

**Jan. 13, 1959**

**J. PICKLES**

**2,868,271**

## POSITIONING DEVICE

Filed Dec. 23, 1954

3 Sheets-Sheet 1

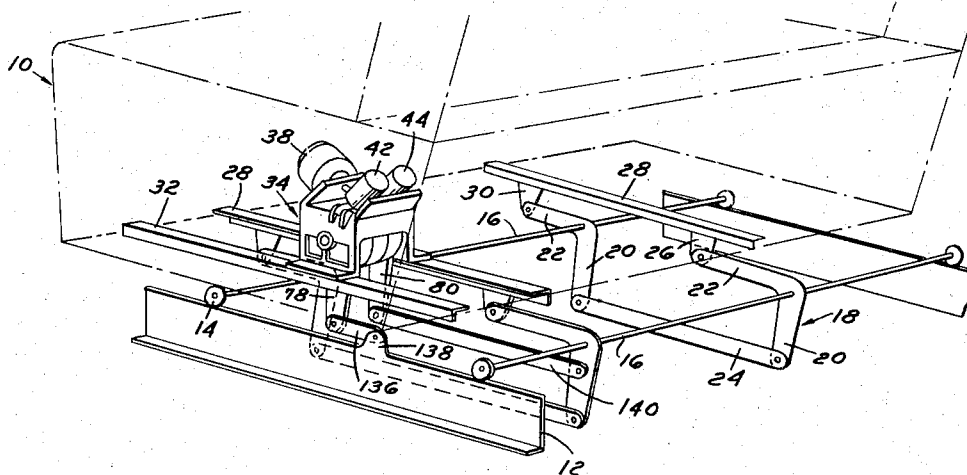
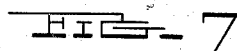
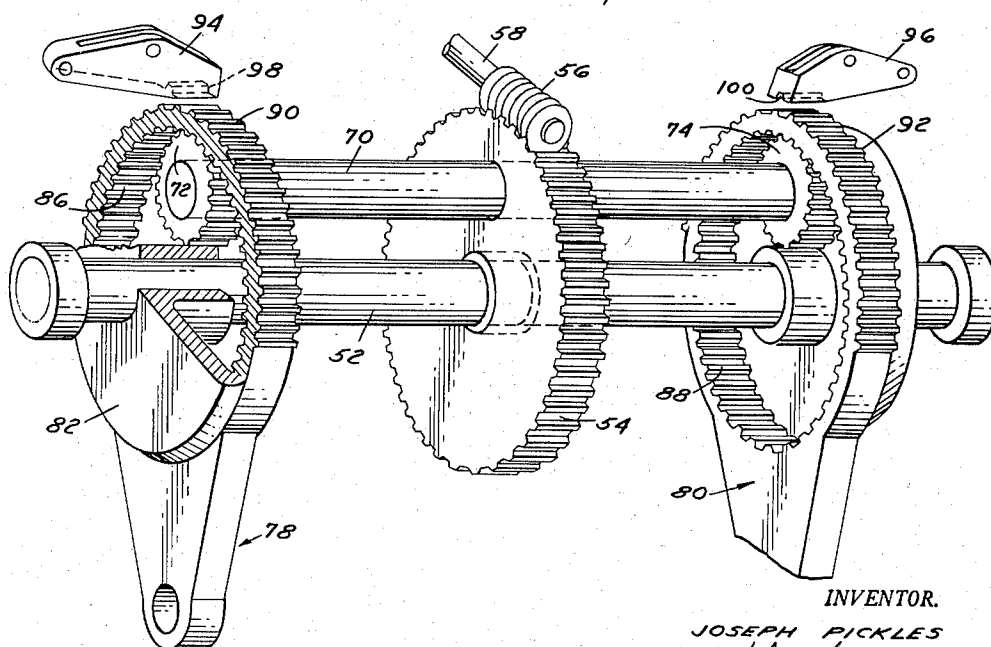


FIG. 1



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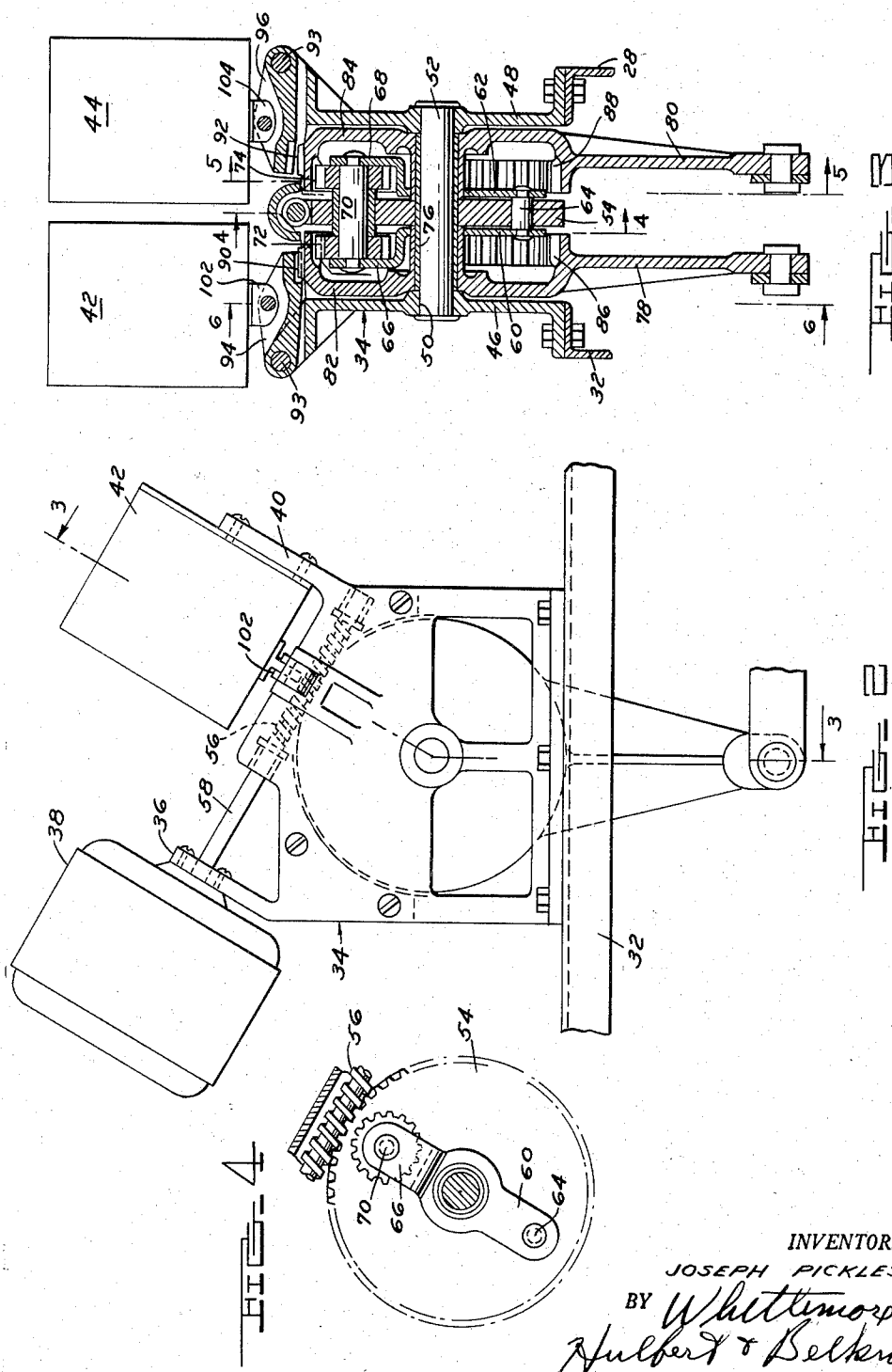
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3 Sheets-Sheet 2



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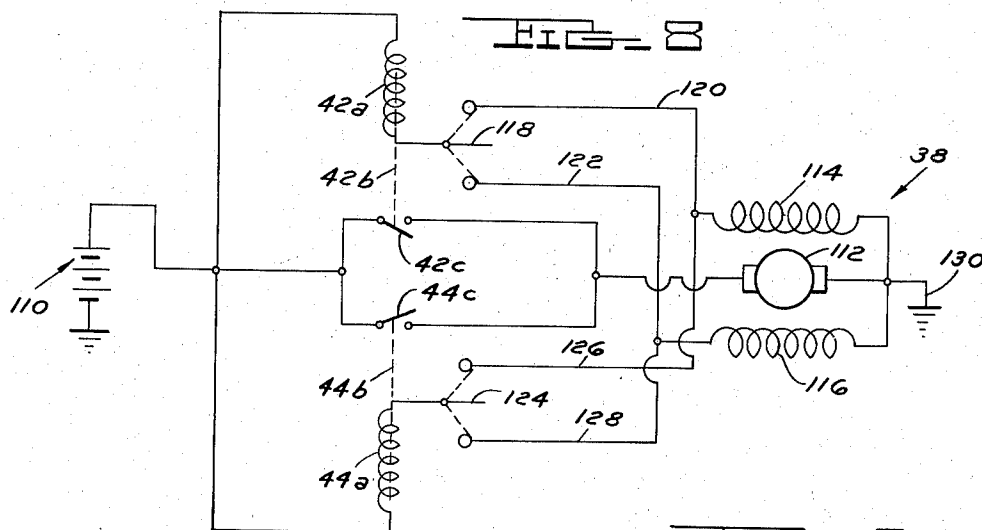
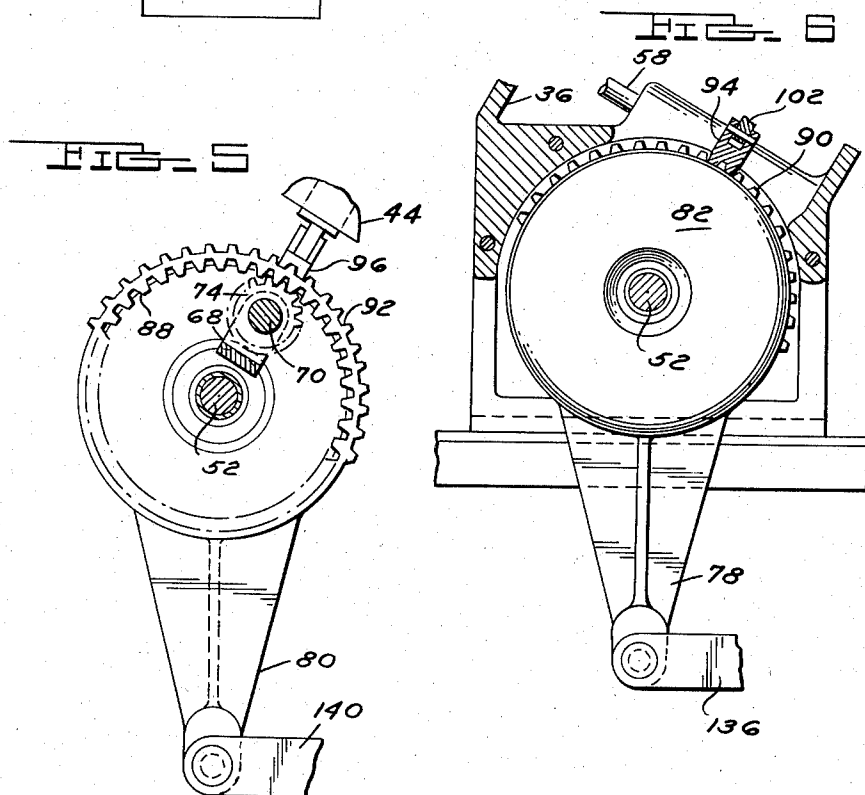
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3 Sheets-Sheet 3



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2,868,271

## POSITIONING DEVICE

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14 Claims. (Cl. 155—14)

The present invention relates to a positioning device.

It is an object of the present invention to provide a positioning device including a single motor and means to provide for moving an adjustable member to a plurality of different positions.

The invention has been illustrated in conjunction with a seat adjusting mechanism and it is accordingly an object of the present invention to provide single motor means for effecting adjustment of a seat into not less than four different positions.

More specifically, it is an object of the present invention to provide means including a single motor and adjusting mechanism for effecting both fore and aft and vertical adjustment of a vehicle seat.

It is a feature of the present invention to provide a motor, a pair of levers for selective actuation by the motor, means for controlling the operation of the motor for forward and reverse rotation, and means operable in conjunction with the motor control means for selectively controlling actuation of the levers by the motor.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a phantom perspective view illustrating the application of the present invention to seat adjusting mechanism.

Figure 2 is an enlarged elevational view of the motor and seat control mechanism.

Figure 3 is a sectional view on the line 3—3, Figure 2.

Fig. 4 is a fragmentary sectional view on the line 4—4, Figure 3.

Figure 5 is a fragmentary sectional view on the line 5—5, Figure 3.

Figure 6 is a fragmentary sectional view on the line 6—6, Figure 3.

Figure 7 is an enlarged schematic perspective view illustrating the principle of operation of the drive means of the present invention.

Figure 8 is a wiring diagram of the present invention.

Referring now to Figure 1 the present invention is illustrated as applied to a vehicle seat, a portion of the seat being indicated in dot and dash lines at 10. In accordance with modern practice it is desirable to effect both fore and aft adjustment of the seat as well as vertical adjustment thereof. In order to accomplish this in a simple and yet effective manner, fixed rails or tracks 12 are mounted on the floor of the vehicle. Mounted on the rails 12 for fore and aft rolling movement thereon is a slide or carriage including wheels indicated at 14 connected by cross shafts 16. Connected to the cross shafts 16 are a plurality of bell crank levers 18 each of which has a depending arm 20 and a horizontally and generally forwardly extending arm 22. The arms 20 of the pairs of bell cranks are interconnected by rigid links 24. The forwardly extending arms 22 of the rear bell crank levers 18 are pivotally connected to ears 26 depending from bars 28 to which the seat construction 10 is

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rigidly connected. Adjacent the forward end of the bars 28 are provided depending ears 30 which are pivotally connected to the forwardly extending arms 22 of the front bell crank levers 18. It will be apparent that the cross shafts 16 together with the bell cranks 18 and bars 28 provide a composite structure which may roll longitudinally of the rails 12. In addition, the bars 28 and accordingly the seat construction 10, may move substantially vertically with respect to the cross shafts 16 as the bell cranks 18 rock about the axes of the shafts 16.

The seat construction is provided with another longitudinally extending bar 32 which in conjunction with the bar 28 at one side of the seat construction serves as mounting means for the power mechanism which constitutes the present invention. The bars 28 and 32 may be regarded as constituting a frame for supporting the seat construction 10.

Referring now to Figures 1—6 the construction comprises a frame 34 which as best seen in Figures 2 and 3 includes an inclined flange 36 for mounting an electric motor 38 and which includes inclined flanges 40 for mounting solenoids 42 and 44. The frame 34 includes a pair of side plates 46 and 48 having aligned openings 50 therethrough for the reception of a cross shaft 52. Mounted for rotation on the cross shaft 52 is a worm gear 54 which is in meshing engagement with a worm 56 connected to the drive shaft 58 of the motor 38. The worm gear 54 has rigidly connected thereto a pair of mounting plates 60 and 62, these plates being pinned together through one or more openings in the worm gear 54 by a corresponding number of pins 64. Adjacent one side of the worm gear 54 the plates 60 and 62 are formed outwardly to provide mounting ears 66 and 68. Suitably journaled in aligned openings in the ears 66 and 68 is a shaft 70 which extends through an opening in the worm gear 54 and which at its opposite ends has rigidly fixed thereto pinions 72 and 74.

Journaled on a bearing 76 on the shaft 52 are drive arms 78 and 80 which include dished portions 82 and 84 respectively provided with internal gear teeth 86 and 88.

The operating mechanism thus far described is illustrated more or less diagrammatically in the perspective view of Figure 7 where the parts are given the same reference numerals.

The exterior of the dished portions 82 and 84 of the arms are provided with external teeth or serrations as indicated respectively at 90 and 92.

Pivoted to the plates 46 and 48 as indicated at 93, are locking members 94 and 96 each of which has tooth portions 98 and 100 engageable with the tooth portions 90 and 92 respectively. Solenoids 42 and 44 include plungers 102 and 104 pivotally connected to an intermediate portion of locking members 94 and 96 respectively. Spring means are provided so that when the solenoids 42 and 44 are de-energized, locking members 94 and 96 are in locked position in engagement with the external teeth 90 and 92 of the operating arms 78 and 80. By a special circuit arrangement later to be described, means are provided for insuring that when the motor 38 is operated in either direction, one or the other of the arms 78 or 80 will be locked by its associated locking member in fixed position while the other operating arm is free to be turned by the mechanism.

Specifically, the arrangement for effecting selective movement of the arms 78 and 80 in either forward or reverse direction is dependent upon the fact that the pinions 72 and 74 have a different number of teeth. In a specific example of the present invention the operating arms 78 and 80 are each provided with 60 teeth. The pinion 72 is provided with 15 teeth and the pinion 74 is provided with 16 teeth. With this arrangement it will

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be apparent that rotation of the worm gear 54 will be effected to produce forward or reverse movement of the operating arms 78 and 80 in accordance with the direction of rotation of the motor and in accordance with which of the operating arms is maintained in locked position. Assume for example that the arm 78 is locked against rotation by downward movement of the locking member 94. Rotation of the worm 56 in a direction to produce clockwise rotation of the worm gear 54 will cause the pinion 72 to roll around in an orbital path while its teeth remain in engagement with the internal teeth 86 of the arm 78. This will produce counter-clockwise rotation of the pinion 72 and hence to the shaft 70 and pinion 74. If the pinion 74 had the same number of teeth as the pinion 72 the arm 80 would remain stationary even though not in engagement with its locking member 96. Since however, the teeth of the pinion 74 are assumed to be 16 in number, it will be apparent that by the time the shaft 70 has made one revolution about the axis of the shaft 52, the operating arm 80 will have been caused to move through an angular arc equivalent to the circumferential spacing of four of its internal teeth. Accordingly, the mechanism provides for a very great speed reduction and thus a small motor of low horsepower will be effective to produce the swinging movement of the arms 78 and 80.

Referring now to Figure 8, there is illustrated the circuit for insuring proper correlation between the parts of the adjusting mechanism. As seen in this figure the power source is illustrated as a grounded battery 110. The windings of the solenoids 42 and 44 are indicated at 42a and 44a respectively. Associated with the movable plungers of the two solenoids are connecting elements 42b and 44b which connect to movable switch elements 42c and 44c respectively. The switches 42c and 44c are in parallel and closure of either completes a circuit from the battery through the armature 112 of the motor 38.

The motor 38 is a split field direct current motor, the two fields being indicated at 114 and 116. Connected in series with the winding 42a of the solenoid 42 is a single pole double throw switch 118 adapted to complete a circuit selectively to a line 120 which connects to the field winding 114 or a line 122 which connects to the field winding 116. In like manner the solenoid winding 44a is connected in series with a single pole double throw switch 124 adapted to complete a circuit selectively to a line 126 which connects to the field winding 114 or a line 128 which connects to the field winding 116. The armature 112 and the field windings 114, 116 are all grounded as indicated at 130.

It will be recalled that the solenoids 42 and 44 are constructed and arranged so that when their windings are not energized, the locking members 94 and 96 respectively are in locking engagement with the operating arms 78 and 80 respectively. If the switch 18 is moved to complete the circuit to the line 120, the field winding 114 of the motor is energized. At the same time, energization of the solenoid winding 42a closes switch 42c thus completing a circuit to the armature 112. Energization of the solenoid 42 also releases the locking member 94 and permits movement of the operating arm 78. At this time locking member 96 remains in locking engagement with the teeth on the operating arm 80. The ensuing operation of the motor 38 results in rotating the worm gear 54 and causing the shaft 70 with its pinions 72 and 74 to revolve about the axis of the shaft 52. Since the arm 80 is locked against rotation, revolving movement of the shaft 70 results in rotation of the pinion 74 and hence of the pinion 72. Inasmuch as the ratio between the number of teeth of the pinion 74 and the number of internal teeth of the operating arm 80 is different from the ratio between the number of teeth of the pinion 72 and the number of internal teeth 86 of the operating arm 78, the operating arm 78 is caused to swing about the axis of the shaft 52 and the direction of swing-

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ing movement depends upon the direction of rotation of the motor 38, which in turn is determined by which of the two fields 114 and 116 is energized.

It will be apparent that movement of switch 118 to complete a circuit to the line 122 reverses the motor 38 with respect to the rotation resulting from completion of the circuit through the line 120. The operation under the control of the switch 124 is exactly similar. Accordingly, the two switches 118 and 124, each of which is a two-position switch, permits selective control of the swinging movement of the arms 78 and 80 in both directions.

Referring again to Figure 1, it will be recalled that the frame 34 which mounts the motor and actuating mechanism is rigidly supported on bars 28 and 32 which in turn are a rigid part of the seat frame construction. The operating arm 78 is connected by a link 136 to an ear 138 carried by one of the tracks 12. Accordingly, as the motor 38 and solenoid 42 are energized, operating arm 78 is caused to swing either forwardly or rearwardly. Due to the connection between its free end and the stationary track 12, this swinging movement of the arm 78 causes fore and aft movement of the seat frame construction as selected by the operator. This fore and aft movement of the seat frame construction is accomplished without disturbing the mechanism for effecting vertical adjustment of the seat frame construction.

The operating arm 80 is connected by a link 140 to one of the bell cranks 18. Inasmuch as the bell cranks 18 are arranged in pairs interconnected by the tie links 24, oscillation of one of the links results in oscillation of all of the links and accordingly results in vertical movement of the seat frame construction. If desired to increase the rigidity of the seat lifting mechanism, one or both of the pairs of links disposed transversely of the vehicle could be directly interconnected.

It is recognized that vertical movement of the seat frame construction results in vertical movement of the operating arm 78 which requires a corresponding rocking movement of the link 136 and accordingly effects a minor and incidental longitudinal adjustment of the seat frame construction as it is adjusted vertically. This of course does not prevent a re-adjustment of the seat in a horizontal plane is required.

In use the operator closes the appropriate switch and holds it in closed position until the required adjustment has been completed. In the event that the adjustment is permitted to continue to a limit of motion, the motor stalls, at which time the operator opens the switch.

While the present invention has been illustrated and described in conjunction with an automobile seat adjustable fore and aft and vertically, and while this is a very useful application of the present invention, it is to be understood that the present invention is not limited to this particular use, but is intended for general application wherever simple control means for effecting power adjustment in a multiplicity of positions is required.

The drawings and the foregoing specification constitute a description of the improved positioning device in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. Power means for a multi-direction seat adjusting mechanism comprising fixed tracks, a slide mounted on said tracks for horizontal front-to-rear movement, seat-support arms pivoted to said slide for generally up and down swinging movement in vertical planes, means interconnecting said seat-support arms, a frame connecting said seat-support arms to a seat construction for raising and lowering the same, said power means comprising a single power device adapted to be carried by said frame and selectively operable to move said slide horizontally on said tracks and to operate said seat-support arms to raise and lower the frame relative to said slide, said

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power device comprising a reversible motor, a pair of operating arms, means adapted to connect one of said operating arms to said track, means adapted to connect the other of said operating arms to one of said seat supporting arms, and drive means selectively connecting said motor to said operating arms.

2. Mechanism as defined in claim 1 in which said drive means comprises a pair of drive pinions, means connecting said pinions for simultaneous rotation, motor-driven means for revolving said pinions about a fixed axis, said operating arms being mounted for rotation about said fixed axis and each having a gear concentric with said fixed axis and in mesh with said pinions, the ratio between the number of teeth on each pinion and the number of teeth on the gear in mesh therewith being different, and seat control means for mechanically blocking either of said operating arms to cause swinging of the other upon operation of said motor.

3. Mechanism as defined in claim 1 in which said drive means comprises a pair of drive pinions, means connecting said pinions for simultaneous rotation, motor-driven means for revolving said pinions about a fixed axis, said operating arms being mounted for rotation about said fixed axis and each having an internal gear concentric with said fixed axis and in mesh with said pinions, the ratio between the number of teeth on each pinion and the number of teeth on the gear in mesh therewith being different, and seat control means for mechanically blocking either of said operating arms to cause swinging of the other upon operation of said motor.

4. Mechanism as defined in claim 2 in which said control means comprises solenoid operated means for each of said arms and connected into the circuit of said motor to insure operation of one of said solenoid operated means upon energization of said motor.

5. Actuating mechanism for a pair of independently movable members comprising a pair of operating arms, means adapted to connect each of said arms to one of said members for effecting different adjusting movements thereof, a reversible motor, a worm driven by said motor, a worm gear connected to said worm, a shaft extending from said worm gear, a pair of pinions on said shaft coupled together for rotation in unison, a pair of gears in mesh with said pinions and rotatable about the axis of said worm gear, the ratio between the number of teeth of each pinion and its associated gear being different, means connecting said operating arms to said gears for actuation thereby, and selectively operable means for preventing rotation of either of said gears whereby rotation of said worm gear by said motor will drive the other one of said gears.

6. Actuating mechanism for a pair of independently movable members comprising a pair of operating arms, means adapted to connect each of said arms to one of said members for effecting different adjusting movements thereof, a reversible motor, a worm driven by said motor, a worm gear connected to said worm, a shaft extending from said worm gear, a pair of pinions coupled together by said shaft for rotation in unison, a pair of internal gears in mesh with said pinions and rotatable about the axis of said worm gear, the ratio between the number of teeth of each pinion and its associated gear being different, means connecting said operating arms to said internal gears for actuation thereby, and selectively operable means for preventing rotation of either of said internal gears whereby rotation of said worm gear by said motor will drive the other one of said internal gears.

7. Actuating mechanism for a pair of independently movable members comprising a pair of operating arms, means adapted to connect each of said arms to one of said members for effecting different adjusting movements thereof, a reversible motor, a worm driven by said motor, a worm gear connected to said worm, a shaft extending from said worm gear, a pair of pinions laterally spaced

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at opposite sides of said worm gear coupled together by said shaft for rotation in unison, a pair of gears in mesh with said pinions and rotatable about the axis of said worm gear, the ratio between the number of teeth of each pinion and its associated gear being different, means connecting said operating arms to said gears for actuation thereby, and selectively operable means for preventing rotation of either of said gears whereby rotation of said worm gear by said motor will drive the other one of said gears.

8. Actuating mechanism for a pair of independently movable members comprising a pair of operating arms, means adapted to connect each of said arms to one of said members for effecting different adjusting movements thereof, a reversible motor, a worm driven by said motor, a worm gear connected to said worm, a shaft extending from said worm gear, a pair of pinions laterally spaced at opposite sides of said worm gear coupled together by said shaft for rotation in unison, a pair of internal gears in mesh with said pinions and rotatable about the axis of said worm gear, the ratio between the number of teeth of each pinion and its associated gear being different, means connecting said operating arms to said internal gears for actuation thereby, and selectively operable means for preventing rotation of either of said internal gears whereby rotation of said worm gear by said motor will drive the other one of said internal gears.

9. Actuating mechanism for a pair of independently movable members comprising a pair of operating arms, means adapted to connect each of said arms to one of said members for effecting different adjusting movements thereof, a reversible motor, a worm driven by said motor, a worm gear connected to said worm, a shaft extending from said worm gear, a pair of pinions coupled together by said shaft for rotation in unison, a pair of internal gears in mesh with said pinions and rotatable about the axis of said worm gear, the ratio between the number of teeth of each pinion and its associated gear being different, means connecting said operating arms to said internal gears for actuation thereby, said internal gears having external toothed portions, and selectively operable locking means engageable with the toothed portions of said internal gears for controlling rotation thereof.

10. Actuating mechanism for a pair of independently movable members comprising a reversible motor, drive means including planetary gearing adapted to connect said motor to both the said members operable to actuate either of said members while the other is locked against actuation, lock means for each of said members, and means automatically operable to effect actuation of one of said lock means upon energization of said motor.

11. Actuating mechanism comprising a reversible motor, a pair of independently adjustable devices, drive means connecting said motor to both of said devices including planetary gearing operable to actuate either of said devices while the other is locked against actuation, lock means normally locking both of said devices against actuation, and means automatically operable to unlock one of said devices upon energization of said motor.

12. Mechanism as defined in claim 11 in which said motor is a reversible electric motor and said lock means comprises a solenoid operatively associated with each of said devices.

13. Power adjusting mechanism comprising a pair of independently movable adjusting devices each of which includes a gear, means mounting said gears in laterally spaced coaxial relationship, a worm gear disposed between said gears coaxially therewith, a shaft carried by said worm gear eccentrically thereof, pinions on said shaft respectively in mesh with said gears, motor means including a worm for driving said worm gear, normally engaged lock means for each of said gears, means for energizing said motor means and means operated upon energization of said motor for actuating one of said lock means to unlocked position.

14. Power adjusting mechanism comprising a pair of independently movable adjusting devices each of which includes a gear, means mounting said gears in laterally spaced coaxial relationship, a worm gear disposed between said gears coaxially therewith, a shaft carried by said worm gear eccentrically thereof, pinions on said shaft respectively in mesh with said gears, motor means including a worm for driving said worm gear, normally engaged lock means for each of said gears, means for energizing said motor means and actuating one of said lock means to unlocked position, said motor means including a reversible electric motor, said lock means comprising a pair of solenoids, and connections between said solenoids and motor to insure energization of one or the other of said solenoids upon energization of said motor.

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