Sept. 30, 1952 L. R. ALLDREDGE ET AL 2,612,209

INVALID CHAIR HAVING FOOTREST BRAKING MEANS

Filed July 15, 1948 2 SHEETS—SHEET 1

Fig. 1.

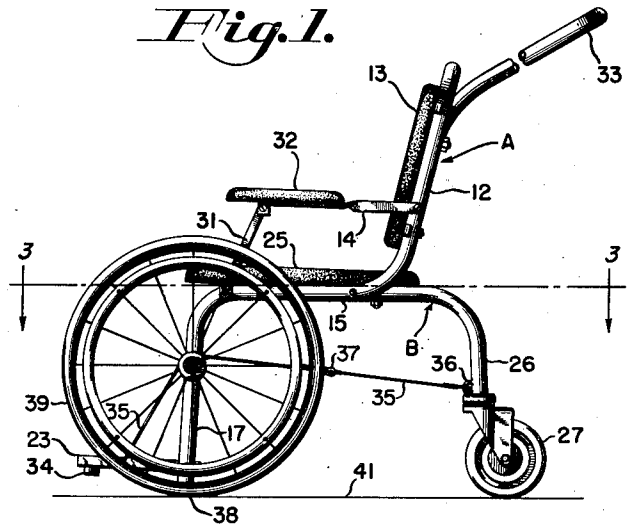


Fig. 2.

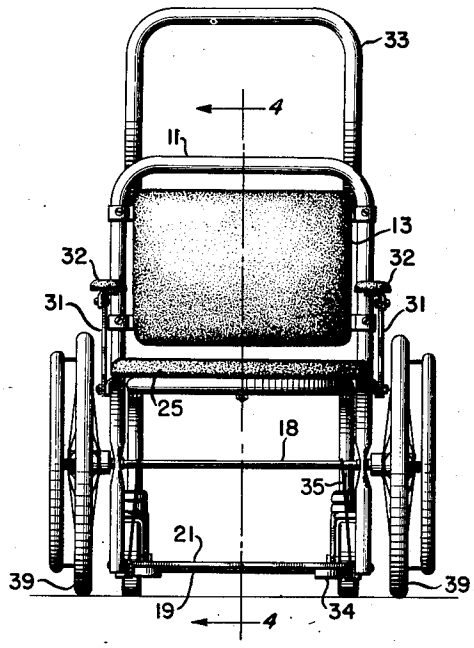
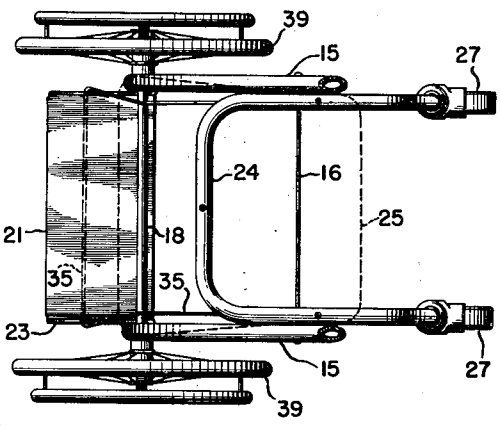


Fig. 3.



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Fig. 4.

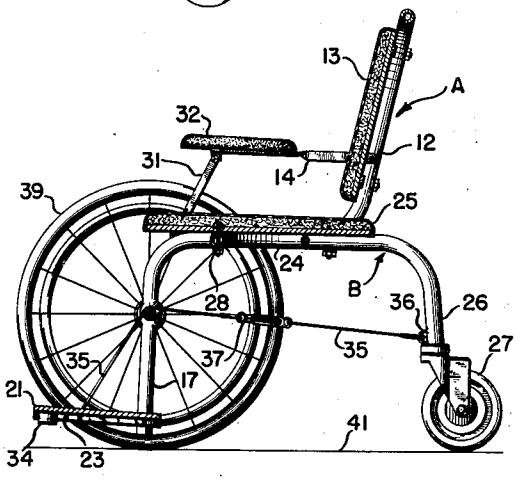


Fig. 5.

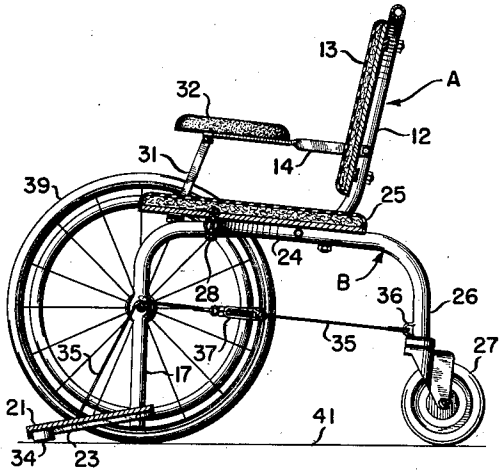


Fig. 6.

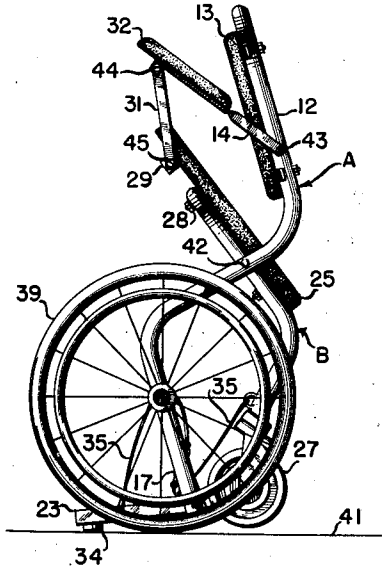
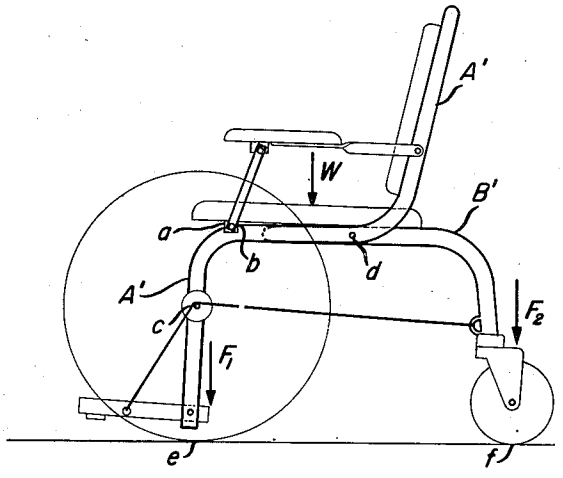


Fig. 7.



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Patented Sept. 30, 1952

2,612,209

UNITED STATES PATENT OFFICE

2,612,209

INVALID CHAIR HAVING FOOTREST BRAKING MEANS

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Application July 15, 1948, Serial No. 38,776

7 Claims. (Cl. 155—30)

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This invention relates to folding wheel chairs. More particularly, this invention relates to folding wheel chairs of the type or character intended for use by invalids of any age in homes, hospitals, and like places, as well as for use outside upon sidewalks and other relatively flat, hard surfaces.

An object of the invention is to provide a new and improved folding-type invalid chair of extremely simple and economical construction employing essentially only two rigid wheel-bearing frame pieces with a single pivotal connection between them arranged in such a manner so that with very little effort the chair may be changed from a stable useable position to a folded position for ease of transport and storage.

A further object of this invention is to provide an invalid chair with load concentrating members arranged in such a way as to reduce to a low value the force transmitted through the pivotal means about which the chair folds when an invalid is seated in the chair thus permitting construction using light weight materials without sacrificing strength and long life.

Another object of this invention is to provide a footboard for an invalid chair which can be depressed into braking contact with the floor by the application of force thereupon incident to the natural entrance or egress from the chair but which cannot be depressed accidentally into braking contact with the floor by the invalid after he is seated in the chair, said footboard being constructed without employing calibrated springs as are used in certain prior art folding wheel chairs.

Additional and further objects, features and advantages of the present invention will become apparent from the following description of an invalid chair according to a preferred embodiment of the invention, reference being made to the accompanying drawings in which:

Figure 1 is a side elevation view of a wheel chair embodying the novel features of the invention;

Figure 2 is a front elevation view of the wheel chair shown in Figure 1;

Figure 3 is a sectional view of the wheel chair as viewed along the line 3—3 in Figure 1;

Figure 4 is a sectional view of the wheel chair taken along the line 4—4 of Figure 2 showing more clearly the footrest linkage and the support for the forward portion of the seat;

Figure 5 is a view similar to that of Figure 4 and showing the footrest assembly pivoted into contact with the supporting surface on which the wheel chair rests;

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Figure 6 is a side elevation view of the wheel chair in its folded position;

Figure 7 is a diagrammatic view of the wheel chair illustrating the distribution of forces resulting from a load applied to the seat of the chair whereby the force transmitted through the pivotal means is kept very low.

Referring now to the diagrams wherein like reference characters refer to like parts throughout the several views, it will be seen that the illustrated embodiment of the invention has a framework consisting of two pieces of formed tubing designated as A and B which are secured in pivotal relation to each other.

Tube A consists of two substantially symmetrical portions forming sides of the chair and a horizontal portion 11 connecting the sides of the chair and forming the top of the chair. Because of the symmetry of the two sides of the wheel chair, for the sake of simplicity, only one side will be described.

From the top of the chair, tube A has a downwardly and slightly forwardly extending upright section 12 to which backrest 13 is bolted or otherwise secured. Armrest support bracket 14 is pivotally secured to the upright section, securing means not shown. The substantially horizontal section 15 extends forwardly from upright section 12 and supports frame pivot rod 16 passing through an aperture in the said horizontal portion. The frame pivot rod is prevented from leaving the aperture by enlarging its ends or by some other suitable means. The substantially vertical section 17 supports wheel-bearing axle 18 which is welded to said vertical section or otherwise suitably secured thereto. Near the lower extremity of said vertical section, footrest pivot rod 19 is secured to said section. Footboard 21 is pivotally secured to said footrest pivot rod such that said footboard bears pivotal relation with said rod. Said rod passes through an aperture in the bracket 23 as clearly shown in Figure 4.

Tube B has a seat support section 24 to which seat 25 is bolted or otherwise suitably secured. Said seat support section is pivotally secured to frame pivot rod 16 passing through aperture in said section. Leg 26 integrally connected to the seat support section has a swivel-type caster 27 secured to its end.

As may be seen from the dashed lines in Figure 3, the seat 25 has a portion in the vicinity of pivot rod 16 which is narrowed to allow pivotal relation between tubes A and B for folding purposes without interference between said seat and tube A in the vicinity of said pivot rod. The for-

ward portion of the seat is broadened to a width that is substantially the same as the lateral distance between the outside surfaces of the two sides of tube A. Angle **29** suitably secured to the underside of said seat bears up against horizontal section **15** of tube A to limit the pivot action of tube B relative to tube A in the counterclockwise direction as viewed in Figure 4. The angle is located so as to bear up against tube A at a point substantially near to a vertical plane passing through axle **18** in order to keep to a low value the load exerted on the frame pivot rod when the wheel chair is occupied.

This feature is best illustrated by referring to Figure 7. The weight of the invalid represented by W is applied to the seat which is on frame B'. Part of this weight F_2 is transmitted directly through the rigid frame B' and the rear wheel to the floor or supporting surface at the point *f*. The remainder of the weight F_1 is transmitted through the angle *a* to the frame A' at the point *b*. If the point *b* is designed to be directly over the front wheel axle *c*, the portion of the invalid's weight which is transmitted to frame A' at the point *b* is subsequently transmitted through the front wheel to the floor at *e*. With this design, the main folding pivot axis at *d* is required to transmit only a small force sufficient to hold up the weight of the back portion of frame A'. In a practical design, in order to preserve the aesthetic appearance of the wheel chair, the point *b* may be slightly nearer to the pivot axis *d* than is shown in Figure 7 without appreciably sacrificing the advantage described above. This design permits the use of light weight metals such as aluminum having low bearing strengths relative to steel without resorting to expensive means for reducing bearing stresses in the frame at the pivot point.

Referring again to Figures 1 to 6, angle **29** secured to the underside of the seat is pivotally connected to arm rest support **31** which in turn is pivotally secured to arm rest bracket **14**. Arm rest **32** is screwed or otherwise rigidly secured to said arm rest bracket.

The push rod **33** shown in Figure 1 is secured to the wheel chair by a detachable means not shown. The push rod is provided with small wheel chairs so that wheel chairs may be propelled by an attendant and hence may be used as perambulators.

The bumper **34** composed of rubber or some other suitable material having a high coefficient of rubbing friction with wood or stone is secured to the forward portion of the underside of the footboard. The rear portion of the footboard is pivotally secured to rod **19** as described previously. A flexible but essentially non-extensible means **35** made of wire rope, chain, or other strong flexible material is securely fastened to the footboard near its forward end. From the footboard, said flexible means extends upward and rearwardly and passes over axle **18** upon which it bears and thence rearwardly and slightly downwardly to eyelet **36** on leg **26** to which said flexible means is terminated and secured. Any suitable means such as a turnbuckle **37** may be used to adjust the length of this flexible means. Such an adjustment will determine the angle of the footboard when it is in its operating position.

The operation of the footboard is as follows: When an invalid steps on the footboard to enter the chair, a tension is produced in the flexible means. This tension causes frame A and frame B to rotate slightly relative to each other. In so doing, the distance between the eyelet **36** and the axle **18** shortens and a portion of the flexible means is drawn over the axle enabling the footboard to pivot such that the bumpers make contact with the floor or ground on which the chair rests, thus preventing the chair from running or tipping. The slight amount by which frame A pivots with respect to frame B causes the front end of the seat to rise by a slight but not objectional amount.

The location of the footrest pivot rod **19** substantially directly above point **38** at which the wheel **39** makes contact with the supporting surface **41** eliminates any moment arm by which the depression of the footboard could cause the wheel chair to tip. The frictional contact of bumpers **34** with said supporting surface prevents the wheel chair from running.

When the invalid transfers the greater part of his weight from the footboard to the seat, tube B and tube A pivot in the reverse direction increasing the distance between the eyelet and the axle causing the flexible means to draw the forward portion of the footboard upward so that the bumpers no longer make contact with the floor. So long as the invalid remains seated, the invalid cannot pivot the footboard so that the bumpers contact the floor. In leaving the chair, the transfer of the invalid's weight from the seat to the footboard depresses the footboard in the manner previously described.

In connection with the description of the folding feature of the wheel chair, refer to Figure 6. As described previously, frame B is pivotally connected to frame pivot rod **16** which in turn is secured to frame A. The axis about which this pivot action takes place appears as a point in Figure 6 and hence is referred to as point **42**. Similarly the axes about which armrest bracket **14** and armrest support **31** pivot appear as points in Figure 6 and they are indicated by **43**, **44** and **45**. Pivot axes **42**, **43**, **44** and **45** are so located that the links between them form a figure which is approximately a parallelogram. Therefore, the pivoting of frame A with respect to frame B is not restrained by the armrest linkage. As viewed in Figure 6, frame B may pivot with respect to frame A in a clockwise direction until caster **27** touches the footboard. The maximum depth of the chair when folded is determined by the size of wheel **39**.

To restrain the amount of pivotal motion of the footrest in the counterclockwise direction as viewed in Figure 6 when the wheel chair is folded, bracket **23** secured to the footboard **21** bears up against the vertical section **17** of frame A when the chair is lifted from the floor.

In wheel chairs designed for self-propulsion by invalid children, the size of the wheels will be small so that the chair can be easily placed in the trunk or rear passenger compartment of an automobile for transportation purposes.

The folding linkages and weight distribution of the chair can be designed so that the resultant torque exerted by gravity on frame B about the frame pivot axis will cause frame B to rotate into the folded position as shown in Figure 6 when the wheel chair is grasped by the top of the chair and lifted from the floor. When the folded chair is placed on the floor with the large wheels touching and then tilted back slightly, the chair will unfold under its own weight to a stable condition shown in Figure 4. The ease of folding is particularly useful since it permits a person to lift an invalid child from the chair,

hold the child in one arm, lift the chair from the ground with the other, and have the wheel chair fold in so doing. Conversely, the child can still be held with one arm as the chair is placed down on the floor with the other and have the chair unfold automatically to a stable operating position.

It is realized by the inventors that many variations of the invention may be made by those skilled in the art. It is, therefore, not the desire of the inventors to limit their invention to the form described herein but only by the spirit and scope of the appended claims.

We claim:

1. A wheel chair of the character disclosed comprising, in combination, a pair of wheel supported frames joined together pivotally about an axis disposed intermediate the wheel axes of the frames whereby the wheel supported ends of the frames may be pivoted toward each other, one of said frames having portions depended from the wheel axis thereof, a footboard pivotally secured to said depended frame portions and extended therefrom in a direction away from the wheel axis of the other frame, and means interconnecting the extended portion of said footboard and the wheel supported ends of said other frame for drawing the wheel supported ends of the frames toward each other in response to downward pivotal movement of the footboard whereby the footboard is lowered pivotally to the floor into braking engagement therewith.

2. A wheel chair as claimed in claim 1 further characterized by the provision of an axle disposed at said wheel axis of said one of the frames and said interconnecting means comprises a cable which passes over said axle.

3. In a wheel chair having first and second pivotally connected frames having limited pivotal movement with respect to each other sufficient to form a stable chair, the combination of a footboard pivotally connected along the rear portion thereof to the first of said frames, a cable connected to said footboard forward of said pivoted connections thereof with said first of the frame members and connected to the second of said frame members, means secured to said first of the frame members above the level of said footboard pivotal connection for guiding the cable, means for varying the length of the cable, and bumpers connected to the forward underside of the footboard.

4. In a wheel chair having a pair of pivotally connected wheel supported frames constructed and arranged for sufficient limited pivotal movement with respect to each other to form a stable chair, the combination of a footboard pivotally connected along the rear edge thereof to one of said frames and flexible non-extensible means interconnecting the forward edge of said footboard and the other one of said frames and extended above the pivotal connection of the footboard whereby a downward force on the footboard sufficient to cause pivotal movement of said frame members causes the footboard to be lowered pivotally to the floor into braking engagement with the floor.

5. A wheel chair comprising, in combination, a U-shaped member having leg portions depended substantially vertically from the bight portion thereof, downwardly extended leg extremities, and horizontal leg extensions interposed intermediate said depended leg portions and said downwardly extended extremities, two wheels journaled to said downwardly extended leg extremities respectively, a backrest secured to said depended leg portions, a horizontally disposed U-shaped member having the legs thereof disposed parallel with and inwardly of said horizontal leg extensions, a pivotal connection between said horizontal leg extensions and said legs of the horizontally disposed U-shaped member, the legs of said horizontally disposed U-shaped member having depending extensions, casters secured to the lower extremities of said depending extensions respectively, a seat secured to the legs of said horizontally disposed U-shaped member, the portion of said seat in the vicinity of said pivotal connection being constructed sufficiently narrow to be inwardly disposed of said horizontal leg extensions, said seat being broadened in the vicinity of the bight portion of said horizontally disposed U-shaped member so as to bear against said horizontal extensions when the wheel chair is unfolded, a footboard pivotally connected to said downwardly extended extremities, and a cable connected to said footboard at the forward end thereof, said cable extending above said footboard pivotal connection to at least one of said depended extensions and secured thereto, whereby a downward force on said footboard sufficient to cause pivotal movement of said U-shaped frame members causes the footboard to be lowered pivotally into braking engagement with the floor.

6. A wheel chair as claimed in claim 5 further characterized by the addition of an axle for said wheels, said cable passing over and bearing against said axle.

7. A wheel chair as claimed in claim 5 further characterized by the addition of arm rests pivotally connected to said substantially vertical leg portions respectively and extending above and substantially parallel to said horizontal leg extensions, and a pair of brace members pivotally interconnecting the forward ends of said arm rests and the forward portions of said seat respectively whereby the arm rests impose negligible restraining forces during the folding operation of the chair.

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