1970 H. E. MARSHALL 3,529,700

BRAKE ASSEMBLY FOR WHEELCHAIRS

Filed Oct. 28, 1968 3 Sheets-Sheet 1

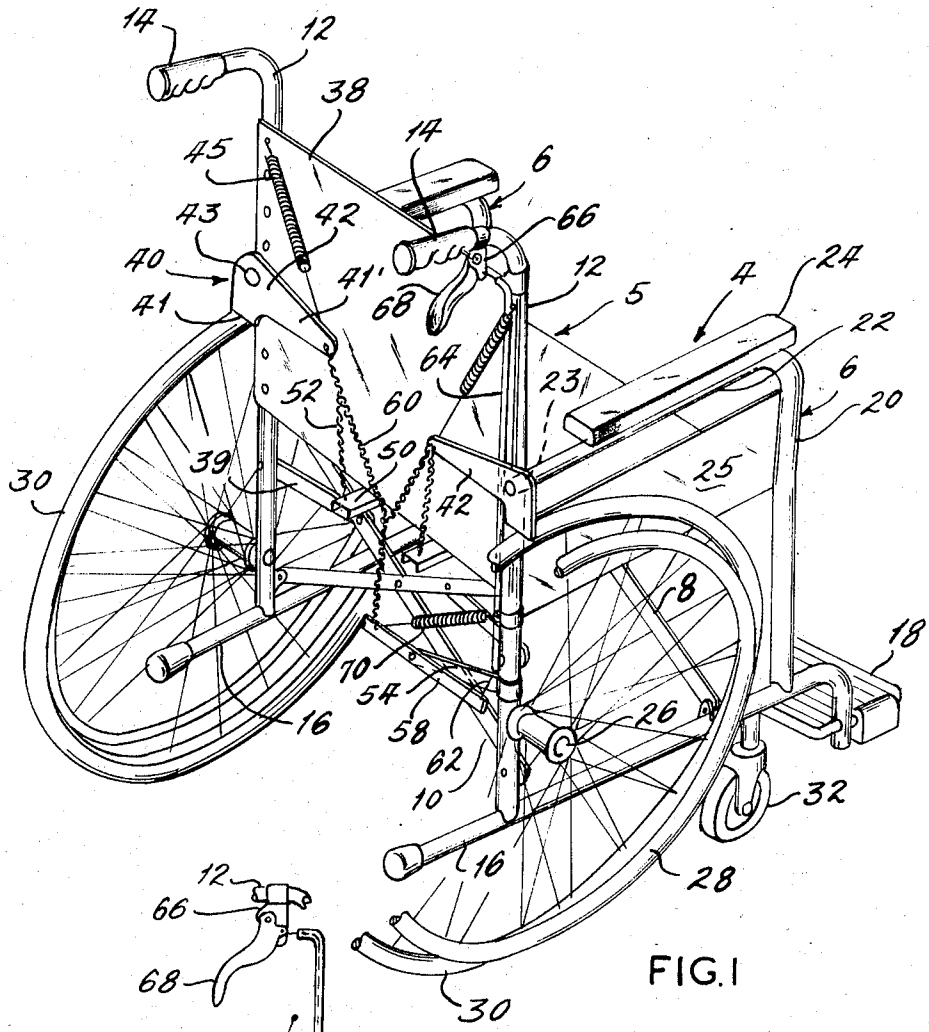

FIG. 1

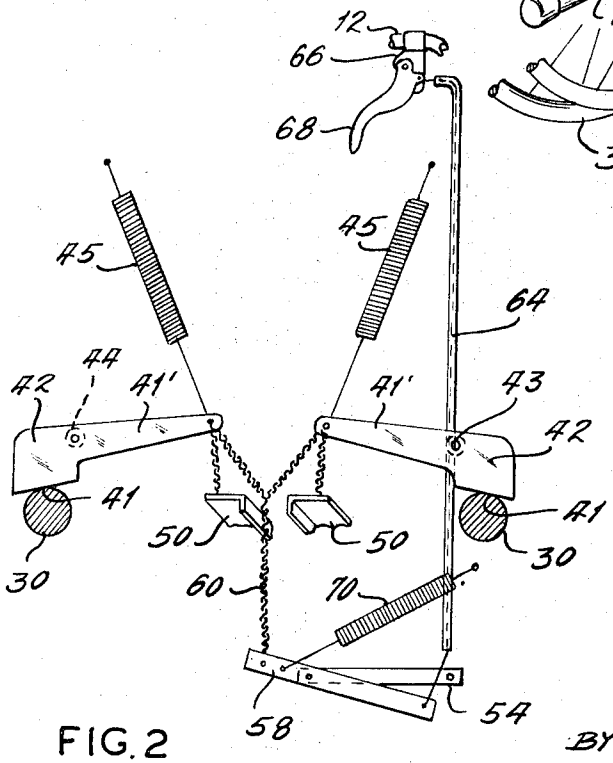

FIG. 2

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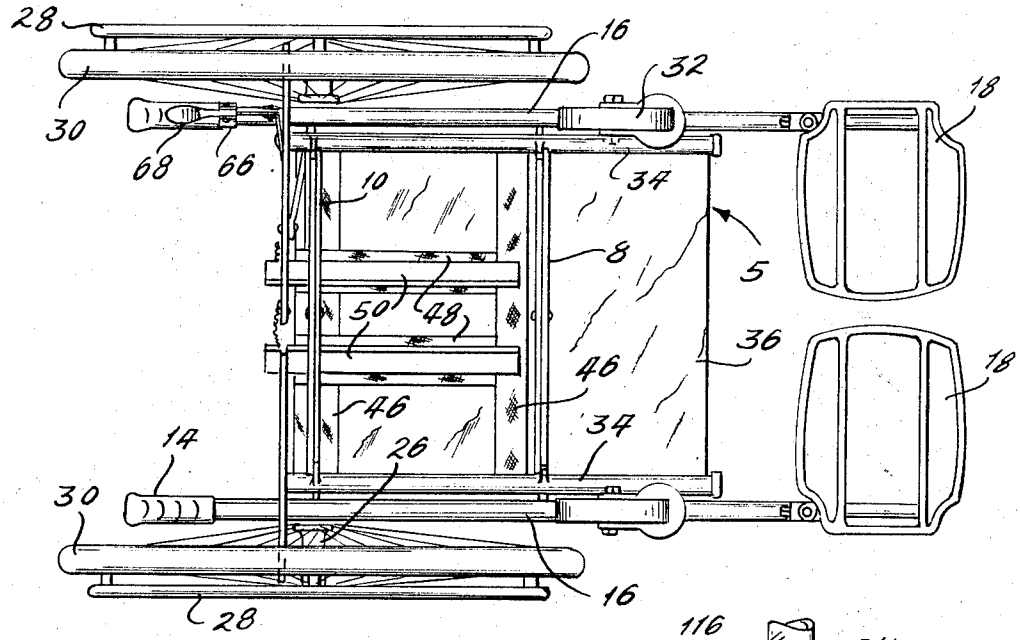

FIG. 3

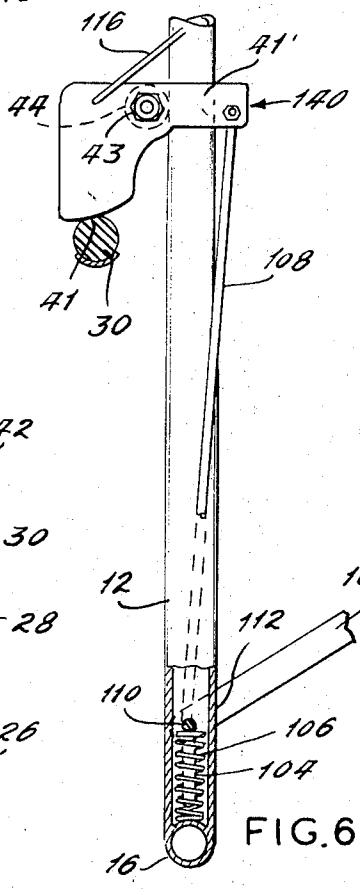

FIG. 6

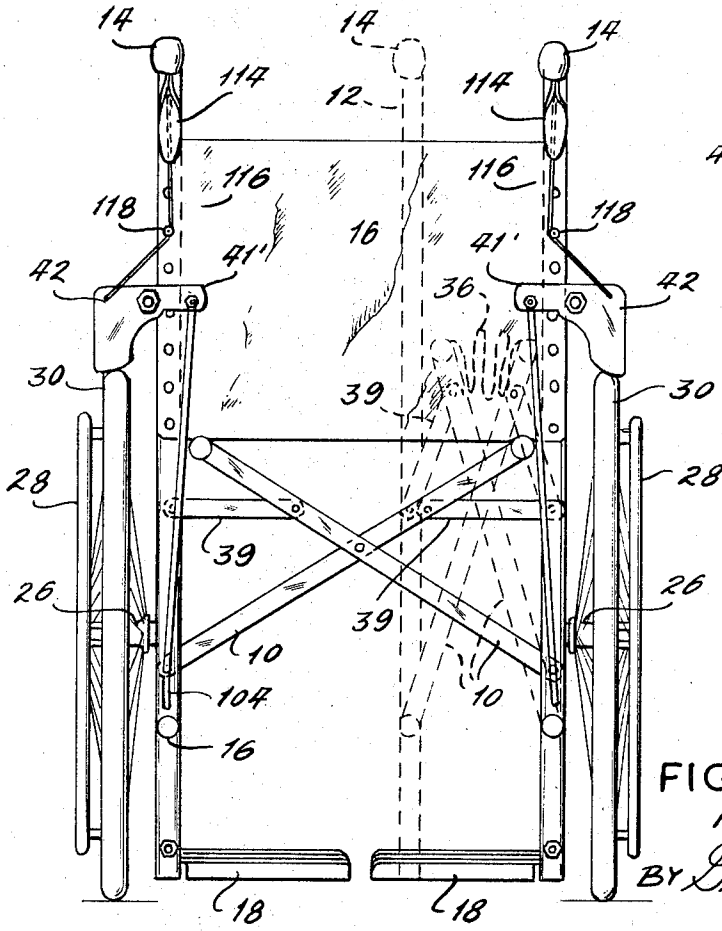

FIG. 5

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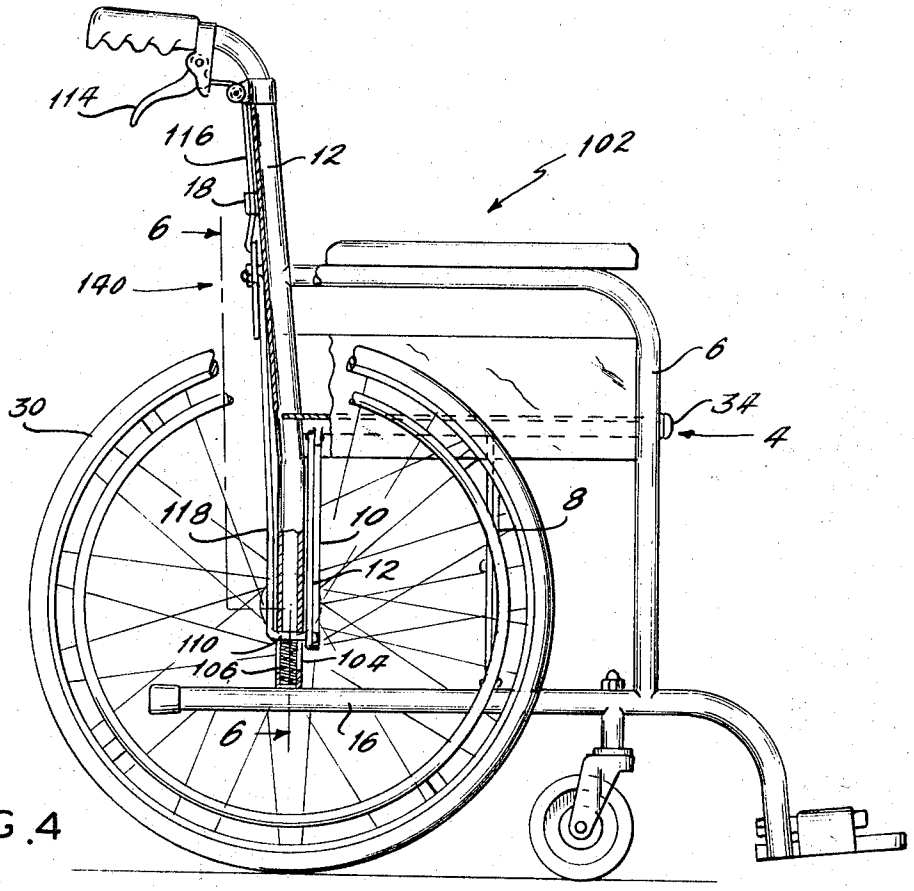

FIG. 4

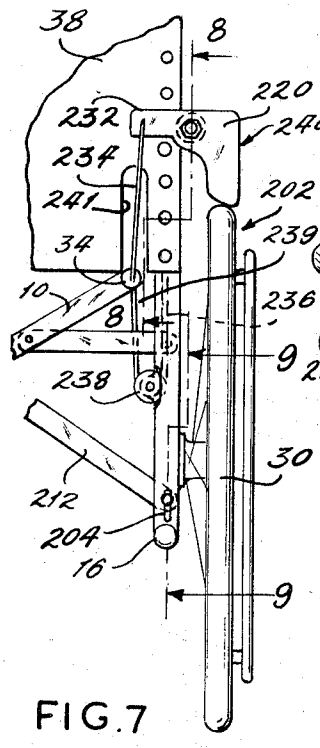

FIG. 7

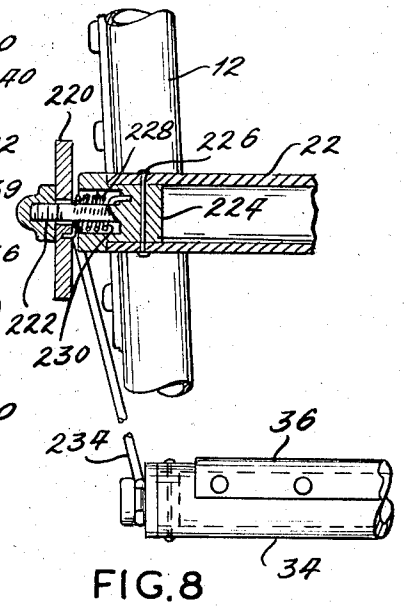

FIG. 8

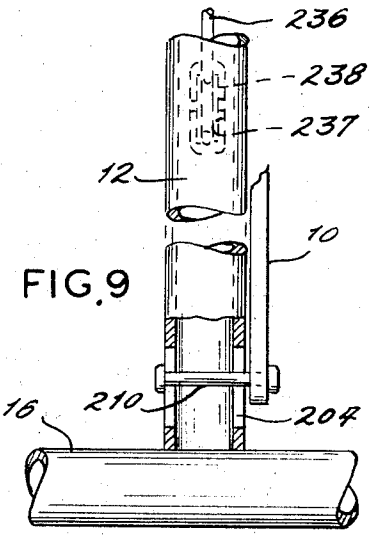

FIG. 9

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United States Patent Office 3,529,700 Patented Sept. 22, 1970

3,529,700

BRAKE ASSEMBLY FOR WHEELCHAIRS

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Filed Oct. 28, 1968, Ser. No. 770,975
Int. Cl. B60t 1/04, 13/04; F16d 65/30
U.S. Cl. 188—109 13 Claims

ABSTRACT OF THE DISCLOSURE

A wheelchair brake assembly including spring loaded brake elements mounted on the main frame of a wheelchair and biased toward wheel engagement. The elements are disengaged from the wheels in response to a seat controlled linkage or manually operable means.

BACKGROUND OF THE INVENTION

This invention relates to a wheelchair having automatic auxiliary wheel locking devices.

Many invalids confined to wheelchairs are capable of leaving their wheelchairs for short distances when some object such as a handrail is available for them to grasp. However, it is important that the wheelchair be locked or stabilized so that it will remain in the same place and does not move as the invalid sits down or stands up. A serious hazard exists for the invalid who fails to set the conventional hand brakes prior to leaving the chair, particularly for invalids who are mentally deficient or senile.

Semi-invalids capable of limited mobility or during recuperation utilize various separate devices for therapy, such as fixed bars and conventional walkers. Although some such invalids may use their wheelchairs as walkers, this practice has not been recommended inasmuch as the conventional hand brakes are not conveniently accessible to one standing upright behind the chair and, if the invalid loses his balance, there is no way to stabilize the wheelchair or prevent its rolling away from him.

SUMMARY OF THE INVENTION

The present invention is embodied in a brake assembly having spring loaded braking means normally biased into engagement with the rear wheels and being connected for movement to a disengaged position in response to the weight of an individual on the seat of the chair. The braking means can also be released from the wheels by manipulating manually operable means at the rear of the chair so that the chair can be moved without someone sitting upon it.

One of the principal objects of the present invention is to provide a wheelchair brake assembly which automatically locks the wheels when the invalid leaves the wheelchair. Another object is to provide a wheelchair brake that can be manually manipulated from the rear of the chair so that an invalid capable of limited mobility can safely utilize the chair as a walker. Still another object is to provide a wheelchair brake kit for converting conventional wheelchairs to incorporate the present invention. A further object is to provide a wheelchair brake assembly that is rugged in construction, simple to operate, and economical to manufacture.

These and other objects and advantages will become apparent hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is also embodied in the parts and in the arrangements and combinations of parts hereinafter described and claimed. In the accompanying drawings which form a part of this specification and wherein like numerals refer to like parts wherever they occur:

FIG. 1 is a perspective view of a wheelchair having a brake assembly embodying the present invention;

FIG. 2 is a diagrammatic view (from the rear of a wheelchair) of the brake assembly;

FIG. 3 is a bottom plan view of the wheelchair;

FIG. 4 is a side elevational view, partially broken away and in section, of a wheelchair having a modified brake assembly embodying the present invention;

FIG. 5 is a rear elevational view of the modified brake assembly illustrated in FIG. 4;

FIG. 6 is a fragmentary sectional view of the modified brake assembly, taken along line 6—6 of FIG. 4;

FIG. 7 is a fragmentary rear elevational view showing another modification of the brake assembly;

FIG. 8 is an enlarged cross-sectional view of the modification taken substantially along line 8—8 of FIG. 7; and

FIG. 9 is an enlarged cross-sectional view of the modification taken substantially along line 9—9 of FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in detail to the drawings, the present invention as illustrated is applied to a wheelchair 2 of the type that can be folded or collapsed to fit more conveniently into confined spaces (as shown in broken lines in FIG. 5), but it will be readily apparent that the invention is also applicable to non-folding wheelchairs of the institutional variety.

The wheelchair 2 includes a main frame 4 having a pair of rigid side frames 6 and a seat unit 5 interconnected by front and rear sets of cross members 8 and 10, respectively. Each side frame 6 is preferably of tubular construction and includes an upstanding rear member 12 formed with a short horizontal portion at its upper end to provide a hand grip or support 14, a lower horizontal member 16 provided with a foldable foot rest 18, an upstanding front member 20 welded to the lower member 16, and an upper horizontal member 22 formed integral with the front member 20 and being welded at its rear end to the side of the upstanding rear member 12 so that the end face 23 of the horizontal member 22 is exposed and presented rearwardly. An arm rest 24 is secured on the upper member 22, and a side panel 25 may be provided between the rear and front members 12 and 20. Each upstanding rear member 12 is fitted with a laterally projecting spindle 26 on which is journaled a rear propulsion wheel 28 having a rubber tire 30. The tire 30 is engageable by a conventional hand brake assembly (not shown) conveniently located on the side frames 6 for operation by a patient sitting in the chair 2. Each lower horizontal member 16, immediately rearwardly from its corresponding front member 20, mounts a caster-type foot wheel assembly 32.

The rear cross members 10 are pinned to the upstanding rear members 12 adjacent to the lower horizontal members 16, while the front cross members 8 are pivotally connected to upwardly projecting tabs attached to the lower horizontal members 16. The front and rear sets of cross members 8 and 10 are pivoted for scissors action between the open and collapsed positions shown in FIG. 5 and the upper ends of the front and rear cross members 8 and 10 are secured to longitudinally extending seat bars 34 of the seat unit 5 which also has a flexible seat panel 36 attached to the bars 34. A flexible back panel 38 is attached to the upstanding rear members 12. The rear cross members 10 are further joined to the upstanding rear members 12 through a pair of stabilizing links 39.

When wheelchair 2 is in its open or erected position, as illustrated in FIG. 1 and in solid lines in FIG. 5, the side frames 6 are spaced fully apart by the front and rear cross members 8 and 10 with the stabilizing links 39 in a substantially horizontal position and the seat bars 34

positioned adjacent to the lower margin of the back panel **39**. The seat panel **36** and the back panel **39** are stretched taut between the seat supports **34** and upstanding rear members **12**, respectively. The wheelchair **2** is collapsed to the broken line position shown in FIG. 5 by merely lifting or moving the seat bars **34** toward each other, thereby raising the bars **34** to a level adjacent to the upper members **22** and drawing the side frames **6** together.

The wheelchair **2** is provided with a brake assembly **40** embodying the invention and comprising a pair of brake arms **42** pivotally mounted on the main frame **4** and having braking margins **41** normally biased into braking engagement with the tires **30**. In the construction of the wheelchair **2** selected for disclosure, the exposed tubular ends **23** of the upper side frame members **22** is positioned above the tire **30** and provides a convenient means for pivotally mounting the brake arms, but it will be apparent that in other typical wheelchair constructions, brackets (not shown) may be used to pivotally secure the braking means **42** on the main frame **4** for engagement with the tires **30**. In the preferred arrangement, the brake arms **42** are journaled on pins **43** set into plugs **44**, which are press fitted or otherwise secured in the exposed tubular ends **23** of the upper horizontal members **22**. Each brake arm **42** projects laterally beyond the side frame **6** so that the lower edge or margin **41** extends laterally across the tire **30** of the main drive wheel **28**. The brake arms **42** pivot in a transverse plane relative to the plane of rotation of the wheels **28** between a disengaged position wherein their lower edges **41** are located slightly above the tires **30** and an engaged position in which the lower margins **41** engage the rubber tires **30** and prevent rotation of the rear wheels **28**.

Referring to the embodiment shown in FIGS. 1–3, the brake arms **42** are biased toward their engaged positions by coiled tension springs **45** which extend between the inner control ends **41'** of the arms **42** and the upper ends of the upstanding rear members **12**.

Beneath the seat panel **36**, a pair of transversely extending webs **46** are suspended between the seat bars **34**, and these webs **46** are in turn interconnected intermediate their ends by a pair of closely spaced longitudinal connecting webs **48** to form a webbed harness beneath the seat panel **36** (FIG. 3). The webs **46** and **48** are fastened to and carry a pair of rigid actuating bars or lever members **50** which extend longitudinally along the webs **48** and project rearwardly beyond the rear edge of the seat panel **36** where they are connected to the ends of the brake arms **42** by means of flexible, non-stretchable connecting chains or cables **52**. The lengths of the cables **52** are such that when the brake arms **42** are in their engaged positions, the actuating members **50** will be elevated slightly and will lift both the webs **46** and seat panel **30** slightly above the position they would otherwise assume if they were suspended freely between the seat supports **34**. Therefore, when a person is seated in the wheelchair **2**, the seat panel **30** is depressed and the cables **52** and inner ends **41'** of the brake arms **42** will be drawn downwardly against the bias of the springs **45**, thus rotating the arms **42** and moving the braking margins **41** upwardly away from the tires **30** to their disengaged positions.

The invention is also embodied in means for manually releasing the braking means **42** to utilize the chair **2** as a walker. An inwardly projecting strut or bracket **54** is rigidly secured to one of the rear frame members **12**, and a brake release lever **58** is pinned to the inner end of this strut **54**. The release lever **58** is connected at its inner end to the inner control ends **41'** of the brake arms **42** by means of a flexible, non-stretchable Y-cable **60**. The outer end of the release lever **58** is connected to a flexible release cable **62** which extends upwardly along the adjacent upstanding rear member **12** through a sheath **64**. At its upper end the sheath **64** attaches to a bifurcated bracket **66** mounted on the horizontal end portion of the upstanding rear member **12** adjacent to the hand grip **14**. Journaled intermediate the furcations of the bracket **66** is a hand lever **68** which is connected to the upper end of the cable **62** so that when the lever is moved toward the hand grip **14**, the cable **62** will be drawn through the sheath **64**. In this embodiment an auxiliary tension spring **70** may be provided between the inner end of the brake release lever **58** and the rear frame member **12** to supplement the force of springs **45** acting through the control linkage in maintaining the cable **62** taut.

The chair **2** with brake assembly **40** is used similarly to any conventional wheelchair. When the invalid is seated upon the seat panel **36**, the webs **46** and **48** and the actuating members **50** are depressed from the normal elevated position. The actuating members **50** acting through the cables **52** rotate the brake arms **42** to the disengaged positions thereof against the bias of the springs **45** and the rear wheels **28**, as well as the wheelchair **2** itself, are free to move (assuming the conventional hand brakes are released). However, when the invalid rises from the seat panel **36**, the tension springs **45** act on the control ends **41'** and rotate the brake arms **42** causing the braking margins **41** to engage the tires **30**, thus locking the wheels **28** against rotation and immobilizing the chair **2**. Accordingly, even though the invalid may neglect to set the conventional brakes, the chair **2** is automatically immobilized by the brake assembly **40** when the invalid is attempting to rise from or seat himself in the chair **2**.

When it is desired to move the chair **2** without the invalid in it, the hand lever **68** is merely squeezed toward its adjacent hand grip **14** to draw the release cable **62** upwardly through the sheath **64** and rotate the release lever **58** on the strut **54**. The inner end of the release lever **58** shifts downwardly and, acting through the Y-cable **60**, moves the brake arms **42** into their disengaged positions against the bias of the springs **45**. Thus, a semi-invalid or recuperating patient can safely employ the chair **2** as a walker, for if for some reason he loses his balance, he need only release his grip on the hand lever **68** to bring the chair **2** to an immobilized condition of sufficient rigidity to enable him to lean against it and regain his balance.

The brake assembly **40** in no way interferes with the structural members of the main frame **4** and, consequently, the chair **2** is collapsible in the conventional manner. It will be readily apparent that the braking means **40** are released automatically in response to a relatively short, vertical displacement of the seat control levers **50**.

Referring now to FIGS. 4–6 in which a wheelchair **102** is provided with a modified brake assembly **140** embodying the invention, the wheelchair **102** is substantially the same as the chair **2** just described and the same reference numerals are applied to similar parts. Similarly, the brake arms **42** are pivotally mounted on the side frames **6** for movement between a tire engaging or braking position and a disengaged or released position, and the parts and relationship of the brake arms **42** and the wheelchair frame **4** may be the same as previously described. However, in this embodiment the seat control means having a short vertical displacement for operating the braking arms **42** is incorporated in structural changes in the wheelchair **102** as will now be described.

The longitudinal bars **34** of the seat unit **5** are interconnected with the side frames **6** of the wheelchair **102** by the front and rear cross members **8** and **10**, the front members **8** being attached to the lower member **16** as previously described. However, the lower ends of the rear cross members **10** are adapted for limited predetermined vertical movement relative to the vertical rear members **12** in the open position of the wheelchair **102**.

A short vertical slot **104** is provided at the lower end of each rear frame member **12**, and relatively strong springs **106** are housed within the tubular members **12**. Control or actuating rods **108** are connected to the opposed inwardly extending control portions **41'** of the

brake arms **42** and are formed with right-angle extension pins **110** positioned through the slots **104** and pivotally connecting the control rods **108** with the lower ends **112** of the cross members **10**. The springs **106** are compressed between the lower members **16** and the extension pins **110** to exert a predetermined force normally biasing the control rods **108** upwardly to rotate the braking margins **41** into engagement with the tires **30**.

It will now be apparent that when someone sits on the seat panel **36**, a force will be exerted downwardly through the rear cross members **10** acting in opposition to the springs **106** so that the seat unit **5** will ride downwardly slightly at the rear portion and carry the control rods **108** to actuate the brake arms **42** to their disengaged positions.

A modified manual release means is also disclosed in FIGS. 4–6. A hand lever **114** is provided on each handle **14** and is connected to a cable **116** which extends around a pulley **118** mounted on the rear frame member **12** above the brake arm **42**. The other ends of these cables **116** are connected to their respective brake arms **42** at a point vertically above the brake margins **41** thereof. When it is desired to move the wheelchair **102** without a patient or to utilize it as a walker, the hand levers **114** are squeezed against the handles **14** to pull the cables **116** and the outer ends of the brake arms **42** upwardly to a brake release condition.

Referring now to FIGS. 7–9, a wheelchair **202** is provided with another modified brake assembly **240**. In this embodiment the seat unit **5** is also adapted for limited vertical movement through the rear cross members **10**. A slot **204** is formed in the rear members **12** adjacent to the lower members **16** and the lower ends **212** of the cross members **10** are pivoted on pins **210** extending through the slots **204**. If desired, spring means (not shown) may be provided between the pins **210** and the lower frame members **16** to cushion the vertical seat displacement.

The brake assembly **240** includes a pair of brake arms **220** which are mounted on pins **222** projecting outwardly from plugs **224** fitted into the rear end of the horizontal members **22** and secured thereto by means of cross pins **226**. The plugs **224** are provided with annular recesses **228** containing spiral springs **230** which wrap around the pins **222** and bias the brake arms **220** toward engagement with the tires **30** of the wheelchair **202**. The inner ends **232** of the brake arms **220** are disposed above the ends of the seat bars **34** and are connected thereto by flexible non-stretchable cables **234**. When the wheelchair is unoccupied the rear ends of the seat bars **34** are in the upper vertical position and the brake arms **220** are biased into brake engagement by the springs **230**.

When an individual sits on the seat panel **36** attached to the seat bars **34**, the rear end of the seat bars will move downwardly through vertical displacement of the lower ends **212** of the cross members **10** relative to the frame members **12**. Since the slots **204** are vertical, the rear cross members **10** are prevented from spreading laterally during this downward movement. As the seat bars **34** are depressed downwardly, the cables **234** are drawn downwardly and pivot the brake arms **220** against the bias of the springs **230** causing the brake arms **220** to retract from engagement with the tires **30** of the wheelchair **202**.

Any suitable release mechanism can be utilized to manually release the brake arms **220** from the tires **30**. Another modified release is shown in FIG. 7 in which a release cable **236** is channelled through the rear frame member **12** between a hand lever (as previously described) and outwardly through an elongated slot **237** around a pulley **238** positioned below the seat unit **5**. The cable is connected to the seat bar **34** through a disconnect link **239**. Accordingly, when the hand lever is grasped, the cable **236** will be drawn upwardly in the frame member **12** and, acting around the pulley **238**, will exert a downward force on the seat unit **5**.

In the embodiment shown in FIGS. 7–9 the rear panel **38** is slotted, as at **241**, to accommodate the connection of the cables **234** to the seat bars **34** and provide for a cable loop when the wheelchair **202** is folded and the seat bars **34** are elevated to their collapsed position adjacent to the upper frame members **22**.

It will be apparent that other modifications of the brake assembly according to this invention may be provided. The brake arms may be angularly mounted on the lower frame members **16** for engagement with the tires **30** and connected to seat and hand release control means through suitable cable linkage extending around pulleys on the rear frame members **12**. However, in this position the brakes would be hidden from the invalid utilizing the chair as a walker and visibility of these brakes may be desirable.

A brake assembly can also be utilized with non-collapsible wheelchairs. These chairs (not shown) normally have seat panels which are more or less rigid, and by hinging these seat panels near their forward ends and attaching the actuating or control means to the bottom of the seat panel the same result will be achieved, since when the invalid sits upon the seat it will swing about the hinge and force the outer ends of the actuating means downwardly against the bias of the brake springs to shift the brake arms to their disengaged positions.

It will also be apparent that the present wheelchair brake invention can be provided on existing conventional chairs by supplying the parts in kit form.

The invention is intended to cover all changes and modifications that will be readily apparent to those skilled in the art.

What is claimed is:

1. A brake assembly kit for modifying a conventional wheelchair for use as a walker, said wheelchair comprising a main frame having opposed tubular side frames with vertical rear members, drive wheels rotatably mounted on said rear members, a back panel supported between said rear members, rearwardly extending rigid hand supports formed on the upper ends of said rear members, and a seat unit supported on said main frame between said side frames; said kit when installed on the wheelchair comprising at least one brake arm with a braking margin, bracket means pivotally mounting the brake arm on the main frame adjacent to a drive wheel with said braking margin extending transversely across said wheel relative to the direction of rotation thereof, spring means mounted between the main frame and said brake arm for urging the braking margin into braking engagement with the wheel, actuating means mounted between the seat unit and the brake arm to act in opposition to the spring means under the weight of an individual seated on the seat unit, and manual means mounted adjacent to one of said hand supports for use by an individual in a walking position to selectively disengage said braking margin from said drive wheel to permit wheelchair movement and selectively reengage said braking margin against said wheel to prevent wheelchair movement and support the individual.

2. A wheelchair comprising a main frame having rigid side frames with vertical rear members, main drive wheels rotatably mounted on said rear members, a back support extending between said rear members, a seat unit supported between said side frames and at least a portion of said seat unit being adapted for limited vertical displacement between an unoccupied upper position and an occupied lower position, and a brake assembly having brake arms pivotally connected to said main frame adjacent to said rear members, said brake arms having braking margins extending transversely to the direction of rotation of said wheels for braking engagement therewith, control means connected with said brake arms and responsive to seat unit displacement to said lower position for disengaging said braking means from said wheels to permit wheel rotation, spring means acting on said seat unit to move it to said upper position and acting on said braking means to urge it into braking engagement,

said brake arms and control means and spring means being positioned at the rear of said seat unit and side frame out of normal reach of an occupant of said wheelchair and operating automatically to engage said brake arms and prevent wheel rotation during seat unit displacement to said upper position without interference by the occupant.

3. The wheelchair according to claim 2 including rearwardly extending hand supports for a person in a walking position behind the wheelchair, and manual means for selectively actuating said brake arms to a disengaged position for permitting wheelchair movement and selectively re-engaging said braking margins against said wheels to prevent wheelchair movement and support the person.

4. The wheelchair according to claim 3 in which said manual means comprises dual hand levers mounted on said hand supports, and cable means directly connecting said hand levers with the respective side brake arm above the braking margin thereof.

5. The wheelchair according to claim 3 in which said brake arms have inner control ends, and said manual means comprises hand lever means mounted adjacent to said hand supports, and means for connecting said hand lever means with said inner control ends of said brake arms.

6. The wheelchair according to claim 5 in which a single hand lever is mounted on one of the rearwardly extending hand supports, and said last mentioned means comprises a cable and lever linkage connecting the hand lever to the seat responsive control means and adapted to simultaneously disengage both of said brake arms.

7. A wheelchair adapted for use as a walker and having a main frame mounted on wheels, a seat unit carried by said main frame, and said main frame having rearwardly extending rigid hand supports for a person in a walking position behind the wheelchair, and a brake assembly for said wheelchair comprising braking means mounted on said main frame, spring means urging the braking means into braking engagement with at least one of said wheels, actuating means associated with said seat unit and coupled to said braking means to act in opposition to said spring means under the weight of a person seated on said seat unit for disengaging said braking means from said wheel, and manual means adjacent to said hand supports for selectively disengaging said braking means from said wheel.

8. The wheelchair according to claim 7 in which said main frame includes frame member means positioned rearwardly of said seat unit and adjacent to the periphery of the wheel, and said braking means comprises a brake arm pivotally connected intermediate its ends to the frame member means for movement about an axis extending generally perpendicular to the rotational axis of the wheel, said brake arm having an outer braking margin extending transversely of the peripheral surface of the wheel and having an inner control end, and said spring means is

connected between said main frame and said inner control end to bias the outer braking margin substantially radially inwardly against said wheel surface.

9. The wheelchair according to claim 8 wherein the brake arms are mounted on plug means inset into said frame member means of said main frame, and said spring means are spiral springs connected at one end to a brake arm and connected at the other end to said plug means.

10. The wheelchair according to claim 8 wherein the seat unit has a flexible seat panel, and said actuating means comprises a rigid control lever extending rearwardly from beneath the seat panel, and connecting means between the rearward end of the rigid control lever and the inner control end of said braking means, said connecting means elevating said control lever and flexible seat panel above the normal occupied position thereof when said braking margin is in wheel engagement.

11. The wheelchair according to claim 7 wherein at least a portion of the seat unit is carried on the main frame by a vertically shiftable supporting structure and said spring means urges the supporting structure upwardly, and said actuating means comprises connecting means interconnecting the braking means and supporting structure.

12. The wheelchair according to claim 11 wherein said seat unit comprises a flexible seat panel secured at its side margins to substantially horizontal seat bars, and said supporting structure comprises a pair of pivotally connected diagonally extending members having upper ends secured to said seat bars and lower ends pivotally and vertically slidably connected to said main frame.

13. The wheelchair according to claim 12 in which a vertical slot is formed on each side of the main frame and a horizontal extension element extends through the slot for vertical sliding movement therein, said elements forming the pivotal connection of the diagonal members lower ends to said main frame, said actuating means comprising a rigid control rod connected between at least one of said extension elements and said braking means, and said spring means bearing against the extension elements and urging them toward the upper ends of said vertical slots to engage said braking means with said wheel.

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GEORGE E. A. HALVOSA, Primary Examiner

U.S. Cl. X.R.

188—2, 29, 167; 280—42