

June 15, 1965

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3,189,368

WHEEL CHAIR DRIVER ATTACHMENT

Filed Dec. 23, 1963

2 Sheets-Sheet 1

Fig. 1.

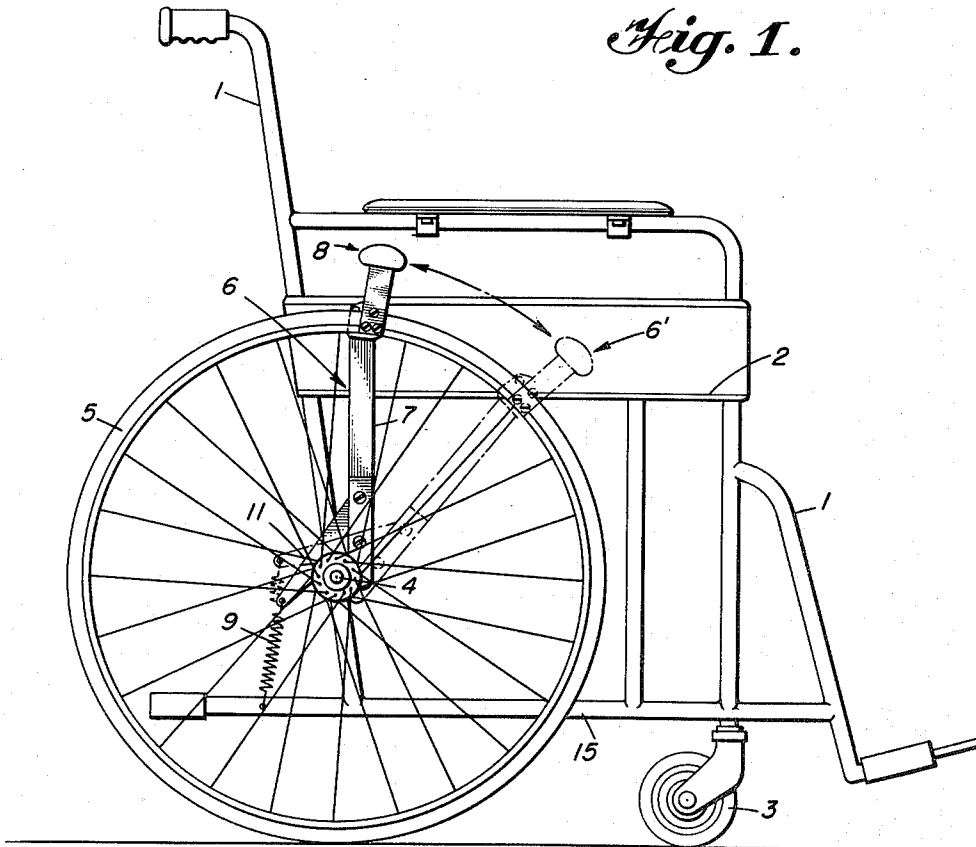
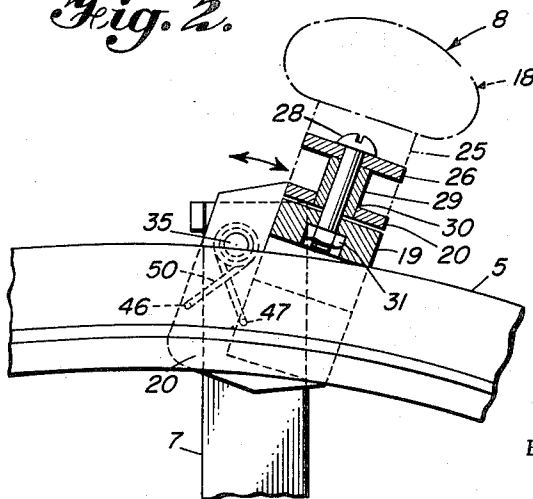


Fig. 2.



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Fig. 3.

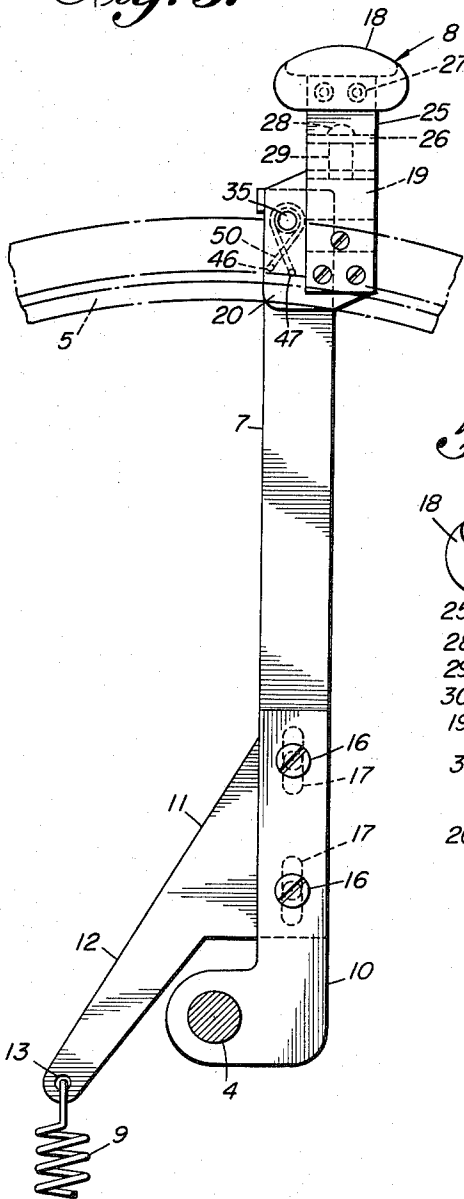


Fig. 4.

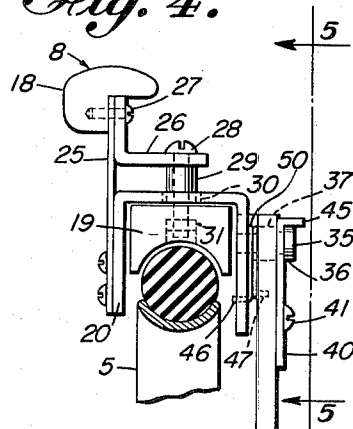
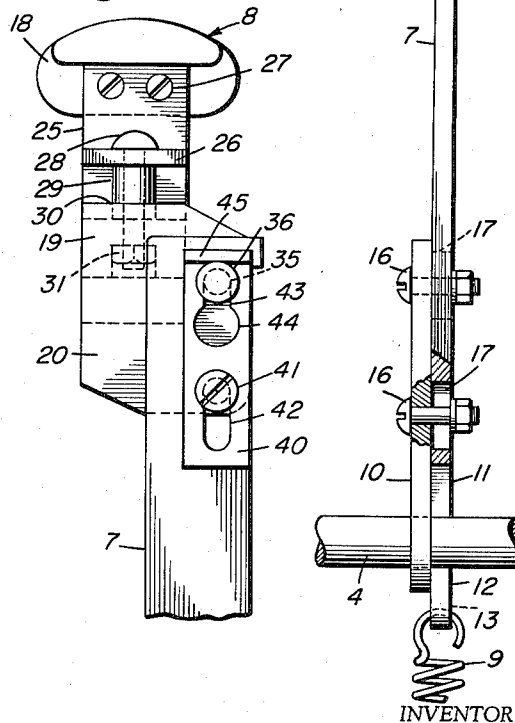


Fig. 5.



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WHEEL CHAIR DRIVER ATTACHMENT

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11 Claims. (Cl. 280-242)

This invention relates generally to wheel chair driver attachments, and more particularly to a wheel chair driver attachment which allows invalids to propel a wheel chair without the necessity of gripping the wheel thereof.

The standard invalid wheel chair is equipped with a driving ring on the periphery of a wheel which may be grasped by the invalid to drive the chair either forward or in reverse. This driving ring is sufficient in many instances, but it is comparatively useless to an invalid who has lost the use of his hands or fingers and who is thus unable to grasp the ring with sufficient force to move the chair.

The prior art driver attachments are likewise of little value to the quadriplegic or other invalid who does not have control over his hands or fingers. For instance, U.S. Patent 2,130,426 to Henderson discloses a wheel chair driving device which consists of a lever arm pivotally mounted on the main axle of the chair and extending upwardly toward the occupant. The upper end of this lever has a handle which can be gripped by the invalid. The Henderson device also includes a dog or pawl pivotally attached to the lever near the wheel of the chair so that this dog grips the wheel to move the chair when the invalid applies a force to the handle. In order to use the Henderson driver to move the chair backward, the invalid must manipulate the wheel-engaging dog to reverse its operation, a manipulation which is obviously very difficult for a person who does not have control over his hands and fingers. The Henderson driver also provides for spaced fingers which retain the wheel-engaging dog is a disengaged position above the wheel only when the driver is in its forwardmost position. This wheel chair driving device disclosed in the Henderson patent contains no mechanism to return the driver to a normal starting position within easy reach of the invalid, or to automatically disengage the driving shoe from the wheel of the chair in all positions, when the device is not in use.

The prior art has thus failed to provide a wheel chair driver attachment which meets the needs of a quadriplegic or similar invalid. Therefore, the instant invention provides an improved wheel chair driver attachment which will enable quadriplegics and other invalids to propel their own wheel chairs with a minimum of effort and without requiring any finger or hand manipulation.

In many cases, invalids who cannot effectively use their hands or fingers to grasp a driving ring or to manipulate a complicated device, still retain sufficient strength in their shoulder and arm muscles to propel a wheel chair equipped with a proper driver attachment. To be of maximum use, such a driver attachment must be mounted upon the chair within easy reach of the invalid, and must be automatically held out of engagement with the wheel so that the movement of the chair is not impeded when the driver is not being used. Further, the driver must be simple to operate, and be designed to assist the invalid in moving his chair with minimum effort by retaining the driver in an accessible starting position, and by automatically returning the driver to this starting position when the driving stroke is completed. In order that the driver may be operated by a person without full control of his hands and fingers, it is of utmost importance that no complicated manipulation, and particularly that no finger manipulation, be necessary to reverse the operation of the driver.

It is therefore an object of this invention to provide a wheel chair driver attachment which can be operated by

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quadriplegics, and other persons who have lost the use of their hands or fingers, to propel a wheel chair without assistance.

It is a further object of this invention to provide a wheel chair driver attachment which does not require any hand or finger manipulation to reverse the direction of the wheel chair.

It is still a further object of this invention to provide a wheel chair driver attachment which is designed to assist the invalid in moving the chair forward or backward with a minimum of effort.

In addition, it is an object of this invention to provide a wheel chair driver attachment which is automatically held in position disengaged from the wheel of the chair and within easy reach of the invalid when the driver is not in use.

It is still another object of this invention to provide a wheel chair driver attachment which is adjustable to various sizes of wheel chairs and which is economical to manufacture, operate and maintain.

With these objects in view, this invention can be generally described as a wheel chair driver attachment comprising a driving arm positioned adjacent a wheel of the chair and which extends toward the periphery of the wheel. Mounting means rotatably mount this arm on the chair, and a handle assembly is pivotally connected to the arm at its upper end. The handle assembly includes handle means to which a driving force may be applied by the use of the hand, arm and shoulder muscles of the invalid, and also includes a driving shoe positioned adjacent the periphery of the wheel. The shoe is operably connected to the handle means so as to engage the periphery and rotate the wheel to move the chair when a driving force is applied to the handle means. The driver attachment further comprises means urging the arm toward a normal position with respect to the chair, and means urging the shoe toward a disengaged position away from the periphery of the wheel. As a result of the combination of these features, the arm and handle assembly are normally maintained in a substantially vertically-extending position ready for use, with the driving shoe disengaged from the wheel periphery.

The construction and operation of this invention will be more completely understood by reference to a preferred embodiment thereof as shown by the drawings, in which:

FIG. 1 is a side elevational view of a wheel chair having the driver attachment of the invention mounted thereon;

FIG. 2 is a partial sectional view of a part of the handle assembly of FIG. 1, to a larger scale;

FIG. 3 is a side elevational view of the complete wheel chair driver attachment of FIG. 1, to a larger scale, with all the parts of the wheel chair removed, except the axle and a portion of the wheel periphery;

FIG. 4 is a front elevational view, partly in section, of the driver attachment of FIG. 3; and

FIG. 5 is a partial elevational view of the driver attachment taken along line 5-5 of FIG. 4.

Referring generally to FIG. 1, a preferred embodiment of this invention is shown attached to a standard type of wheel chair. This wheel chair includes a frame 1, and an occupant's seat 2. A small wheel or caster 3 supports the front of the chair. The main axle 4 of the chair is mounted on the frame 1 and has the main driver wheels 5 mounted thereon for rotation therewith.

The driver attachment of the invention, generally indicated by the numeral 6, is mounted on the chair adjacent wheel 5. This driver attachment generally includes a driving arm assembly 7 and a handle assembly 8 which is pivotally connected to the upper end of the arm. The numeral 6' in FIG. 1 indicates, in phantom, the forward position which the driver attachment may reach when in

use and a spring 9 urges the driver attachment back toward the normal, substantially vertical position shown in full lines.

Referring to the other figures of the drawing for a more details description of an embodiment of this invention, the driving arm assembly 7 includes at its lower end a mounting member 10 forming a journal by which the arm is rotatably supported by the main axle 4 of the wheel chair. The spring 9 is connected to the driving arm 7 through a side piece 11 of the arm which extends transversely therefrom and is provided with an ear 12 having a passage 13 therethrough for reception of the loop end of spring 9. The opposite end of spring 9 is attached to a similar slot in a lower frame member 15 of the wheel chair. With this manner of connection, the load on spring 9 is substantially tensional and exerts a biasing force on arm 7 which tends to hold it in a normal, substantially vertical position when the driver attachment is not in use.

In order to be adjustable for use on chairs having wheels of various diameters, driving arm 7 is adjustably attached to the mounting member 10 by means of bolts 16 which extend through elongated slots 17 in the lower end of the arm. With this simple and inexpensive connection, arm 7 can be longitudinally adjusted so that the driver attachment fits various sizes of wheel chairs.

The upper portion of the handle assembly 8 includes a handle 18 which may be padded to suit the particular needs of the wheel chair occupant. The padding or cushioning preferably covers the top and extends over the outward side of the handle, as best seen in FIG. 4. This padding on the side facilitates use of the driver attachment to move the chair backward, as will be more fully described hereinafter.

Handle assembly 8 also includes a shoe 19 designed to engage the periphery of the wheel 5 when the chair is to be driven. Shoe 19 is positioned between the legs of a generally U-shaped body member 20 of the handle assembly, which legs extend downwardly along opposite sides of the wheel 5.

A leaf spring 25 is bolted at its opposite ends to the handle 18 and the body member 20 to resiliently connect these elements together. This leaf spring is flexible in a direction generally axial of the wheel 5, and inflexible in the plane of the wheel. A second connection, mainly comprised of angle bar 26, connects the handle 18 to the wheel-engaging shoe 19, and retains the shoe within the U-shaped body 20. The upper end of angle bar 26 is fixed to handle 18 by screws 27, and the lower end is connected to shoe 19 by a bolt and nut fastener including bolt 28. The bolt 28 extends through and is threadedly engaged within a sleeve 29 whose upper end is held by the bolt against the lower side of the angle bar 26 and whose lower end extends through a slot 30 through the central portion of the body member 20 of the handle assembly. The lower end of the bolt 28 extends through a passage in the shoe 19 and is attached to the shoe by a nut 31. Consequently sleeve 29 rigidly joins the lower portion of angle bar 26 and shoe 19 so that movement of the angle bar is directly transmitted to the shoe. However, slot 30 is larger than the sleeve 29, particularly in the direction axial of the wheel 5, so that sleeve 29 may move in the slot in this axial direction to a limited extent prior to its engagement with the body member 20.

The pivotal connection between the driving arm assembly 7 and the handle assembly 8 is made by a pivot pin 35 secured at one end to body member 20 of the handle assembly. The opposite end of the pivot pin has an enlarged cap 36 which extends through a hole 37 in the upper end of arm 7. A clip 40 engages this pin behind cap 36 and prevents removal of the pin from hole 37. Hole 37 is located on the upper end of arm 7 so that when pin 35 extends therethrough the entire handle assembly 8 is pivotally connected to the upper end of the driving arm. In such a position, the handle assembly extends over the wheel and the handle 18 is within easy reach of the invalid in the chair.

Clip 40 releasably secures pin 35 to the arm 7 so the handle assembly 8 can be readily removed, such as for cleaning and servicing, or to prevent damage to the assembly when the chair is being transported. For this purpose, clip 40 is slidably connected to the upper end of driving arm 7 by screw 41 extending through lower slot 42 in the clip. Screw 41 should be sufficiently tightened to hold the clip in the vertical position, as shown in the drawings, and at the same time allow the clip to slide upwardly under screw 41. Clip 40 also has an upper slot which is restricted at 43 and enlarged at 44. The portion 44 of the upper slot is sufficiently large to allow cap 36 of pivot pin 35 to pass therethrough when the clip is in its uppermost position with enlargement 44 aligned with hole 37. With pin 35 extending through hole 37 and enlargement 44, the handle assembly is releasably secured to the arm by pushing downward on a projection 45 of the clip 40 so that the restricted slot portion 43 of the clip is opposite the enlarged cap 36. Handle assembly 8 is thus securely mounted on the driving arm, and the entire driver attachment is ready for use. To remove the handle assembly, the projection 45 is raised until slot portion 44 and hole 37 are again aligned, and then pin 35 is pulled out through hole 37.

A torsion spring 50 is coiled around pin 35 and has one end attached to the body member 20 at slot 46 therein, with the other end attached to the upper end of driving arm 7 at slot 47 therein. This spring connection between the handle assembly and the driving arm urges the handle assembly toward a substantially aligned position with respect to the arm and exerts a biasing force which holds the shoe 19 in a disengaged position away from the periphery of the wheel 5 when the driver is not being used. By retaining the shoe away from the wheel, spring 50 prevents unnecessary wear of the wheel chair tire and also allows unrestricted movement of the chair when the driver attachment is not being operated, such as when the chair is coasting or being pushed by an assistant.

Thus assembled, the driver is attached to the wheel chair in a position which places the handle 18 above the wheel 5 within easy reach of the invalid occupying the chair, as fully illustrated in FIG. 1.

When using this invention to move a wheel chair forward, the invalid, using his hand, arm and shoulder muscles, pushes forward on the handle 18 in a direction substantially peripheral of the wheel 5. The resistance of spring 9 urges the driving arm 7 toward its normal substantially vertical position with sufficient force so that this forward driving force causes the handle assembly 8 to pivot forward about pin 35 with respect to the driving arm. As shown in FIG. 2, as the handle assembly 8 pivots, the shoe 19 is brought into engagement with the periphery of the wheel. After shoe 19 is in this engaging position any further driving force on handle 18, sufficient to overcome the resistance of spring 9, will rotate the wheel 5 and move the chair forward.

When the forward driving stroke is completed, the invalid merely releases his force on handle 18 and springs 9 and 50 will automatically return the complete driver attachment to its original starting position. In particular, spring 50 brings shoe 19 into a disengaged position away from wheel 5 and spring 9 returns arm 7 to its normal substantially vertical position with respect to the chair. The driver attachment is again ready for use without any manipulation by the operator, and forward movement can be continued by reapplying the driving force as described above.

When using this invention to move a chair backward, the invalid first pushes forward in a direction generally parallel to the surface of the floor, on a lower portion of handle 18, preferably on the padded part which extends downwardly on the outside of the handle. Because of the low position of this force, the handle assembly 8 does not rotate about pin 35 a sufficient amount to engage shoe 19 with the wheel. Instead of moving the chair forward, the force thus applied moves the entire driver

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attachment to a forward position, such as that shown in phantom in FIG. 1. With the driver in this forward position, the occupant then pulls inwardly on handle 18 in a direction substantially axial to wheel 5. This axial force causes leaf spring 25 to yield so that handle 18 and the attached angle bar 26 are rocked inwardly. This inward movement of angle bar 26 causes the sleeve 29 to rock slightly inwardly in slot 30 and thereby to rock the shoe 19 into engagement with the periphery of wheel 5. While continuing to exert this axial force to retain the shoe in engagement with the wheel, the invalid can move the wheel chair backward by exerting a reverse driving force on handle 18 in a direction peripheral of the wheel 5. The backward movement of the chair can be continued by repetition of this operation. Again, spring 9 and spring 50 will return the complete driver attachment to its original normal position, and will urge shoe 19 to a disengaged position, when the driving stroke is completed.

From the above description of the construction and operation of the wheel chair driver attachment as encompassed by this invention, it is apparent that this invention is particularly useful to quadriplegics and other persons who have lost the useful of their hands or fingers and who thus cannot manipulate complicated driving devices. To use the instant invention, the invalid need only be capable of exerting a directed force on handle 18. This can be accomplished by using the shoulder or upper arm muscles to push the handle with the heel of the hand, the wrist, or even a portion of the forearm, since it is unnecessary to completely grasp the handle to operate the driver attachment. More importantly, no complicated finger or hand manipulation is necessary to reverse the operation of the driver when using the instant invention. As previously described, it is only necessary to change the direction of the applied force in order to move a wheel chair backward with this invention. Moreover, the operation of springs 9 and 50, which automatically return the driver to the original starting position after a driving stroke is completed and retain the driver in an inoperative position when the driver is not being used, allow this invention to be used by persons who do not have the ability or strength to operate the driver attachments previously proposed.

While the wheel chair driver attachment of this invention has been described with particular reference to a preferred embodiment thereof, the invention is not limited to such embodiment. In fact, many modifications may be made persons skilled in the art without departure from the scope of the invention, which is defined solely by the appended claims.

I claim:

1. A wheel chair driver attachment comprising
 - a driving arm,
 - mounting means rotatably mounting said arm on the chair adjacent a wheel of the chair so that the arm extends toward the periphery of the wheel,
 - a handle assembly pivotally connected to said arm, said assembly including handle means to which a driving force may be applied and also including a shoe positioned adjacent the periphery of the wheel and so operably connected to said handle means that the shoe engages the periphery of the wheel to drive the chair when a driving force is applied to said handle means,
 - and means urging said shoe toward a disengaged position away from the periphery of said wheel.
2. The apparatus of claim 1 including means urging said arm toward a normal position with respect to the chair.
3. A wheel chair driver attachment comprising
 - a driving arm,
 - mounting means rotatably mounting the lower end of the arm on the chair adjacent a wheel of the chair so that the arm extends upwardly in a substantially ver-

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- tical position toward the periphery of the wheel,
- a handle assembly pivotally connected to the upper end of the arm, said assembly including handle means to which a driving force may be applied and also including a shoe positioned adjacent the periphery of the wheel and so operably connected to said handle means that the shoe engages the periphery of the wheel to drive the chair when a driving force is applied to the handle means.
- first said spring means connected between the arm and chair urging the arm toward a substantially vertically-extending position, and
- second spring means connected between the arm and the handle assembly urging the shoe toward a disengaged position away from the periphery of said wheel.
- 4. The apparatus of claim 3 wherein said mounting means is secured to the main axle of the wheel chair adjacent a wheel of the chair.
- 5. A wheel chair driver attachment comprising
 - a driving arm,
 - mounting means rotatably mounting said arm on the chair adjacent a wheel of the chair so that the arm extends toward the periphery of the wheel,
 - a handle assembly pivotally connected to said arm, said assembly including handle means to which a driving force may be applied and also including a shoe positioned adjacent the periphery of the wheel, said handle assembly further including means connecting said handle means to said shoe, said connecting means being flexible in a direction substantially axial to the wheel and inflexible in the plane of the wheel so that the shoe may be caused to engage the periphery of the wheel both by a forward force rotating the handle means in the plane of the wheel and by an axial force rotating the handle against said flexible connecting means.
- 6. A wheel chair driver attachment comprising
 - a driving arm,
 - mounting means rotatably mounting the lower end of the arm on the chair adjacent a wheel of the chair so that the arm extends upwardly toward the periphery of the wheel,
 - a handle assembly pivotally connected to the upper end of the arm, said assembly including handle means to which a driving force may be applied and also including a shoe attached to said handle means adjacent the periphery of the wheel,
 - first biasing means connected between the arm and the chair urging the arm toward a normal position with respect to the chair, and
 - second biasing means connected between the arm and the handle assembly urging the shoe toward a disengaged position away from the periphery of the wheel,
 - said handle assembly further including a body portion pivotally connected to the arm, and means connecting said handle means to said shoe, said connecting means being flexible in a direction substantially axial to the wheel and inflexible in the plane of the wheel and so operably connecting said shoe to said handle means that the shoe may be caused to engage the periphery of the wheel both by a forward driving force rotating the handle means against said first biasing means to rotate the arm away from said normal position to drive the chair, and by an axial force rotating the handle means against said flexible connecting means.
- 7. The apparatus of claim 6 wherein said arm is adjustable longitudinally thereof with respect to said mounting means to permit said driver to be adaptable to wheel chairs having wheels of various diameters.
- 8. The apparatus of claim 6 wherein said pivotal connection between the handle assembly and the upper end of the arm is manually releasable to permit the removal of the assembly from the arm.
- 9. The apparatus of claim 6 wherein said body portion

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of said handle assembly comprises a generally inverted U-shaped member having a central portion extending transversely above the wheel of said chair with outer legs extending radially inwardly of the wheel along opposite portions of the outer portion thereof, and wherein said shoe is mounted within said member above the periphery of said wheel.

10. The apparatus of claim 6 in which said connecting means is a leaf spring, attached at opposite ends to said handle means and said body portion of the handle assembly.

11. The apparatus of claim 10 in which said handle assembly further includes

an L-shaped angle bar attached at the upper end of its vertically-extending leg to said handle means, a sleeve attached to the horizontally-extending leg of the angle bar and extending through a slot in the body portion of the handle assembly which slot is larger in a direction parallel to the axle of the wheel than is the sleeve, so that the handle means, angle

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bar and sleeve may be rocked with respect to said body portion of the handle assembly, said shoe being attached to the lower end of said sleeve to rock into engagement with the periphery of the wheel when an axial force is applied to the handle means.

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