Feb. 24, 1959 A. SIMON 2,874,756

INVALID'S WHEELCHAIR

Filed Aug. 5, 1955 2 Sheets-Sheet 1

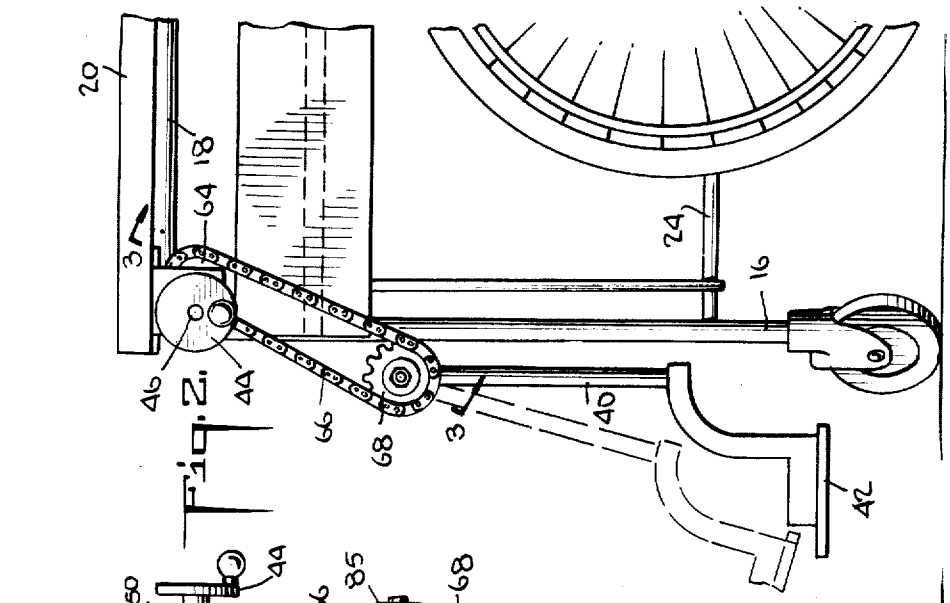


Fig. 2.

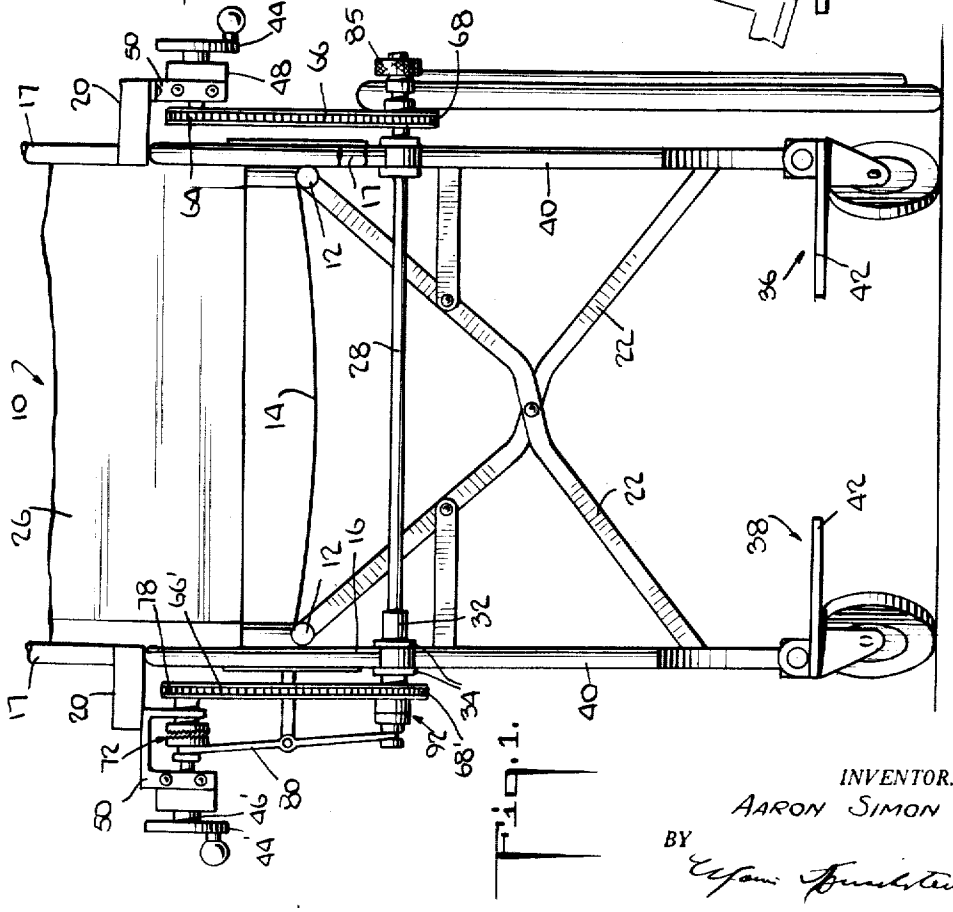


Fig. 1.

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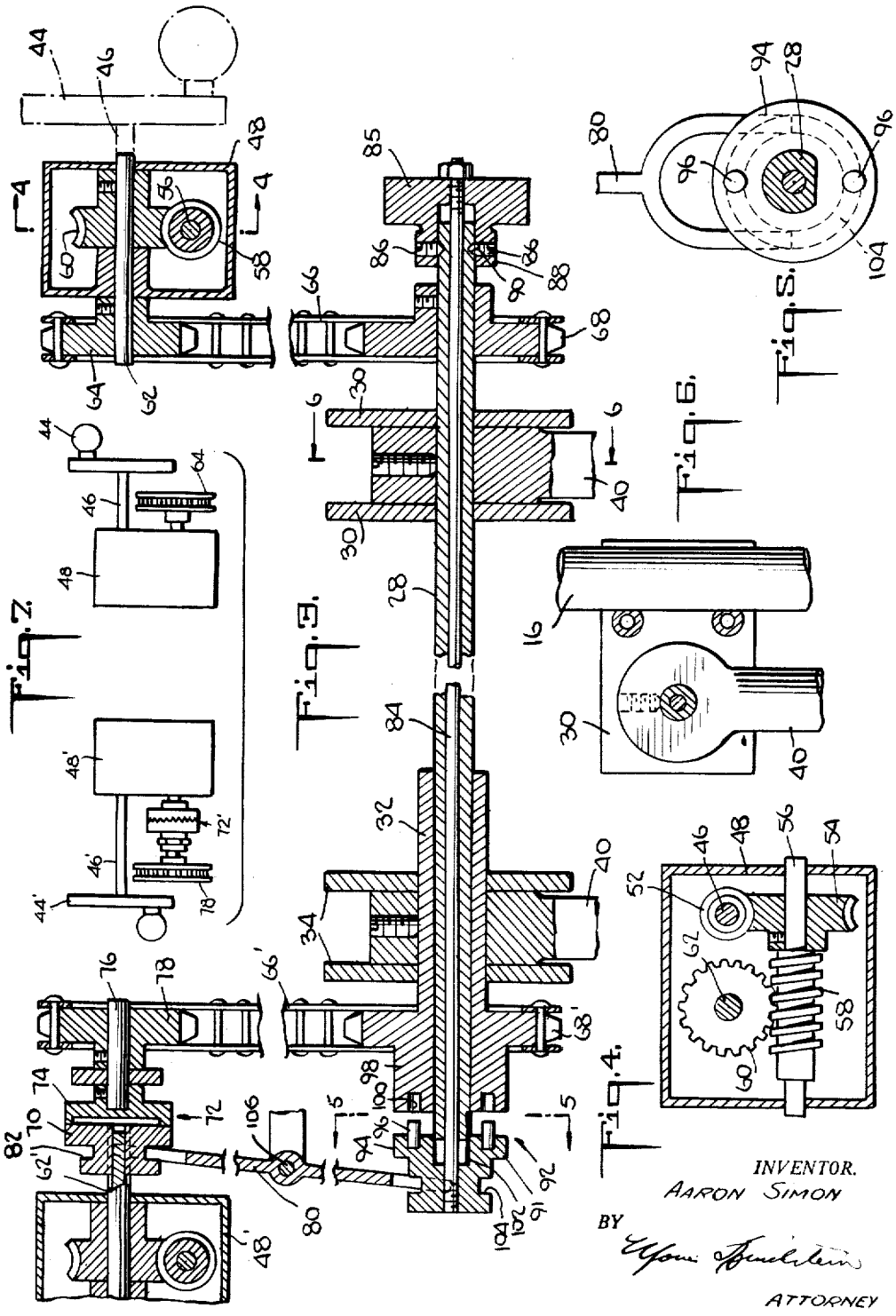


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

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INVALID'S WHEELCHAIR

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10 Claims. (Cl. 155—171)

This invention relates to an invalid's wheelchair.

The leg rests of a conventional chair of the character described are angularly adjustable about a horizontal axis slightly forward of the chair's seat to hold an invalid's legs at any desired height. However, until the present time, the mechanism employed to effect such adjustment has been so arranged that as a practical matter it has been necessary for an attendant to operate the same.

It is an object of my invention to provide an invalid's wheelchair with an adjustable foot rest whose position can be varied by an invalid seated on the chair.

It is another object of my invention to provide a chair of the character described in which the invalid can accomplish the desired adjustment readily and with very little effort.

It is another object of my invention to provide a chair of the character described which includes relatively few extra parts so that the cost of a chair with the additional feature is only slightly higher than that of a conventional chair.

It is another object of my invention to provide a chair of the character described in which the mechanism for effecting the aforesaid adjustment is rugged and foolproof in operation.

Other objects of my invention in part will be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the wheelchair hereinafter described and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention:

Fig. 1 is a front view of a wheelchair constructed in accordance with my invention, the means for detachably coupling the right and left leg-rest adjusting mechanisms being shown in engaged position.

Fig. 2 is a fragmentary side view of the wheelchair.

Fig. 3 is an enlarged fragmentary cross-sectional view taken substantially along the line 3—3 of Fig. 2 and showing in disengaged position the means for detachably coupling the right and left leg-rest adjusting mechanisms.

Figs. 4, 5 and 6 are sectional views taken substantially along the lines 4—4, 5—5 and 6—6, respectively, of Fig. 3; and Fig. 7 is a schematic view of an alternate arrangement of the components in the driving trains connecting the hand wheels and driving sprockets for raising and lowering the leg rests.

Referring now in detail to the drawings, the reference numeral 10 denotes an invalid's wheelchair which is of conventional construction except for the means adjusting the position of the leg rests. By way of example, such chair includes a pair of horizontal parallel tubular supports 12 between which a chair seat 14 is draped. The ends of the tubular supports are secured to front vertical rods 16 and rear vertical rods 17. The front

and rear rods at each side of the chair are integrally connected by a horizontal reach 18 which supports an arm rest 20. The vertical rods on the opposite sides of the chair are maintained in spaced position by cross struts 22. An auxiliary horizontal strut 24 extends from each vertical front rod 16 to the associated rear rod 17. The rear rods, as in conventional, extend above the arm rests and support a back 26.

In accordance with my invention, I provide a hollow, i. e. tubular, cross shaft 28. Said shaft is journaled at one end thereof in a pair of bearings 30 that are suitably secured to one of the front vertical rods, for example, the rod shown at the right hand side of the chair in Fig. 1.

A sleeve 32 rotatably receives the other end of the cross shaft 28. Said sleeve is journaled in a pair of bearings 34 similar to the bearings 30 but secured to the other front vertical rod. Thus, the bearings 30, 34 in cooperation with the sleeve 32 function to support the cross shaft 28 for rotation, said bearings being so disposed that the axis of rotation is horizontal and somewhat forward of and below the front edge of the seat 14.

Two conventional leg rests 36, 38 are provided, each including an arm 40 which terminates in a foot platform 42. At its upper end, one of the arms 40 is fixedly secured to the cross shaft 28 between the bearings 30. The upper end of the other arm 40 is similarly fixedly secured to the sleeve 32 between the bearings 34. It thus will be appreciated that if the cross shaft 28 is rocked, it will raise or lower the leg rest 36, the same correlation existing between the leg rest 38 and the sleeve 32.

A pair of suitable means is included for oscillating the cross shaft 28 and the sleeve 32 independently of one another, said means being so constructed and arranged as to be capable of manual manipulation by an invalid seated in the chair.

The means for oscillating the cross shaft 28 constitutes a hand wheel 44 fast on a horizontal actuating spindle 46. The spindle is located alongside and beneath the arm rest on the same side of the chair as the leg rest 36 carried by the cross shaft. Said spindle runs perpendicularly to the length of its adjacent arm rest and its outer end protrudes slightly beyond the arm rest near the front vertical rod 16. Thus an invalid in the chair is able to grasp the hand wheel easily with his hand in a convenient position for turning it.

The spindle 46 constitutes the drive shaft for a kinematic reduction transmission housed in a casing 48 that is suitably supported as by a bracket 50, from the associated arm rest. Said transmission is so constructed that it will transmit power only in a single direction, i. e. from its input end to its output end, being incapable of transmitting power in a reverse direction, whereby the transmission is self-locking. Accordingly, for convenience, the transmission will be referred to hereinafter as "anti-reversing."

More specifically, the transmission includes an input worm gear 52 fast on the drive spindle 46 in mesh with a worm wheel 54 that is secured to a jack shaft 56 suitably journaled within the casing 48. The jack shaft 56 mounts a second worm gear 58 meshing with a second worm wheel 60, the latter being fast on an output shaft 62. The worm wheels and gears are so mutually constructed and arranged that the output shaft is parallel to the input shaft of the anti-reversing reduction transmission.

Said output shaft has secured thereon a drive sprocket 64, about which a chain 66 is trained. The chain also is trained about a driven sprocket 68 which is fast on the cross shaft 28. It thus will be seen that rotation of the hand wheel 44 in either direction causes slow angular movement of the shaft 28 in a corresponding direction. Inasmuch as the kinematic drive is anti-re-

versing, the leg rest will maintain any adjusted position to which it is set.

The means for oscillating the sleeve **32** is generally similar to the means for oscillating the cross shaft. Thus, to turn the sleeve **32** I provide a hand wheel **44'** fast on a horizontal actuating spindle **46'**. The spindle **46'** is located on the side of the chair opposite from the spindle **46** and preferably is in substantial registration therewith.

Said spindle constitutes the drive shaft for a kinematic reduction transmission housed in a casing **48'** and identical with the transmission driven by the spindle **46**. The output shaft **62'** is secured to a driving element **70** of a toothed coupling clutch **72**, the driven element **74** of which is mounted on a shaft **76** carrying a drive sprocket **78** which corresponds to the sprocket **64** on the opposite side of the wheel chair. The driving element **70** is translatable without rotation on its shaft **62'**, as by splining, and is moved by a shift lever **80**, the operation of which will be described in detail hereinafter. It will suffice at this time to note that the upper end of the shift lever is formed in the shape of a yoke which is located in a groove **82** formed in a collar carried by the driving element **70** whereby rocking movement of the shift lever will engage or disengage the two clutch elements.

It also is desired to point out that the driving and driven elements of the clutch **72** have a large number of facing matched teeth and valleys so that the two elements can engage or disengage in a large number of relative angular positions.

A chain **66'** trained about the sprocket **78** engages a driven sprocket **68'** which is fast on the sleeve **32**. The kinematic drive for the sleeve **32** from the hand wheel **44'** to the driven sprocket **68'** is located at the left side of the chair shown in Fig. 1, adjacent the leg rest **38** controlled thereby, that is to say, on the side of the chair opposite from that on which the hand wheel **44** and its kinematic drive are disposed.

Means is included to enable an invalid to raise or lower both leg rests by manipulation of a single hand wheel. Said means essentially constitutes a clutch for coupling or uncoupling the cross shaft **28** and sleeve **32** whereby to enable them to be selectively jointly or individually rotated according to the desire of the user. The clutch includes a control rod **84** axially slidable within the hollow cross shaft **28** and extending from end to end thereof. The rod projects from both ends of the shaft.

One projecting end of the rod, e. g., the end at the side of the chair on which the hand wheel **44** is located, is threaded to receive an internally threaded manipulating handle **85**. For convenience of operation, the periphery of the handle is knurled. A pair of screws **86** are carried in a collar **88** integral with the handle. The tips of said screws ride in an annular groove **90** in the rod whereby the handle is free to turn but not to translate with respect to the cross shaft. Accordingly, when the handle is turned, it will shift the rod **84** in one direction or another depending upon the direction of rotation of the handle.

The other projecting end of the rod securely carries a driving member **91** of a second clutch **92**. For example, the member **91** may, as shown, constitute a plate **94** from which a pair of pins **96** project inwardly parallel to the rod **84**. The driven member of the clutch **92** constitutes a sleeve **98** integral with the driven sprocket **68'**. Said sleeve includes a pair of openings **100** adapted to be registered with the pins **96**. When the pins are received in said openings, the clutch is engaged. When the pins are withdrawn from said openings, the clutch is idle.

The driving member **91** is mounted to turn with the cross shaft **28** but to be axially translatable with respect thereto. To this end said member is formed with a bore **102** of non-circular cross section and the adjacent end of the shaft is shaped to match (see Fig. 5).

It will be apparent that when the pins **96** are located in the openings **100** rotation of the hand wheel **44** will turn both sprockets **68**, **68'**.

Inasmuch as the kinematic trains connecting the two manipulating means (the hand wheels **44**, **44'**) to their associated leg rests **36**, **38** include anti-reversing transmissions, it is necessary when the two leg rests are coupled for joint rotation by engagement of the clutch **92** to disengage one or the other of the anti-reversing transmissions, since otherwise neither manipulating means could be operated. It is for this reason that the clutch **72** is provided.

It is necessary for said clutch **72** to be operated concurrently with the clutch **92**, that is to say, when the two leg rests are to be manipulated simultaneously the clutch **72** should be disengaged and the clutch **92** engaged, and when the two leg rests are to be manipulated independently the clutch **92** should be disengaged and the clutch **72** engaged. To accomplish this operation automatically, I utilize the shift lever **80**, whose upper end, as mentioned heretofore, is in engagement with the annular groove **82** on the driven clutch element **74**. The lower end of the shift lever likewise is formed in the shape of a yoke which is received in an annular groove **104** in the driving member **91** of the clutch **92**. The shift lever is pivotally mounted as on a shaft **106** intermediate the ends of the lever.

It now will be seen that as the driving member **91** moves outwardly toward idle position upon operation of the manipulating handle **85**, the lever **80** will shift the clutch element **70** into engagement with the clutch element **74**.

Although in the two extreme positions of the control rod **84** either one or the other of the clutches is engaged and the other one is disengaged, there is an overlap in the operation of the clutches so that at the mid-point of the shifting cycle both clutches are engaged. I thus ensure that at no time is either of the leg rests left unconnected to a driving mechanism including an anti-reversing transmission and therefore under no conditions will a leg rest inadvertently be allowed to drop.

It may be noted that since only two coupling pins **96** are employed, said pins and the openings **100** are in register in but two positions for one complete relative rotation of the cross shaft and sleeve. Actually, they are in registration only once inasmuch as the arm **40** experiences a maximum movement of about 90° in the operation of the chair. Accordingly, when it is desired to couple the two leg rests for joint movement, it is simpler to lower the leg rest directly coupled to the hand wheel **44** to its extreme bottom position and to also independently lower the leg rest coupled to the hand wheel **44'** to its extreme bottom position. In the two extreme bottom positions of the leg rests, the pins **96** will be in exact registration with the openings **100**. It will be understood, of course, that this suggested procedure does not preclude the possibility of coupling the two parts of the clutch **92** in any position of the leg rests if the operator's dexterity is sufficiently great.

In the form of the invention just described I have shown the drive sprockets **64**, **78** located adjacent the frame of the chair and inwardly of the reduction transmissions **48**, **48'**. It is to be observed however that it also is within the scope of my invention to locate the drive sprockets outwardly of said transmissions, such arrangement being illustrated schematically in Fig. 7 where all parts are identified by the same reference numerals as in the first form of my invention.

It thus will be seen that there is provided a device which achieves all the objects of my invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be

made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an invalid's wheel chair, a pair of leg rests, means separately mounting said leg rests for oscillation about a single horizontal axis, a first manually manipulatable means including an anti-reversing transmisison for permitting an invalid in the chair to oscillate one of said leg rests independently of the other, a second manually manipulatable means including an anti-reversing transmission for permitting the invalid to oscillate the other leg rest independently of the first, manually manipulatable means for disengagably coupling said leg rests for joint oscillation, and means for disengaging one of said first or second manually manipulatable means when the last named manually manipulatable means couples the leg rests.

2. In an invalid's wheel chair, a pair of leg rests, means separately mounting said leg rests for oscillation about a single horizontal axis, a first manually manipulatable means in cluding a worm drive for permitting an invalid in the chair to oscillate one of said leg rests independently of the other, a second manually manipulatable means including a worm drive for permitting the invalid to oscillate the other leg rest independently of the first, manually manipulatable means for disengagably coupling said leg rests for joint oscillation, and means for disengaging one of said first or second manually manipulatable means when the last named manually manipulatable means couples the leg rests.

3. In an invalid's wheel chair, a pair of leg rests, means separately mounting said leg rests for oscillation about a single horizontal axis, a first manually manipulatable means including an anti-reversing transmission for permitting an invalid in the chair to oscillate one of said leg resets independently of the other, a second manually manipulatable means including an anti-reversing transmission for permitting the invalid to oscillate the other leg rest independently of the first, manually manipulatable means for disengagably coupling said leg rests for joint oscillation, and means for concurrently disengaging one of said first or second manually manipulatable means when the last named manually manipulatable means couples the leg rests.

4. A combination as set forth in claim 3 wherein each of the first and second manually manipulatable means includes a handle and means mounting said handle for rotation about an axis.

5. A combination as set forth in claim 4 wherein the axis of rotation of each handle is horizontal.

6. In an invalid's wheel chair, a first elongated member, a second elongated member coaxial with said first member and rotatable with respect thereto, means mounting both said members for rotation about a common horizontal axis, a pair of leg rests, means securing a first leg rest to one of said members and a second leg rest to the other of said members, means for selectively coupling said members, a first handle on one side of said chair, a second handle on the other side of said chair, a kinematic train interconnecting one of said handles and one of said members, a second kinematic train interconnecting the second handle and the second member, an anti-reversing transmission in each kinematic train, and means for selectively disengaging one of the kinematic trains.

7. A combination as set forth in claim 6 wherein the means for selectively disengaging one of the kinematic trains is interconnected with the means for selectively coupling the members whereby said one train is disengaged from its handle when the members are coupled.

8. A combination as set forth in claim 7 wherein one of the members is hollow and telescopically receives therein a portion only of the other member.

9. A combination as set forth in claim 8 wherein the means for selectively coupling the members includes an element mounted for axial movement with one of said members and means on the other member for engaging said element.

10. In an invalid's wheel chair having a seat and a pair of arm rests, a hollow shaft, a sleeve in which one end of said shaft is rotatably received, means jointly supporting said sleeve and shaft for rotation about a horizontal axis forward of and below the seat, a first leg rest secured to the shaft, a second leg rest secured to the sleeve, a first handle adjacent one arm rest, a second handle adjacent the other arm rest, a kinematic train interconnecting the first handle with the hollow shaft, a kinematic train connecting the second handle with the sleeve, the first kinematic train including a first worm gear rotated by the first handle, a first worm wheel turned by the first worm gear, a first drive sprocket turned by the first worm wheel, a first driven sprocket fixed to the shaft and a first chain trained about the first drive sprocket and the first driven sprocket, the second kinematic train including a second worm gear rotated by the second handle, a second worm wheel turned by the second worm gear, a clutch turned by the second worm wheel, a second drive sprocket turned by the clutch, a second driven sprocket mounted on the sleeve, a second chain drawn about the second drive sprocket and the second driven sprocket, a control rod slidable in said hollow shaft, one end of said rod being threaded and receiving a threaded handle, means mounting said knob for rotation on the shaft and preventing axial movement of said rod relative to said shaft whereby when the knob is turned the rod will be axially shifted in the shaft, a clutch driving element mounted on the rod, means preventing relative rotation of the driving element and shaft, a clutch driven element mounted on the sleeve, said elements engaging and disengaging upon movement of the rod, and means kinematically connecting the two clutches for engaging one of said clutches when the other is disengaged or vice versa.

References Cited in the file of this patent

UNITED STATES PATENTS

830,261	Sterling	Sept. 4, 1906
946,842	Haas	Jan. 18, 1910
2,322,683	Costa	June 22, 1943
2,514,655	Luketa	July 11, 1950
2,522,759	Sindquist	Sept. 19, 1950
2,687,765	Hurtubise	Aug. 31, 1954
2,690,788	Ames	Oct. 5, 1954
2,793,682	Duke	May 28, 1957