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[54] **STANDING WHEELCHAIR**
8 Claims, 9 Drawing Figs.

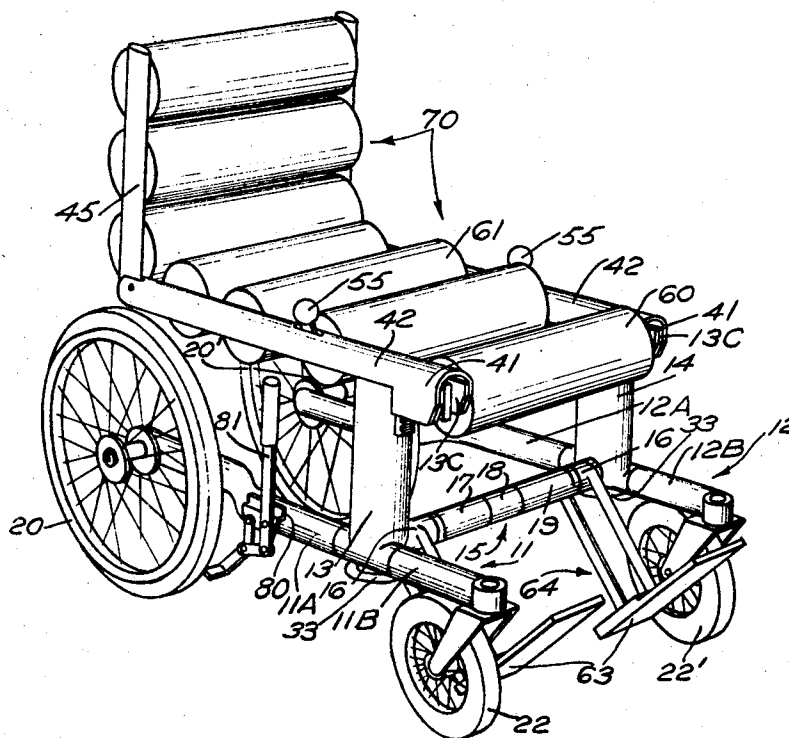
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297/330
 [51] Int. Cl. **A47g 5/00**
 [50] Field of Search. **297/42, 44,**
330, 316, 335, 324, 323, 332, 313, DIG. 4, 283;
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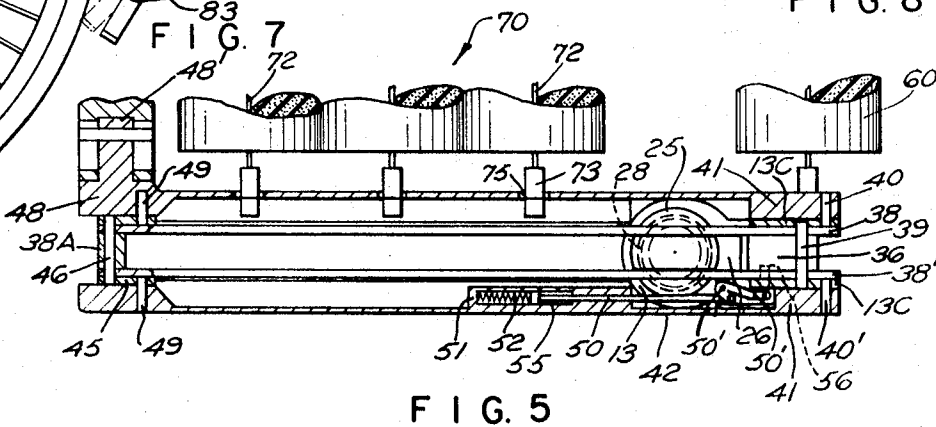
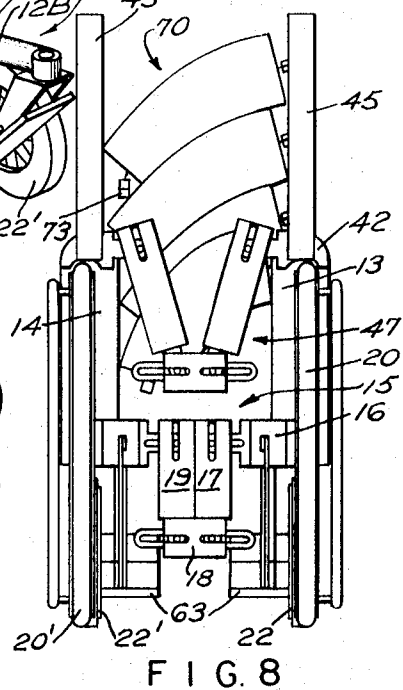
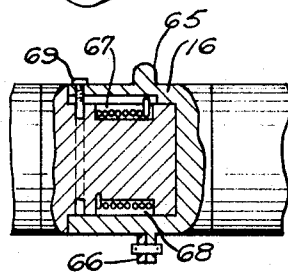
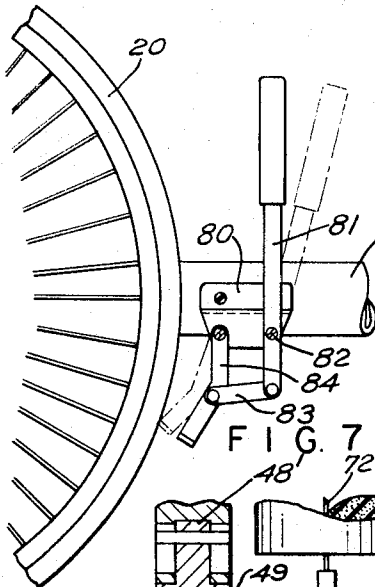
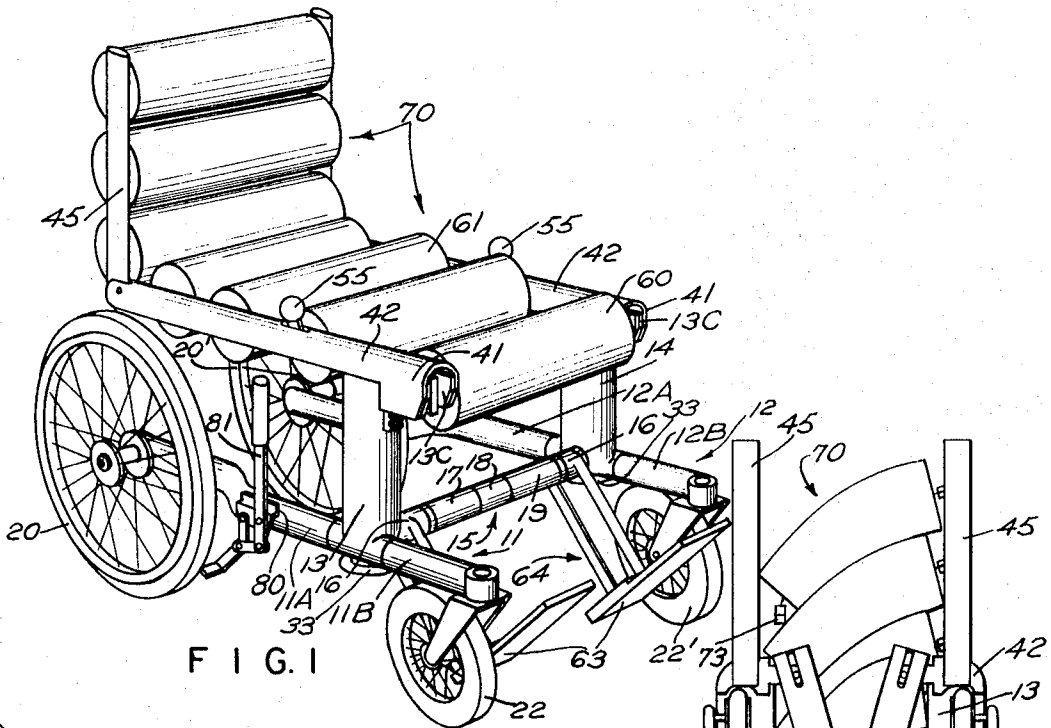
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ABSTRACT: A wheelchair for lifting a person paralyzed from the midthoracic region down is provided which consists of a wheeled framework mounting parallel rod frame coupled to a seatback frame, the seat frame being actuated by a spring motor which straightens the seat and seatback to a position 10° less than vertical to provide standing support for the paralyzed person.





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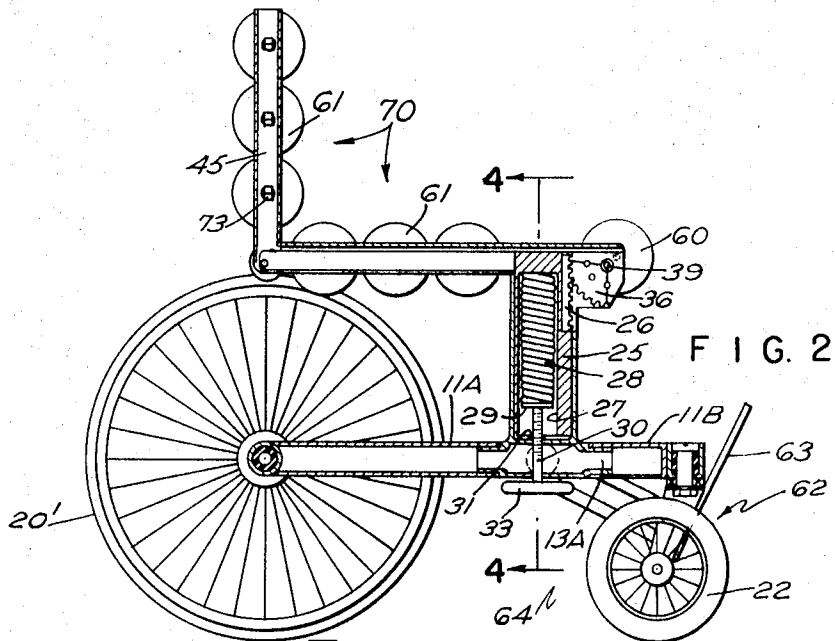


FIG. 2

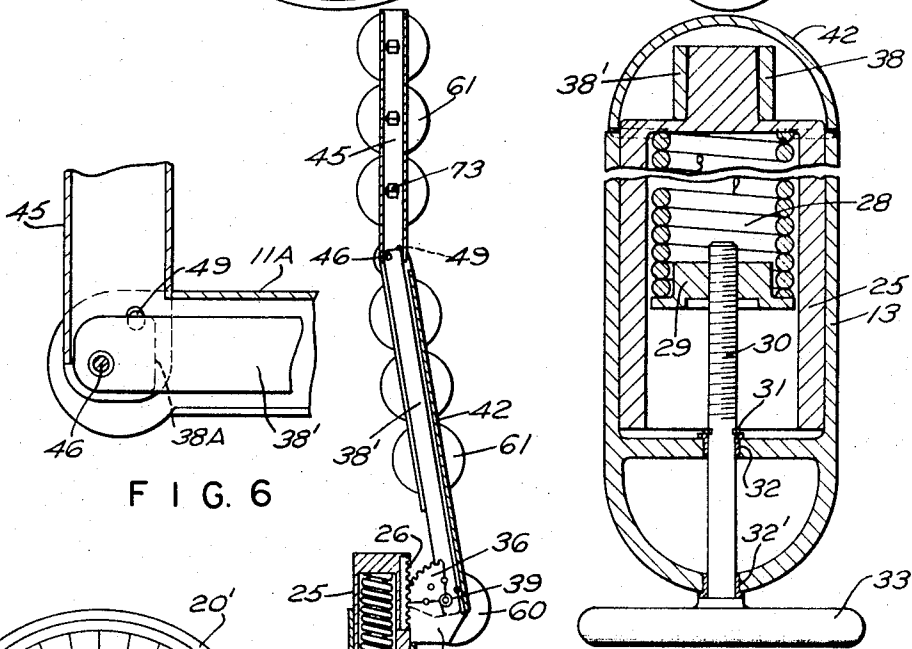


FIG. 4

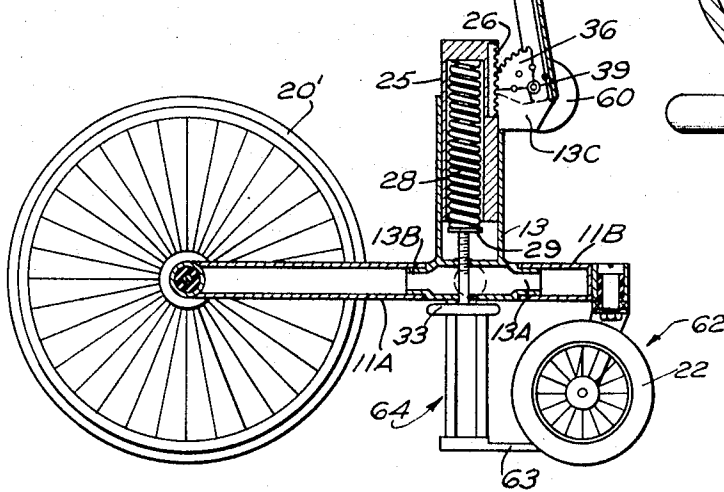


FIG. 3

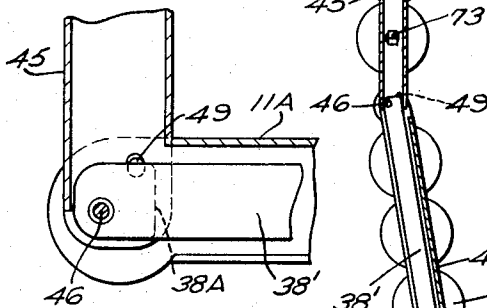


FIG. 6

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STANDING WHEELCHAIR

BACKGROUND OF THE INVENTION

There are approximately 250,000 disabled persons in the United States today who are unable to function unassisted in today's society. A large segment of this handicapped population that are in wheelchairs are those with various forms of paraplegia. In cases of this type it is of great physiological benefit for the patient to be able to stand. The upright position affords better abdominal organ function, better blood and lymph circulation, and better muscle vitality in the afflicted limbs. The weight bearing also inhibits the tendency of calcium rejection causing bone brittleness and atrophy. Today, standing of a patient is achieved through great discomfort and inconvenience by strapping him to a tilt table or support box where he stands immobile for a variable length of time. This is really nothing more than an exercise which is expensive, time consuming and uncomfortable.

SUMMARY OF THE INVENTION

A wheelchair framework is fitted with a parallel rod seat and seatback which will maintain the seatback substantially vertical as the seat rises to a standing position which will be slightly removed from vertical by a small amount on the order of 10° or so to eliminate a patient's fear of falling forward. To actuate the seat and seatback, a pair of compression springs are utilized, the force from which is applied through a rack and pinion which is coupled to the seat. Once the spring is released and the patient leans forward, the entire mechanism becomes actuated and the seat and seatback elevate to a near vertical position. The patient is maintained in position by a knee cushion which would normally engage his legs just below the knee joints and will keep the immobilized area of the patient in position. In addition the wheelchair provides a foot pad system which drops to the floor as the patient rises with actuation of the mechanism so as to provide a firm anchor for the patient when he is standing.

The standing attitude that is achieved by the wheelchair of the instant invention places the patient on a correct proportional eye level with his peers and adds to his self-confidence. With utilization of the device of the instant invention it is quite easy to achieve a standing position without any undue exertion or with the use of auxiliary devices, such as braces or crutches, and will permit the person who has been erected to return to sitting position merely by placing pressure in a proper location. The system incorporates, therefore, the natural motion of standing without requiring outside power source.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the wheelchair in closed position made in accordance with the invention;

FIG. 2 is a side elevational view partly in section illustrating the wheelchair and its actuating mechanism;

FIG. 3 is a view similar to FIG. 2 with the seat and seatback in elevated position;

FIG. 4 is a sectional view taken on lines 4-4 of FIG. 2 showing in greater detail the spring and its housing for the actuation mechanism;

FIG. 5 is a partial top view partly in section illustrating the seat frame;

FIG. 6 is a detail elevational view of the joint between the seat and the seatback;

FIG. 7 is an elevational view showing a brake mechanism that may be attached to the wheelchair;

FIG. 8 is a front view of the wheelchair in folded position; and

FIG. 9 is a top view partly in section of the foot pad mounting.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 there is shown a framework consisting of two longitudinal members 11 and 12 to which vertical members 13 and 14 are affixed. Between the two longitudinal members 11 and 12 is a spreader bar generally designated 15 which is made up of two end sections 16 to which the foot pads are attached and three articulated sections 17, 18 and 19. To this basic framework and particularly the longitudinal members 11 and 12, wheels are attached, as for example, large rear driving wheels 20, 20' which are affixed to the rearward end of the frame members 11 and 12 respectively and wheels 22, 22' are casters in a suitable fashion to the front end of the longitudinal members 11 and 12.

Preferably the longitudinal members 11 and 12 are made from tubular stock. For simplicity the right side of the chair will now be described, although it is to be understood that the structure is repeated on the left side. To this end, the member 11 consists of a rear section 11A and a front section 11B (see FIGS. 2 and 3). Between these sections there is telescopically received the vertical member 13 which is cast in T-shaped fashion so as to provide internal sleeves as at 13A, 13B. Within the vertical casing 13 is a piston 25 of generally inverted cup-shaped form and which has secured to the outer wall thereof a rack 26. A motor means in the form of a compression spring 28 is received within the piston recess 27 (FIG. 2) which spring exerts a force between the end wall of the recess and an adjustable stop 29. The adjustable stop is threadingly received on a threaded shaft 30 that is held in position by a lock ring 31 (see FIG. 4) and thence passes through a pair of bushings 32, 32' in the walls of the member 13 and thence on outwardly where a handwheel 33 is affixed to the shaft 30 to rotate the same. It will be apparent that by rotating the handwheel 33, the compression of spring 28 may be varied and in this manner the force exerted by the spring varies. Preferably the piston 25 is made self-lubricating within the member 13 by coating the same with plastic material such as PTFE or an equivalent thereof.

It should be noted that a pair of boss plates 13C are located at the upper end of the vertical member 13 and between these boss plates 13C are located a first arm unit of the seat portion of the frame consisting of a pair of arms, which arms are designated 38, 38' and between the arms is located the gear segment 36. The arms 38, 38' are secured to the gear segment 36 as by spot welding and by reference to FIG. 5 it will be seen that the arms and gear assembly is pivoted to the boss plates 13C by pivot pin 39 while trunnions 40, 40' protrude from boss plates 13C into internal bosses 41 of the arm casing 42. The arm assembly is therefore made up of the first unit of two lifting arms, which are in effect made part of the gear, and in addition an outside casing 42 or second arm unit, which is pivoted, it will be noted, at another point to the bosses 13C. In this manner a parallel arm arrangement is achieved in conjunction with the arm 38 in the outside casing 42 utilizing the two spaced pivot points.

At the rearward end of the arms a spacer block 38A is fastened and at this location the seatback frame 45 is pivoted to the arms 38, 38' by pivot pin 46 (see FIGS. 5 and 6) and is also pivoted to the arm casing 42 on trunnions 49. In this manner it will be noted that the coupling between the seat and the seatback is a parallelogram type of linkage arrangement, the main parallelogram being formed on the seat itself with coupling to the seatback at one end of the parallelogram. This arrangement insures that as the seat is raised from horizontal position, the seatback will extend itself substantially vertical upon full 80° elevation of the seat portion as illustrated in FIG. 3.

Spreader bars generally designated 47 (FIG. 8) extend between the two halves of the frame at the juncture of the seat and seatback. To mount the spreader, a boss 48 with a trunnioned ear portion 48' extends from the arm casing 42 and couples into a slot of the first of a plurality of articulated sections. This spreader together with spreader 15 gives lateral stability to the structure.

To maintain the chair in a normal attitude some locking means is needed between the piston and its casing or in some of the suitable location where relative rotative motion is achieved. A number of locking schemes will suggest themselves and for simplicity of disclosure I have illustrated herein a pair of spring-loading locking actuator rods 50 (see FIG. 5) in arms 42 which couple to a bellcrank arm 50' pivoted at 50'' to a part of arm casing 42. At the free end of the bellcrank is a locking pin 56 that passes through boss plate 13C into arm 38'. The rod 50 is suitably guided in a housing 51 that contains a compression spring 52 and is reciprocated by a lever such as 55 (see FIG. 1) to rock the bellcrank and withdraw pin 56 to release the chair for actuation. It should be recalled that duplicate structure is provided on the left side of the unit and thus as the patient leans forward in a normal attitude to get out of a chair which moves his center of gravity forward toward the pivot 39 and with the two springs in proper compression, this will then permit the two pistons such as 25 to raise and slowly the seat and seatback will elevate to the position as shown in FIG. 3. The patient will be maintained from completely falling forward by the slight rear attitude of the seat and seatback and further by the knee restraint cushion 60 which engages the patient below the knee, bulging outward upon engagement, with thigh engagement occurring on cushion unit 61.

During this operation the patient's pressure on the foot pad assembly generally designated 62 (see FIG. 2) will be exerted. As seen more particularly in FIG. 1 the foot pads consist of a bottom plate 63 which is supported in position by parallelogram linkage generally designated 64 which linkage is affixed to the part 16 of the stretcher bar at opposite points thereof, for example on ear 66 and welded to point 65. The part 16 of the stretcher bar is a pair of nesting pieces having a recess 67 in which there is located a torsional spring 68 (FIG. 9). In this fashion the torsional spring, one end of which is locked to each part, is suitably loaded so that the foot pads normally are in the position as illustrated in FIGS. 1 and 2, but any pressure placed thereon will move in a clockwise direction about the part 16 as viewed in the drawings. To maintain this structure integral a pin 69 passes through the outer sleeve and into a circumferential slot in the inner part.

The chair is maintained in elevated position by the pin 56 passing thru different reception holes in plate 13C and arm 38'. To return the chair to normal attitude, the patient releases the locks and since his buttocks are already exerting pressure on the seat cushions to maintain himself erect, the seat and seatback will thereupon return to nearly the position of FIG. 1, final down position being obtained by moving the patient's weight back toward the seatback. The mechanism may then be locked by moving levers 55.

The seat and the seatback are provided with seating cushions consisting of cylindrical members made up of foam with vinyl covers, identical structure being used for knee and thigh pads 60, 61. Within these foam pieces with vinyl covers

generally designated 70, a spring wire 72 is located having an end part 73 that is preferably of a spring clip construction that is adapted to be inserted into a plurality of apertures such as 75 in the arm casing 42 or the seatback casing 45. In this fashion it is relatively easy to telescope the chair for cartage by first snapping loose the seat cylinders 70 together with pads 60, 61 and then moving the spreader bars 15, 47 apart so that the joints thereof will articulate and then the whole assembly may be pushed together to the position as shown in FIG. 8.

For braking purposes of the wheelchair a usual brake linkage may be provided and affixed for example to the frame member 11, the brake linkage consisting of a mounting plate 80 with an actuating lever 81 pivoted as at 82 to the plate and having a linkage made up of two parts 83 and 84 which will move towards the wheel 20 when the lever is moved to the broken line position.

I claim:

1. A wheelchair comprising a frame having a pair of longitudinal members, wheels rotatably mounted on said members, vertical members affixed to the longitudinal members, seat arms pivoted to the vertical members, lateral means extending between and supported by said arms in all positions of pivoting, seatback frame members pivoted to the seat arms, motor means in the vertical members operative between the frame and the seat arms to elevate the seat arms and coupling means between the seat arms and vertical members to normally maintain the seat arms and seatback substantially at 90° to each other and upon elevating the seat arms to relatively rock the seatback and increase the angle between the seat arms and seatback and provide a generally continuous generally vertical support.

2. A wheelchair as in claim 1 wherein the seat arms comprise two arm units, the first unit being pivoted to the vertical members and the second unit being pivoted to the first on a spaced axis and wherein the seatback frame is pivoted to the first and second arm units on spaced axes.

3. A wheelchair as in claim 1 wherein the seat arms have a segment of a gear secured thereto and the motor means has a rack engaging the gear segment.

4. A wheelchair as in claim 1 including articulated spreader bars between the seat arms and between the longitudinal members.

5. A wheelchair as in claim 4 wherein the spreader bar between the longitudinal members mounts a pair of foot pad assemblies on torsionally biased sleeves.

6. A wheelchair as in claim 1 wherein a knee pad is detachably fastened between the seat arms adjacent the pivot point thereof.

7. A wheelchair as in claim 1 wherein the seating cushions are cylindrical foam filled units detachably secured to the seat arms and seatback frame.

8. A wheelchair as in claim 2 wherein the first arm unit is coupled to a segmental gear and the motor means has a rack engaging the gear.