

Feb. 1, 1955

L. BENNETT ET AL
CURB CLIMBING WHEEL CHAIR

2,701,005

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3 Sheets-Sheet 1

Fig. 1

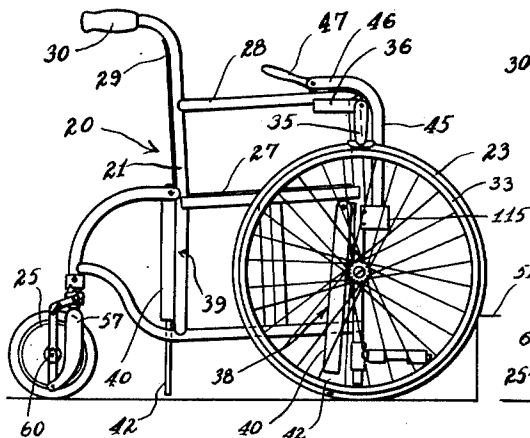


Fig. 2

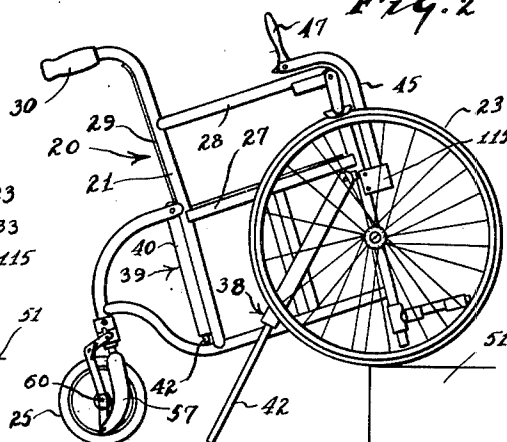


Fig. 3

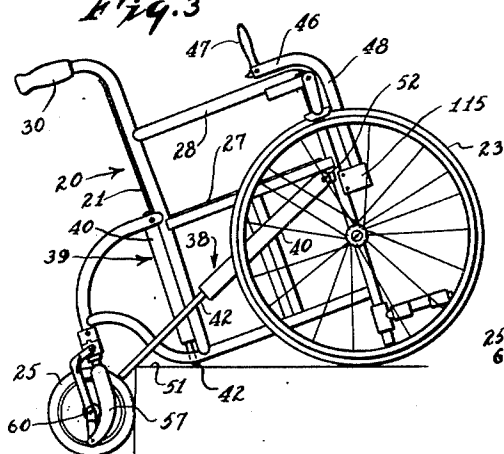


Fig. 4

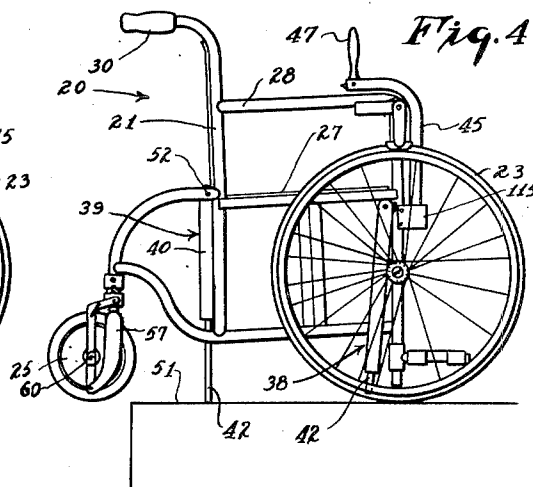
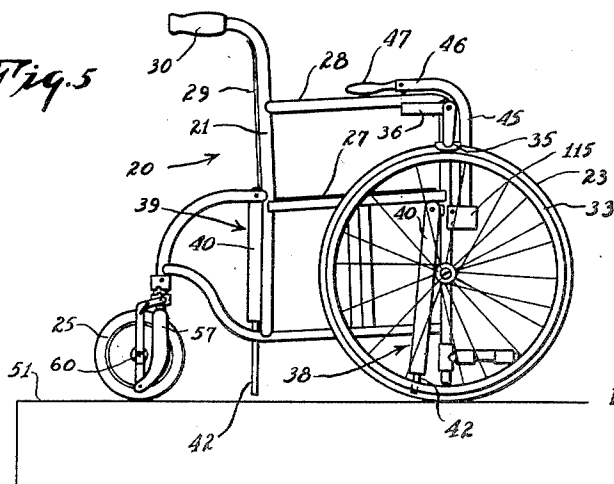


Fig. 5



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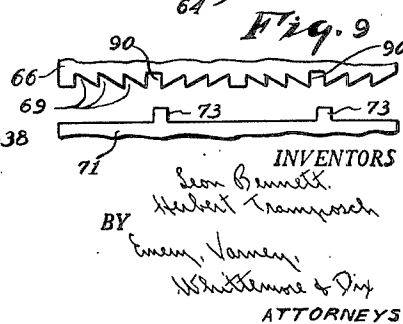
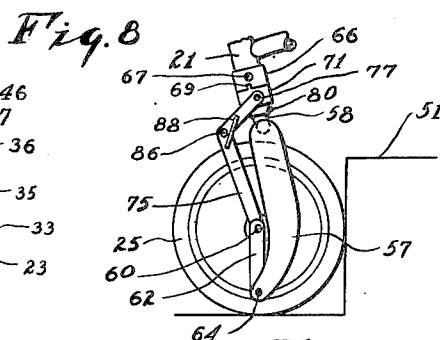
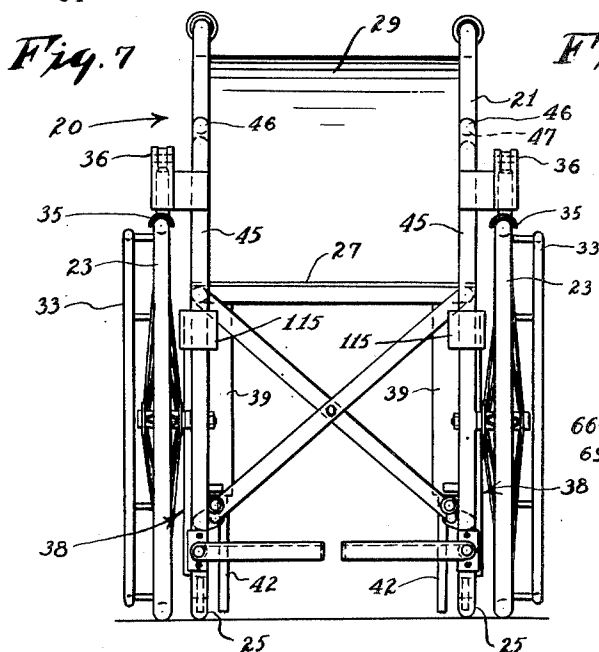
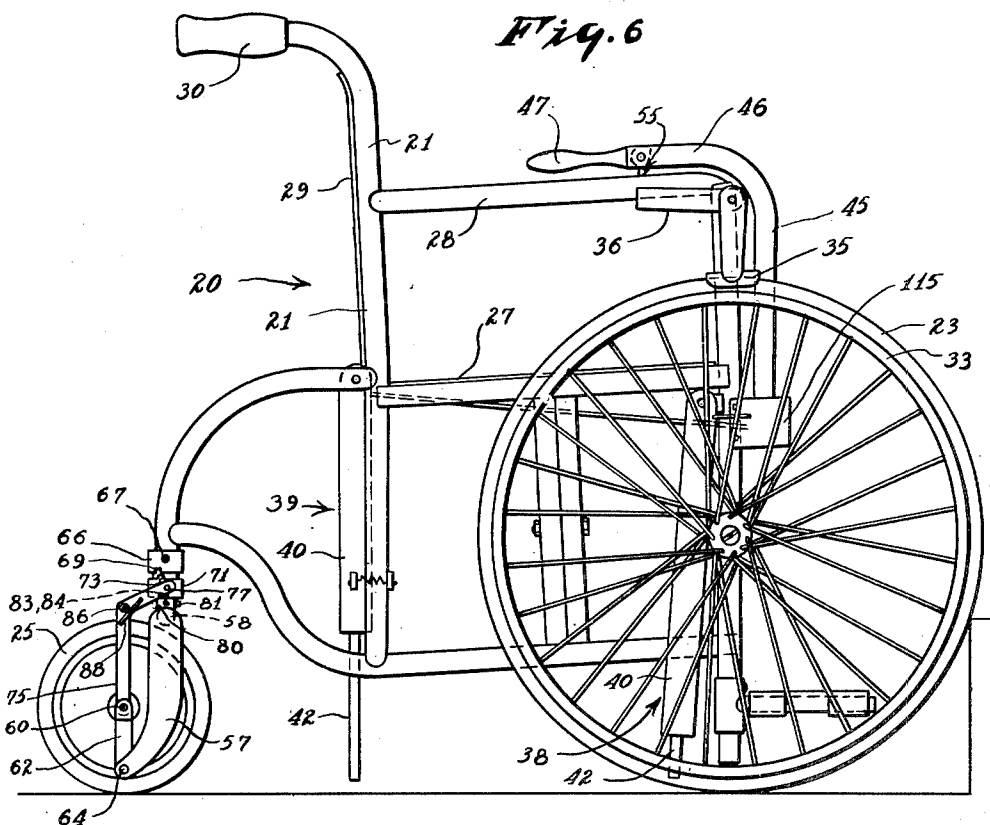
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3 Sheets-Sheet 2



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2,701,005

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3 Sheets-Sheet 3

Fig. 10

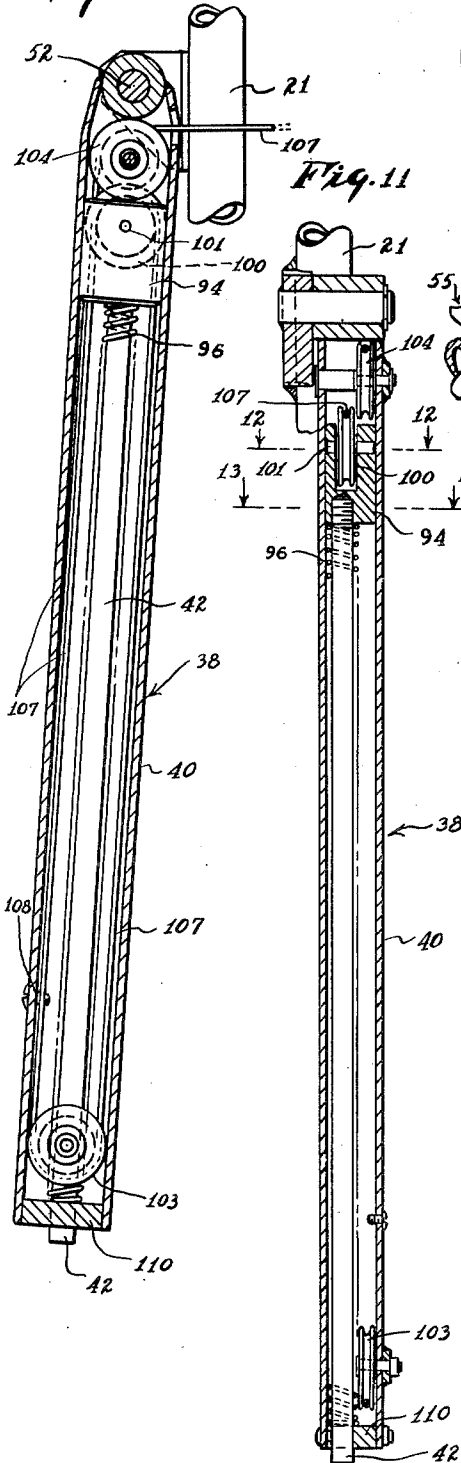


Fig. 11

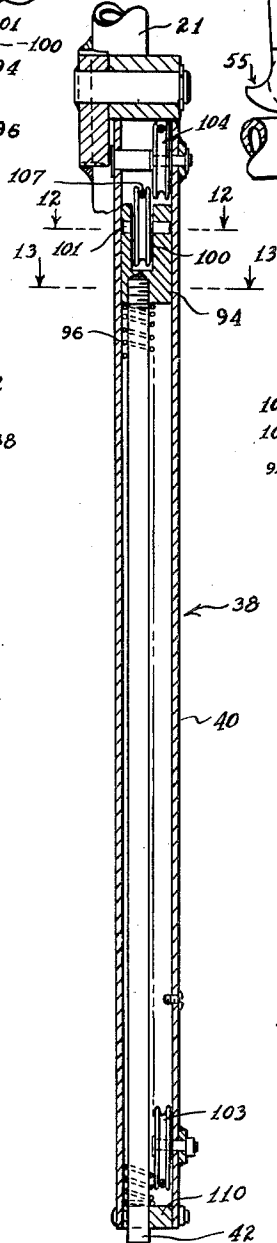


Fig. 12

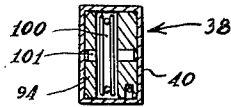


Fig. 13

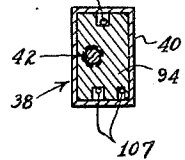
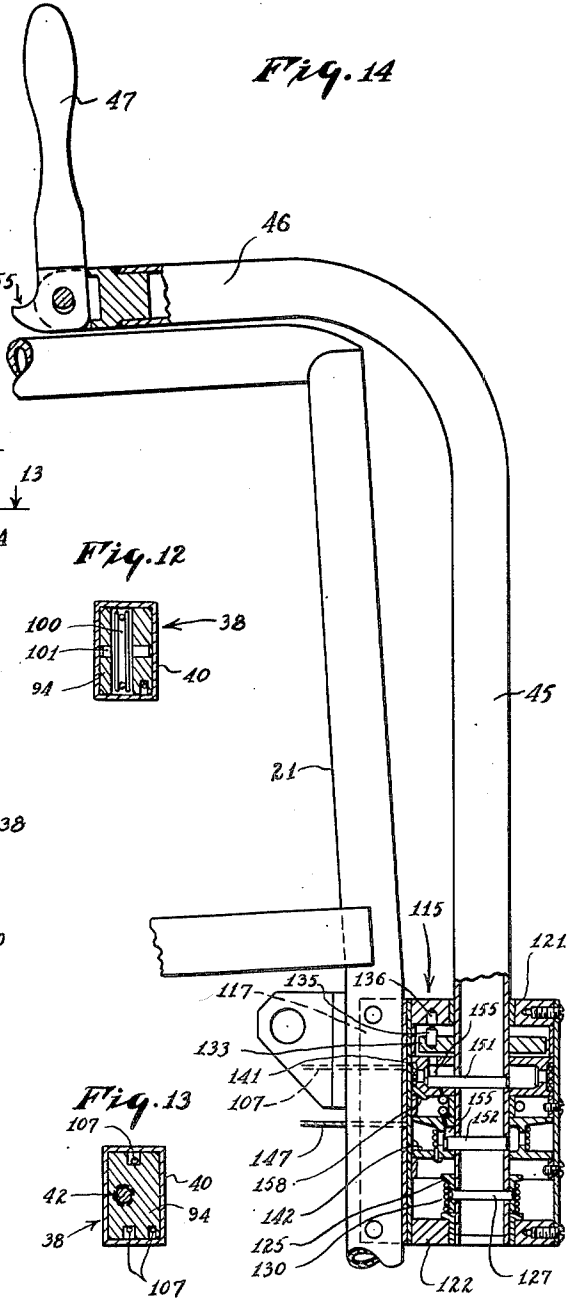


Fig. 14



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1

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CURB CLIMBING WHEEL CHAIR

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Application June 23, 1954, Serial No. 438,665

15 Claims. (Cl. 155—30)

This invention relates to wheel chairs such as are used by invalids who are unable to walk. If the invalid has the use of his arms, as is often the case, he can propel himself from place to place in the wheel chair by means of hand rims attached to the front wheels of the chair. It has been a serious disadvantage, however, when patients come to a step, such as a curb; the wheel chair will not climb the step. Various devices have been suggested for making wheel chairs capable of climbing curbs; but these devices have been complicated and impractical, and they have required wheel chairs of special construction.

It is an object of this invention to provide an improved wheel chair which has simple and practical means for causing it to climb a step or curb, and with lifter operating mechanism that is actuated by the occupant of the chair. Another object of the invention is to provide lifters for making a wheel chair climb a curb, and with the lifter construction such that it can be attached to wheel chairs of conventional construction. One feature of the invention relates to a combination of front and back lifters for the wheel chair with common operating mechanism that extends the lifters at one end of the chair while it retracts the lifters at the other end of the chair. In the preferred construction, the front lifters have a substantially longer stroke than the rear lifters and they are connected with the chair in such a way that they slope rearwardly toward their lower ends to develop a forward component of thrust when they lift the front wheels from the ground. These front lifters are pivotally connected to the frame of the wheel chair so that they can swing rearwardly about the pivot connections as the wheel chair moves forwardly across the top of the step or curb.

Other features of the invention relate to simple and rugged operating mechanisms for the lifters including cables which wrap around drums operated by cranks which are manipulated by the occupant of the wheel chair. The invention includes several safety features, one of which is an automatic lock for preventing operation of the lifters except when the occupant of the chair is manipulating the actuating mechanism of the lifter operating mechanism. Another safety feature relates to an automatic lock for preventing the rear wheels of the chair from castering when the front wheels of the chair are lifted from the ground.

Other objects, features and advantages of the invention will appear or be pointed out as the description proceeds.

In the drawing, forming a part hereof, in which like reference characters indicate corresponding parts in all the views;

Figure 1 is a side elevation of a wheel chair embodying this invention and with the wheel chair shown at the foot of a curb which it could not climb without the aid of this invention;

Figure 2 is a view similar to Figure 1, but showing the first sequence in the operation of the invention to climb the curb;

Figures 3-5 are views similar to Figures 1 and 2 but showing successive stages in the operation of the invention in raising the wheel chair up over the curb;

Figure 6 is an enlarged view of the wheel chair shown in Figures 1-5;

Figure 7 is a front view of the wheel chair shown in Figure 6, but on a slightly reduced scale;

Figure 8 is a fragmentary view showing the caster wheel of Figure 6 with its locking means in the position

2

occupied when the front end of the wheel chair is raised from the ground;

Figure 9 is a detailed view showing a development of the caster locking jaws;

Figure 10 is a greatly enlarged sectional view through one of the front lifters of the wheel chair;

Figure 11 is a sectional view through the front lifter shown in Figure 10 but with the section taken at right angles to that of Figure 10;

Figures 12 and 13 are sectional views taken on the lines 12-12 and 13-13, respectively, of Figure 11; and

Figure 14 is an enlarged view partly in sections showing the mechanism by which the occupant of the chair actuates the lifters.

Figure 1 shows a wheel chair 20 having a carriage frame 21 with front wheels 23 and rear wheels 25. The frame 21 has a seat 27, arms 28, a back 29 and handles 30 by which the wheel chair can be pushed when occupied by a person unable to propel himself. The front wheels 23 have hand rims 33 by which an occupant of the chair can propel the chair, if he has the full use of his arms and hands.

The rear wheels 25 are caster wheels, but have special mounting so that they can be locked against castering movement while the chair is climbing a curb; this construction will be described more fully in connection with Figures 6 and 8. The wheel chair is shown with a brake 35 on the front wheels operated by handles 36 in accordance with conventional construction.

The chair has two front lifters 38, one on each side of the chair frame 21; and has two rear lifters 39, one of which is on each side of the chair but spaced close enough together so as not to interfere with the operation of the caster wheels 25. In the preferred embodiment of the invention, each of the lifters 38 and 39 includes a housing 40 and a push rod 42 which slides axially in the housing 40, and which is thrust outwardly from the lower end of the housing 40 to extend the lifter when the wheel chair is to be raised.

The construction of the lifters 38 and 39 will be explained fully in connection with Figures 10-13, and for the present it is sufficient to understand that the housings 40 are pivotally connected at their upper ends to the frame 21 of the chair, and that the push rods 42 are operated to thrust them downwardly from the housings to extend the lifters when the wheels of the chair are to be raised from the ground. The lifters 38 and 39 are operated by rotating shafts 45, one of which is shown in Figures 1-6, and each of which has its upper end extended horizontally to provide a crank 46 having a handle 47 at its outer end.

When the occupant of the chair wishes to actuate the lifters 38 and 39, he moves the handle 47 into an upwardly extending position and uses it to rotate the shaft 45. Rotation of the shaft 45 in one direction causes the front lifters 38 to be extended while the rear lifters 39 are being retracted. Rotation of the shaft 45 in the opposite direction causes the front lifters 38 to retract and causes the rear lifters 39 to be extended.

Figure 1 shows the wheel chair 20 in the position which it occupies when it first comes into contact with a curb 51. The lifters 38 and 39 are shown with their push rods 42 in the positions which they normally occupy when the wheel chair is in use on level ground. The push rods of the front lifters 38 are retracted almost all the way, whereas the push rods of the rear lifters 39 are retracted only slightly.

The first operation in climbing the curb 51 is for the occupant of the chair to turn the handles 47 up into position to rotate the shafts 45 in directions which will extend the front lifters 38. These front lifters 38 slope toward the rear at their lower ends so that as they are extended, and lift the front wheels 23 from the ground, there is a forward component of thrust. The combination of lift and forward thrust serves to deposit the front wheel 23 on top of the curb 51.

The occupant of the chair propels the chair forward at the new level on which the front wheels 23 are now located, and this brings the wheel chair into the position shown in Figure 3. The front lifters 38 are free to swing about their pivotal connections to the frame 21, which

3

connections are indicated by the reference character 52. This free swinging movement prevents the front lifters from interfering with the advance of the wheel chair along the high ground at the level of the top of the curb 51.

The extending of the front lifters 38 causes the rear lifters 40 to retract so that the push rods 42 of the rear lifters 40 clear the curb 51 as indicated in Figure 3. The next operation is for the occupant of the chair to rotate the shaft 45 in a reverse direction so as to retract the front lifters 38 and to extend the rear lifters 39. This causes the rearward end of the wheel chair to be lifted so that the caster wheels 25 are raised to the level of the curb 51 as shown in Figure 4.

The rear lifters 39 slope forwardly with respect to their upper ends when the chair is in the position shown in Figure 3. Each rear lifter 39 is against the frame 21, however, so that it cannot swing forwardly and move the wheel chair back in what would be a reverse of the operation of the forward lifter 38 in thrusting the wheel chair forward between the positions shown in Figures 1 and 2. It should also be noted that when the wheel chair is in a substantially level position, as shown in Figure 4, the rear lifter 39 is in a substantially vertical position, but it can swing rearwardly, about its pivot connection 52 with the frame, as the occupant of the carriage turns the wheel 23 to move the carriage from the position shown in Figure 4 to that shown in Figure 5. During this movement, the rear lifter 39 swings forward about its point of contact with the ground. As the rear lifter 39 moves into an angular position, it permits the rear of the wheel chair to move down and it is desirable, therefore, to have the rear wheels 25 higher than the top of the curb 51 when the wheel chair is in the position shown in Figure 4.

After the rear wheels 25 are on the high level, the occupant of the chair retracts the push rod of the rear lifter 39 so that it no longer touches the ground and the lifters are then in the positions shown in Figure 5, which are the normal positions occupied by the push rods of the lifters when the chair is being used to travel along a level surface. The handle 47 can then be moved into its lowered position, parallel to the arm 28 of the wheel chair; and there is a cam 55 on the lower end of the handle 47 in position to raise the crank 46 to a predetermined spacing above the wheel chair arm 28, and to prevent the crank 46 from being pushed downwardly accidentally. As long as the crank 46 is held in this elevated position above the arm 28, the lifters are locked against movement, as will be understood in connection with the description of Figure 14.

Figures 6 and 8 show the automatic means for locking the caster wheels 25 against casting movement when the front wheels of the chair are raised off the ground. These figures show only one of the caster wheels 25 but it will be understood that the construction is the same for the caster wheels on both sides of the wheel chair. There is a yoke 57 which has a pintle 58 at its upper end. The pintle 58 is rigidly connected with the yoke 57 and rotates in bearings located in the rearward part of the wheel chair frame 21. The rear wheel 25 has an axle 60; but instead of having this axle extend through openings in the lower end of the yoke 57, the axle has links 62 connecting it with pins 64 in the lower ends of the yoke 57 on both sides of the caster wheel 25. With this construction, the load carried by the rear wheel 25 hangs from the axle 60.

When the front wheels of the chair are lifted, the frame of the wheel chair tilts rearwardly at the top, that is, toward the left in Figure 6 and this causes the yoke 57 to be tilted rearwardly. This locates the upper end of the yoke 57 more nearly over the axle 60, that is, it reduces the distance between the axle 60 and the portion of the wheel chair frame in which the bearings for the pintle 58 are located.

There is a collar 66 secured to the wheel chair frame by a set screw 67. There are fixed locking jaws 69 in the bottom face of the collar 66. A movable collar 71 slides up and down on the frame 21; and there are jaws 73 projecting from the upper face of the movable collar 71 for engaging the fixed locking jaws 69 on the collar 66. A link 75 is connected to the movable collar 71 by a pivot 77 at the upper end of the link. The lower end of the link 75 is pivotally connected to the axle 60.

When the frame 21 tilts, as the front of the wheel chair is raised, and the distance between the frame 21 and the axle 60 is reduced by having the frame move into a posi-

4

tion more nearly over the axle 60, the link 75 pushes the movable collar 71 upwardly and brings the jaws 73 into engagement with the fixed locking jaws 69. The movable collar 71 slides axially along the lower end of the frame 21 and is also rotatable on the frame 21 about the axis of the pintle 58.

Two screws 81 are attached to the lower rear frame 21. These screws extend far enough so that they can engage the recess 84 in the bottom face of the movable collar 71. Engagement occurs when the castor wheels 25 are off the ground as in Figure 4. When engaged, wheels 25 are locked to the frame and casting is impossible.

When the frame is tilted, the collar 71 cannot rotate because it is in engagement with the fixed jaws of the collar 66 secured to the frame 21; and the yoke 57 cannot rotate because its connection with the chair through the links 62 and 75 are locked through collars 71 and 66. This locks the entire castor assembly against rotation, that is, against any casting movement.

One of the advantages of the automatic locking means for the casting wheels, as disclosed in Figures 6 and 8, is that the mechanism does not operate to lock the caster wheels when the wheel chair is going uphill, even though the slope raises the front wheels above the level of the caster wheels, as much, or even more, than when the front wheels are raised to climb a curb. The reason for this difference is that the reaction thrust of the ground against the wheel 25 is normal to the surface of the ground, and is, therefore, not vertical when the wheel chair is rolling uphill. The link 62 will shift out of vertical positions, and to the same angle as the vertical thrust reaction of the ground against the wheel when the wheel chair is moving uphill. This compensates for the tilting of the frame 21 and leaves the parts in the same relative positions in respect to one another as when the wheel chair is on level ground.

There are links 75 on both sides of the caster wheel 25 and the bolt 86 is a tie member between the two links 75. The rib 88 is merely a reinforcing fin extending from the outside of the link 75. There is a similar reinforcing rib on the opposite side of the link 75 on the other side of the caster wheel 25. The caster wheel on the other side of the carriage is similar to that illustrated in Figures 6 and 7 and is equipped with the same kind of automatic locking means for preventing the wheels from casting when the front wheels of the carriage are lifted off the ground.

Figure 9 is a development of the fixed locking jaws 69 and the locking jaws 73 which are located at the upper end of the movable collar 71. There are recesses 90 among the locking jaws 69 and into which the jaws 73 extend when the caster wheel is in a position extending rearwardly. Since the caster wheel may be in an angular position at the time that the front wheels of the wheel chair are raised from the ground, the other locking jaws 69 are provided for preventing any casting of the wheel into a position at a greater angle to its straight-back position. These locking teeth 69 are made as ratchet teeth, however, so that they do not prevent movement of the caster wheel into a more rearward position. Any sideways sway of the rearward end of the wheel chair during the curb climbing operation will cause the jaws 73 to ratchet over the sloping jaws 69 and will usually result in the jaws 73 finally coming into engagement with the recesses 90 which prevent any casting of the rear wheels 25.

Even if the jaws 73 never come into position to engage the recesses 90, during the curb climbing operation, the caster wheels are locked against the only kind of movement which would make the operation dangerous, that is, swinging of the caster wheels into a greater angle to their straight-back positions, or swinging movement into a forwardly extending position.

Figures 10-13 show the internal construction of one of the front lifters 38. The housing 40 is of generally rectangular cross-section and there is a rectangular block 94 at the upper end of the push rods 42 for preventing the push rod from rotating in the housing 40. This block 94 may be considered the upper end of the push rod 42 and the portion of the push rod below the block 94 is preferably cylindrical and it is surrounded by a compression spring 96 which urges the push rod 42 into its retracted position. In the drawing, the push rod 42 is shown in retracted position with the block 94 at the upper end of its stroke.

There is a sheave 100 rotatable on an axle 101 carried by the block 94. There are other sheaves 103 and 104 on axles secured to the housing 40. A cable 107 is connected at its end 108 to the inside of the housing 40. From this anchored end 108, the cable 107 extends upwardly in the housing 40, around the sheave 100, then downwardly again and around the sheave 103 in the lower end of the housing 40, and then upwardly and over the sheave 104 from which the cable 107 passes through an opening in the upper end of the housing 40 and to a cable drum which will be described in connection with Figure 14.

From this construction it will be apparent that when the cable 107 is pulled from outside the housing 40, this pull on the cable will cause the block 94 to be pulled downwardly in the housing 40 and the push rod 42 will be thrust from the lower end of the housing to extend the lifter. The sheaves 100, 103 and 104 provide a pulley system, and a mechanical advantage of two to one, gaining force, is obtained because of the fact that the sheave 100 serves as a movable pulley of the system. This mechanical advantage makes it easier for the occupant of the chair to raise his own weight, and that of the chair, when operating the lifters.

Figures 12 and 13 show sectional views through the block 94. This block slides freely in the housing 40 as a guide bearing; and there are grooves in the block providing ample clearance for the runs of the cable 107. This avoids wear on the cable 107 such as might result if there were no definite grooves for its passage and a general clearance were provided in which the push rod could sometimes bear against the cable depending upon the direction of thrust against the lifter. Although the block 94 provides a bearing at only the upper end of the push rod 42, there is ample bearing support for the lower end of the push rod in the bearing surface provided by a head 110 at the lower end of the housing 40. The push rod 42 never moves far enough down to bring the block 94 close to the head 110. This prevents excessive bending moments on the push rod 42, and provides ample space for compression of the spring 96.

Figure 14 shows a drum housing 115 secured to the frame 21 by a bracket 117. The drum housing 115 has upper and lower heads designated by the reference characters 121 and 122, respectively, and the shaft 45 rotates in bearings in the heads 121 and 122 of the drum housing 115. There is a collar 125 secured to the shaft 45 by a pin 127. A spring 130 is compressed between the collar 125 and the bearing in the lower head 122. This compression spring urges the shaft 45 upwardly. Another collar 133, secured to the shaft 45, carries a stud 135 which engages in a recess 136 in the head 121 of the drum housing when the shaft 45 is thrust upwardly by the spring 130. There are a number of recesses 136 angularly spaced around the shaft 45 so that it is not necessary for the collar 133 to rotate to any large angle before the stud 135 is in position to engage one or the other of the recesses 136. When the occupant of the chair is not exerting a downward thrust on the handle 47, and through this handle and crank 46, on the shaft 45 to compress the spring 120, this spring will lift the shaft 145 and carry the stud 135 into engagement with one of the recesses 136 to lock the operating mechanism for the lifters. This automatic locking occurs whether the lifters are in extended or retracted position and whether the wheel chair has any of its wheels raised from the ground or not.

There are two cable drums 141 and 142 located within the drum housing 115. These cable drums 141 and 142 are freely rotatable in the housing and are held against axial movement in the housing by shoulders on the inside wall of the housing. This construction shown in Figure 14 is duplicated on both sides of the wheel chair so that they are separate operating mechanisms for the lifters of both sides of the chair.

The cable 107 for operating the front lifter extends through an opening in the drum housing 115 and wraps around the drum 141. Another cable 147 comes from the rear lifter which is similar in construction to that shown in Figures 10-13, except that the rear lifter is shorter in length. This cable 147 extends through an opening in the drum housing 115 and wraps around the drum 142. Because of the fact that the front and rear lifters have strokes of different lengths, the diameters of the cable drums 141 and 142 are different, and the difference is proportional to the difference in the length of the strokes of the front and rear lifters so that the same

amount of rotation of the cable drums 141 and 142 will produce a full stroke of both the front and rear lifters.

The cables 107 and 147 are wrapped in different directions around the drums 141 and 142 so that rotation of the drums in one direction wraps the cable on one drum and unwraps it from the other. Conversely, rotation in the opposite direction wraps the cable that was formerly unwrapping and permits the other cable to unwrap.

The cable drums 141 and 142 are rotated by pins 151 and 152 extending from the shaft 45. These pins 151 and 152 extend into annular spaces in the hubs of the drums, and the pins could rotate with the shaft 45 without imparting rotation to the drums if there were no obstructions extending across the annular spaces. However, there are one or more fins, or other obstructions 155 extending transversely across the annular spaces in the drum hubs and into the paths of the pins 152. These fins 155 provide lost motion connections between the shaft 45 and the cable drums 141 and 142. Whenever the direction of rotation of the shaft 45 is reversed, no rotary motion is imparted to the drums 141 and 142 until the pins 151 and 152 have travelled back far enough to come around into contact with the other side of the fin 155 or into contact with a similar fin located in a different angular position around the interior of the cable drum. These lost motion connections make it unnecessary to construct the apparatus with the accurate manufacturing tolerances which would otherwise be required. There is a torsion spring 158 located between the cable drums 141 and 142. This torsion spring urges the drums in opposite directions for taking up any slack in the cables 107 and 147.

The cable drums on the opposite sides of the wheel chair are wound so that the cranks 46 and handles 47 must be rotated in opposite directions in order to make the lifters on the opposite sides of the wheel chair operate in the same directions. This makes it easier for the occupant of the wheel chair to manipulate the lifter operating mechanism since it is much easier to move the hands toward and away from one another than it would be to move them in the same direction as would be required if both cranks had to be rotated the same way.

The preferred embodiment of the invention has been illustrated and described, but changes and modifications can be made and some features can be used in different combinations without departing from the invention as defined in the claims.

What is claimed is:

1. A curb climbing wheel chair for invalids comprising a carriage frame, wheels at the front of the carriage frame, other wheels at the rear of the carriage frame, lifters at the front of the frame pivotally connected at their upper ends to the frame and sloping rearwardly toward their lower ends, the lifters being extendable to raise the front wheels of the chair from the ground, other lifters at the rear of the carriage frame and connected to the frame and extendable to lift the rear wheels from the ground, and lifter operating mechanism in position to be actuated by the occupant of the chair.

2. The wheel chair described in claim 1 characterized by lifter operating mechanism which has a portion of the mechanism common to both the front and rear lifters and connected to the front and rear lifters in such a way that movement of the operating mechanism to extend the front lifters retracts the rear lifters and vice-versa.

3. The wheel chair described in claim 1 characterized by front lifters which include a housing and a push rod that thrusts downwardly from the housing as the lifter is extended and a cable that pulls the push rod down to extend the lifter, and lifter operating mechanism that has at least a portion of the mechanism common to both the front and rear lifters with means for pulling the cable to extend the push rod of the front lifters when the operating mechanism is moving in a direction to retract the rear lifters.

4. The wheel chair described in claim 1 characterized by front lifters which include two lifters, one on each side of the carriage frame, with each lifter comprising a housing and a push rod that thrusts downwardly from the housing when the lifter is extended, a sheave at the upper end of the push rod, a cable inside the housing and attached to the housing near the lower end thereof, the cable extending upwardly along the push rod, over the sheave at the top of the push rod and then downwardly to the lower end of the housing again and over

guide means to a drum, and the lifter operating mechanism includes a drum on which the cable winds, mechanism for rotating the drum, and connections from said mechanism to the rear lifters and through which the rear lifters are retracted when the operating mechanism moves in a direction to extend the front lifters.

5. The wheel chair described in claim 1 characterized by two lifters at the front of the frame and two lifters at the rear of the frame, each of the lifters including a housing which is connected with the frame and a push rod slidable axially in the housing, a sheave at the top of the push rod, a cable anchored at one end to the lower portion of the housing and extending upwardly around the sheave and then downwardly again in the housing, guide means over which the cable passes from the housing, and the lifter operating mechanism includes two drums on either side of the carriage frame, one of the drums being in position to wrap the cable from the front lifter on that side of the frame and the other drum in position to wrap the cable from the rear lifter on that side of the frame, common operating mechanism for both of the drums on one side of the carriage and other common operating mechanism for both of the drums on the other side of the carriage, the cables being wrapped on the drums in a direction that causes one cable to wrap on its drum while the other cable unwraps when the drums are rotated by the common operating mechanism.

6. A curb climbing wheel chair comprising a carriage frame, large wheels supporting the front of the frame, smaller caster wheels supporting the rear of the frame, automatic locking means operated by the lifting of the front end of the carriage to prevent casting of the rear wheels, lifters connected to the forward end of the carriage and extendable to lift the forward end of the carriage for climbing a curb, and operating mechanism for the lifters located in position to be actuated by an occupant of the chair.

7. The wheel chair described in claim 6 characterized by locking means for the caster wheels which includes a linkage by which the load carried by the caster wheels hangs from axles of the caster wheels, locking jaws, and motion transmitting means operated by tilting of the upper end of the linkage rearwardly with respect to the supporting thrust on the caster wheels for engaging the locking jaws to hold the rear wheels against casting movement.

8. A wheel chair including front wheels, rear caster wheels, means for locking the caster wheels against casting movement, the locking means including elements operated by a change in the angular relation between the downward load on the caster wheels and the reaction force between the caster wheels and the ground on which the wheels are supported, lifters located at and connected to the front of the wheel chair and extendable to raise the front wheels from the ground, said lifters sloping rearwardly toward their lower ends which contact with the ground, other lifters located at and connected to the rear of the wheel chair, and lifter operating mechanism in position to be actuated by an occupant of the chair.

9. A wheel chair for invalids including a carriage frame, front wheels, rear wheels, lifters connected to the front of the frame, other lifters connected to the rear of the frame, and lifter operating mechanism in position to be actuated by an occupant of the chair, the lifter operating mechanism including a portion of the mechanism which is common to both the front and rear lifters and that operates the lifters at one end of the frame to raise the carriage while the lifters at the other end of the frame are operating in a direction to lower the carriage.

10. A wheel chair for invalids including, in combination, front wheels, rear wheels, lifters connected to the front of the chair, other lifters connected to the rear of the chair, said lifters being extendable to raise the wheels of the chair from the ground, cables that operate the lifters including different cables for the front and rear

lifters, and lifter operating mechanism including at least a portion of the mechanism which is common to both the front and rear lifters, said mechanism including a drum on which the rear lifter cable wraps, another drum of different diameter on which the front lifter cable wraps, and a common shaft for rotating both of the drums, the cables being wound on the drums in a direction to cause one cable to wrap when the operating mechanism is moved in a direction to cause the other cable to unwrap.

11. The wheel chair described in claim 10 characterized by lifter operating mechanism having automatic locking means for preventing the drums from rotating when the lifter operating mechanism is not actuated, and in which the common operating mechanism includes a vertical shaft having a crank at its upper end and located at one side of the wheel chair in position to be rotated by the occupant of the chair, a spring that urges the vertical shaft upwardly to operate the automatic lock for preventing rotation of the drums, said automatic lock being released by downward movement of the vertical shaft against the pressure of said spring, and lost motion connections between the vertical shaft and at least one of the drums so that the first part of the rotation of the vertical shaft in a direction to reverse the rotation of the drum is a free movement not imparted to the drum.

12. A wheel chair for invalids including, in combination, front wheels, rear wheels, lifters carried by the chair in position to raise the front wheels from the ground, other lifters carried by the chair in position to raise the rear wheels from the ground, each of the lifters comprising a housing and a push rod movable axially in the housing, a cable that pulls the push rod in a direction to thrust it from the housing to lift the wheel chair, a spring in each housing in position to urge the push rod back into the housing to retract the lifter when the pull on the cable is relaxed, and lifter operating mechanism actuated by the occupant of the chair and including drum means on which the cables from the lifters wrap in opposite directions so that rotation of the drum means pulls one cable while it relaxes the other, the lifter operating mechanism including at least a portion of the mechanism common to both the front and rear lifters and rotatable in opposite directions to selectively extend the front lifters while retracting the rear lifters, and vice versa, and a lost motion connection between the common operating mechanism and the drum means.

13. A curb climbing wheel chair for invalids including, in combination, a carriage frame, front wheels, rear wheels, lifting means extendable to raise the front wheels from the ground, said lifting means being pivotally connected to the frame at their upper ends and sloping rearwardly toward their lower ends, and said lifting means including housings and push rods axially movable in the housings to thrust the lower ends of the push rods downwardly to raise the wheel chair, and actuating mechanism for the lifter means in position to be manipulated by the occupant of the wheel chair.

14. The wheel chair described in claim 13 characterized by rear wheels which are caster wheels and automatic locking means that hold the caster wheels against casting movement when the lifting means raise the front wheels from the ground.

15. The wheel chair described in claim 13 characterized by automatic locking means which lock the lifter means whenever the occupant of the wheel chair releases the actuating mechanism with which he controls the lifting means.

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