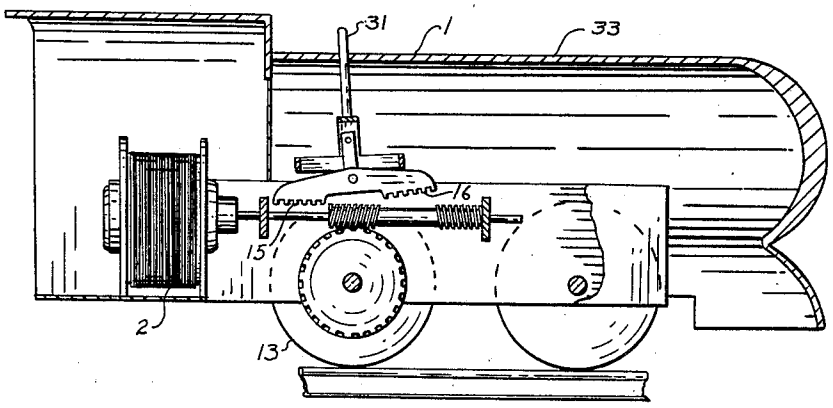
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AUTOMATIC GEAR CONTROL MECHANISM

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Fig. 1



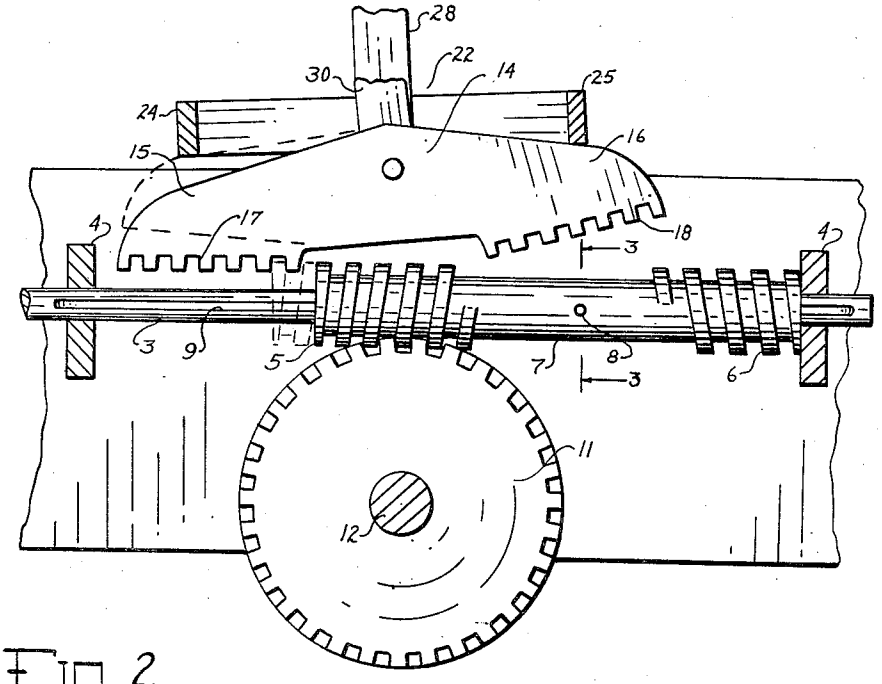


Fig. 2

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AUTOMATIC GEAR CONTROL MECHANISM

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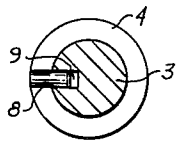


Fig. 3

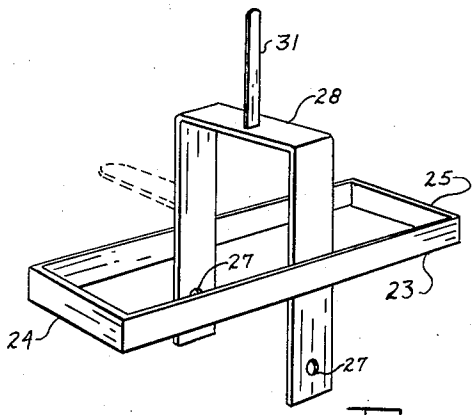


Fig. 4

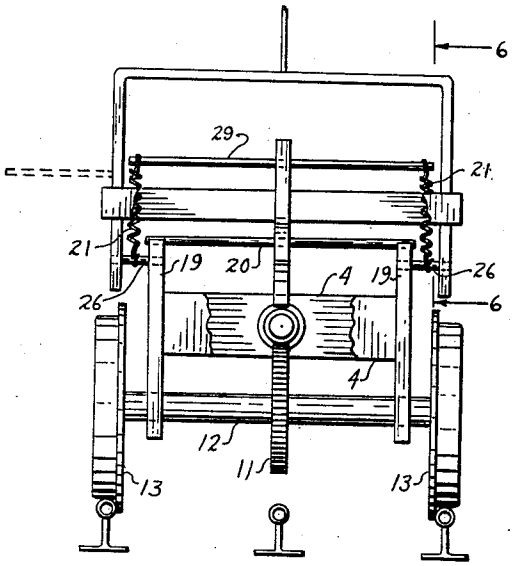


Fig. 5

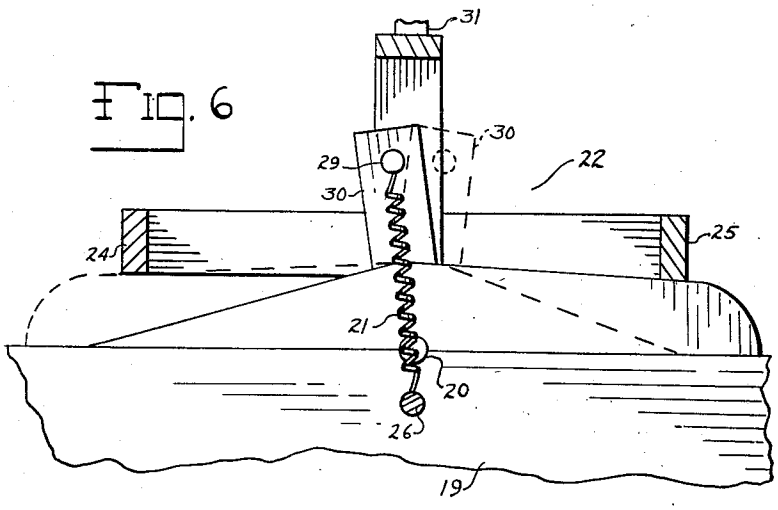
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AUTOMATIC GEAR CONTROL MECHANISM

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FIG. 6



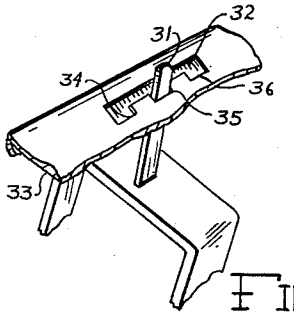


FIG. 7

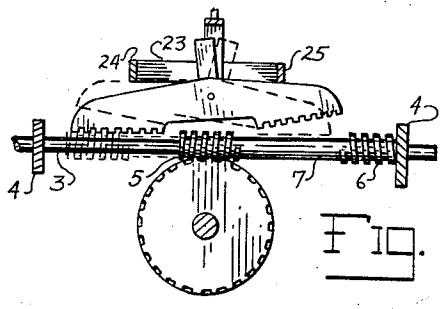


FIG. 8

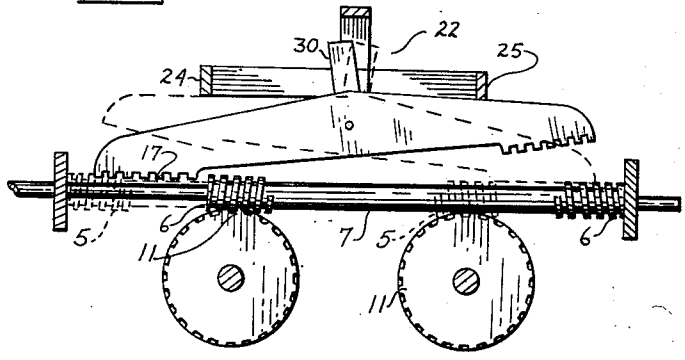


FIG. 9

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AUTOMATIC GEAR CONTROL MECHANISM

Millard L. Johnson, Larchmont, Pa.

Application October 23, 1946, Serial No. 705,098

9 Claims. (Cl. 105—119)

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The present invention relates to an automatic gear control mechanism for the operation of toy electric trains, more particularly to such trains employing a worm drive for the locomotive.

The principal object of the invention is the provision of a simplified gear system under the control of a selector device adapted to be set manually and designed to pre-select the direction in which the toy electric locomotive may be made to travel when the power is turned on.

Another object is the provision of a control mechanism for a gear system embodying a worm drive for the locomotive, which gear system functions automatically to disconnect the motive power from the drive wheels upon interruption of the electric current used to energize the motor, whereby the locomotive may coast freely when the motor is shut off.

Another object of the invention is the provision of simplified means for determining the direction the locomotive shall travel, upon the application of motive power thereto, said means being free of switch relays, multi-switch contacts, or the like, which are generally required to reverse the direction of travel of the locomotive.

A further object is the provision of a power system which permits the electric motor of the locomotive to run in one direction only, irrespective of the direction in which the locomotive moves.

A still further object of the invention is the provision of a selector mechanism having different settings, and which when once set causes the locomotive to travel in the pre-selected direction until that particular setting is changed at the will of the train operator.

Other objects of the invention relating to details of construction, arrangement of parts, and the manner in which they function will be apparent as the description proceeds.

For a full and more complete understanding of the invention, reference may be had to the following description and accompanying drawings, wherein:

Figure 1 is a sectional view of a toy locomotive embodying the present invention;

Figure 2 is an enlarged fragmentary elevational view of the gear system;

Figure 3 is a section taken on line 3—3 of Figure 2;

Figure 4 is a perspective view of the gear rack tripping means;

Figure 5 is an end elevational view showing the mounting of the gear mechanism on the locomotive frame;

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Figure 6 is an enlarged sectional elevation, on line 6—6 of Figure 5, of the tripper mechanism;

Figure 7 is a fragmentary perspective view, showing the construction for pre-determining the manner of operation of the gears;

Figure 8 is a sectional elevation of the gear and tripper mechanisms, showing the tripper in neutral position and the motions of the rocker arm and worm gears; and

Figure 9 is a view similar to Figure 2, showing a modification consisting of a duplication of the gear elements.

Referring to the accompanying drawings, and more particularly to Figures 1 and 2, an electric locomotive is generally indicated by the reference character 1, having mounted therein a motor 2, which may be driven by an alternating current derived from a supply line of commercial voltage.

A drive shaft 3 supported in suitable bearings 4 may be directly connected to the armature of the motor 2. Power supplied to the shaft 3 is used to propel the locomotive through a gear system, which may comprise worms 5 and 6 having opposite pitch; i. e., left and right hand threads, respectively formed on a sleeve 7. The sleeve 7 is adapted to reciprocate back and forth on the shaft 3, but is pinned thereto by means of a key 8 fitted into a keyway 9. The worms 5 and 6 are adapted to mesh with a worm wheel 11, which is mounted on an axle 12 of the driving wheels 13.

A rocker 14, having arms 15 and 16, carries at the extremities thereof a set of gear teeth forming racks 17 and 18. The teeth of the racks 17 and 18 are adapted to mate with the worms 5 and 6 respectively, when they come into engagement, as hereinafter described. The rocker 14 is pivotally mounted within the sides of the locomotive frame 19, by means of a shaft 20. The ends of the shaft 20 rest in grooves formed on the edges of the frame 19 (see Figures 5 and 6) and said shaft is yieldingly maintained in position by coil springs 21, as hereinafter more fully set forth.

Cooperatively positioned with respect to the rocker 14 is a gear rack tripper mechanism, designated generally by the reference character 22, comprising a rectangular frame 23, the transverse ends of which constitute stops or abutments 24 and 25 for the gear racks 17 and 18 respectively (see Figures 1, 2, 4, 6, and 8). As will be noted, the gear rack tripper mechanism 22 is

mounted over the top of the gear racks 17 and 18 by the engagement of studs 26 in holes 27 (see Figures 4 and 5) provided in a yoke member 28 forming a part of the frame 23. The studs 26 are secured to the engine frame 19, and extend laterally therefrom. A bar 29 is carried upon an extension 30 of the rocker 14, and one end of the several coil tension springs 21 is secured thereto, and the other end of said springs is fastened on the studs 26. The springs 21 perform the dual function of (1) maintaining the ends of the shaft 20 in the grooves formed in the frame 19, as mentioned above; and (2) holding the rocker 14 on opposite sides of center when it is rocked to the right or left about the shaft 20 by manipulating a handle 31 carried upon the top of the yoke 28.

The handle 31 is made of spring steel and extends through a slot 32 (see Figure 7), preferably located in the top of the locomotive hood or boiler 33. The slot 32 is provided with notches 34, 35, and 36, which constitute positions in which the handle may be set, which settings in turn control the direction of travel of the locomotive, as presently explained. It is obvious that the handle 31, if desired, may be secured to the side of the yoke 28, and project laterally from the boiler 33, as shown in dotted lines in Figures 4 and 5.

From the above, it will be appreciated that the construction employed to pre-determine the direction that the locomotive shall move may be regarded as a selector mechanism which may be set by the operator, and in this manner, the direction of movement of the train may be pre-selected and/or changed at will.

The operation of the above-described mechanisms in controlling the movements of the locomotive may be described as follows. Let it be assumed that the position of the handle 31 is set in the notch 34, and that the gear rack 17 and coating worm 5 is effective in combination with the worm wheel 11 to control the rotation of the latter in a counterclockwise direction and consequently to drive the locomotive rearwardly.

As illustrated in Fig. 2, the gear rack tripper frame 23 has been swung in a counterclockwise direction or to the left, this action initially engaging the abutment or stop 24 thereon with the sloping upper adjacent edge of the rocker 14 and thereby turning the latter in a counterclockwise direction to the position shown in Fig. 2. With the left hand threaded worm 5, operatively engaged with the worm wheel 11, as long as current is supplied to the motor 2, the locomotive will continue to run rearwardly, the operating parts remaining in the same relative position shown. When the motor is deenergized, the shaft 3 will cease to drive the locomotive, but the momentum of the latter will cause it to coast in the direction it was previously moving; i. e., rearwardly. Since the sleeve 7 is secured against rotational movement on the shaft 3 by the pin 8, although slidable on said shaft, it will rotate therewith, but will now begin to move axially to the left, thereby bringing the worm 5 into abutment with the adjacent end of the rocker 14 and on further movement to the left causing said rocker 14 to turn the frame 23 sufficiently to bring the end 25 into contact with arm 16 of rocker 14. The rocker 14 will now be moved to a position temporarily that permits the worm 5 to pass under the rack 17. The latter however is immediately returned by the springs 21 into its previous position but with the rack 17 now in mesh with the worm 5, as illustrated in dotted lines in Fig. 8. When the motor 2 is again energized the worm 5 and sleeve 7 while rotating in the same clockwise direction will move axially to the right as the worm threadedly engages the rack 17 or until the said worm 5 is again in mesh with the worm wheel 11 and effective to run the locomotive rearwardly again. Each time the motor is deenergized and subsequently energized, the same cycle of operations will ensue, the locomotive running rearwardly upon reenergization of the motor.

In order to cause the locomotive to run forward, the handle 31 must be moved into the notch 32, which is the forward setting. This will cause the rocker arm 14, under the action of springs 21, to be snapped right of center, as shown for example in dotted lines in Figures 6, 8, and 9. In this position, the gear rack 16 engages the stop 25 of the frame 23 (see Figures 8 and 9). It will be appreciated that the motor 22 only rotates in one direction, and with the gear rack tripper mechanism in its present assumed position, the movement of the sleeve 7 will be to the left, so that the worm 6 will be brought into engagement with the worm wheel 11. Since the pitch or threads of the worm 6 are right-handed, as opposed to the left-handed threads of the worm 5, the worm wheel 11 will now be rotated in a clockwise direction, with the result that the locomotive will move forward. When the power to the motor is interrupted, the sequence of operations previously described with respect to the disengagement of the worm 5 from the worm wheel 11 will be repeated except in reverse order. Also, as in the previous case, each time the power to the motor 2 is turned on, the locomotive will continue to move in a forward direction.

When the handle 31 is placed in the center slot 35, deenergization and subsequent reenergization of motor 2 will result in axial movement of the worm sleeve 7 alternately to the left and to right or vice versa, as the worms 5 and 6 alternately abut their adjacent stops 4 and permit the temporarily center-positioned worm to turn the worm wheel in the direction dictated by the instantly engaged worm. The left hand threaded worm 5 serving to run the locomotive rearwardly and the right handed worm operating the locomotive forwardly. In either case, the motor 2 and connected sleeve 7 continue to turn in the same direction.

The modification shown in Figure 9 contemplates the duplication of the gear mechanism by extending the sleeve 7 and providing two sets of worm gears 5 and 6, which are adapted to engage two worm wheels 11. This arrangement affords a two-wheel drive for the locomotive, and in that respect furnishes variations in structural and operational features. It is obvious that the more varieties of operational features are incorporated into the locomotive, there is a corresponding increase in the attraction to the operator.

From the foregoing description, it will be appreciated that in accordance with my invention, greatly improved results are obtained, as for example, stopping the locomotive is more realistic because of the coasting feature incorporated in my construction, as opposed to a quick, jerky stop, and sliding of the wheels of the locomotive on the track where this coasting feature is absent in previous mechanically-driven locomotives.

It is also obvious that my construction greatly simplifies the operation of the locomotive in that no switching relays, multi-switch contacts or the like, are required to reverse the direction of travel of the engine. This simplification is largely effected from the fact that it is not necessary to

reverse the motor to obtain a reversal in the direction of travel of the locomotive.

While certain preferred embodiments of the invention are hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact construction illustrated and described because various modifications of the details may be provided in putting the invention into practice within the purview of the appended claims.

What is claimed is:

1. In an electrically powered mechanically driven toy locomotive, the combination of, an electric motor as the primary power source for driving the locomotive, a drive shaft fast to said motor and rotatable thereby, a gear rack mechanism comprising a pivotally mounted rocker having gear racks on the ends thereof, a plurality of worms formed on a sleeve and each of which is adapted to mate with one of said racks, said sleeve being slidably mounted on said shaft but secured against rotation thereon a worm wheel adapted to mesh with said worms, said worms being juxtapositioned with respect to said racks and said wheel, a tripper mechanism comprising a frame having stops and mounted above said rocker, a spring actuated mechanism for snapping said rocker from right and left of center, a selector mechanism for setting said tripper mechanism, the arrangement of worms with respect to said racks being such that they mate when said motor is deenergized and said worms are caused to mate with said worm wheel when the motor is energized, the order of mating between said worms and said racks being determined by the setting of said selector mechanism, which order remains unchanged until a given setting of the selector mechanism is changed.

2. In a device of the kind described, in combination, a frame, a plurality of wheels movably supporting said frame, a motor mounted on the frame, a shaft connected to said motor, a sleeve slidably mounted on the shaft but secured against rotation thereon, a pair of worms arranged on said sleeves, each of said worms being alternatively engageable with a worm wheel secured to means fastened to a pair of said wheels, said shaft being arranged to turn in one direction only, and manually operable means connected to the frame and coactable with said worms to cause said sleeve to be moved axially of said shaft to selectively bring one of said worms into mesh with said worm wheel and thereby determine the direction of rotation of said worm wheel.

3. In a toy locomotive of the kind described, a body portion, a plurality of wheels movably supporting the body portion, an electric motor arranged on the body portion and having a shaft, a sleeve slidably mounted on the shaft but prevented against rotation thereon, a right hand worm fast to a portion of the said sleeve, a left hand worm fastened to another portion of the sleeve, stop means to limit axial movement of said sleeve, a second shaft connecting a pair of said plurality of wheels, a worm wheel fastened to said last mentioned shaft and operably connectable with either of said worms, and a pair of racks rockably mounted on said body portion and selectively engageable with either of said worms.

4. In a toy locomotive of the kind described and having a body portion, a motor arranged on the body portion and having a shaft, a sleeve slidably mounted on the shaft but secured against rotation thereon, a worm fastened to the sleeve and

having a right hand thread, a second worm secured to said shaft and having a left hand thread, a worm wheel selectively engageable by either of said worms and fast to a second shaft, a pair of wheels secured to the said second shaft and operable to drive the locomotive, and selector means movably mounted on the body portion and engageable with either of said worms, said selector means being operable to automatically control the engagement of the worms with the worm wheel and thereby control the direction of movement of the locomotive.

5. In a toy locomotive, the combination of, an electric motor and a source of power for operating the same, a rocker having gear racks cut thereon, a sleeve having oppositely directed worm sections formed thereon and either one of which is adapted to mesh with one of said racks, a drive shaft connected to said motor and carrying said sleeve, means for moving said rocker to bring one of said gear racks into engagement with one of said worm sections, a worm wheel connected to the drive wheels of the locomotive and adapted to mesh with either of said worm sections, a tripper mechanism for controlling said rocker, a selector device for setting said tripper mechanism, the meshing relation of said worms with said racks and said worm wheel being such that they alternately engage and disengage when the power to the motor is turned on or off.

6. In a toy locomotive, the combination of, a worm wheel to be driven, an electric motor housed within a casing, a source of power for operating said motor, a gear rack mechanism comprising a pivoted rocker having gear racks cut on the extremities thereof, a sleeve having oppositely directed worm sections formed thereon and either of which is adapted to be brought into mesh with one of said racks to move said sleeve longitudinally and bring one of said worm sections into meshing engagement with said worm wheel, a drive shaft connected to said motor and drivably carrying said sleeve, a tripper mechanism for bringing one of said worm sections and one of said gear racks into selective engagement, said tripper mechanism comprising a frame having stops adapted to engage said rocker, and a selector mechanism operatively associated with said rocker for pre-determining the order of engagement of said rack and gears, whereby through operation of said selector device the direction of movement of the train may be controlled when power is applied to the motor.

7. In a toy locomotive, the combination of, a worm wheel to be driven, an electric motor housed within a casing and having a drive shaft, a source of power for energizing said motor, a sleeve keyed to said drive shaft and having a pair of oppositely directed worm sections, a gear rack mechanism including a pair of racks each of which is adapted to mesh with one of said worm sections to move said sleeve axially of said drive shaft and bring one of said worm sections into meshing engagement with said worm wheel, a tripper mechanism including a frame for actuating said gear rack mechanism, a selector device having recesses and adapted for controlling said tripper mechanism, said device comprising a handle secured to said frame element, said handle being adapted to fit into said recesses which constitute operating positions on the selector, whereby through the operation of the selector device the direction of travel of the locomotive may be pre-determined when power is applied to the motor.

8. In a device of the kind described, the com-

bination of a rotatable shaft, a sleeve slidably mounted on the shaft but prevented from rotation thereon, a right hand worm fast to the sleeve, a left hand worm secured to the sleeve, a worm wheel selectively engageable with either of said worms and adapted for rotation by one of said worms in a clockwise and by the other of said worms in a counterclockwise direction, and a pair of racks mounted on a rocker with each rack being engageable by one of said pair of worms, means to rock said rocker, either of said worms normally serving to rotate the worm wheel when said rotatable shaft is turned, said sleeve being axially moved when said worm wheel is rotated while one of said racks and the corresponding one of said worms are in engagement, said racks being movable to a position engageable by either of said worms and effective to control the direction of rotation of the worm wheel clockwise or counterclockwise.

9. In a toy locomotive of the kind described and having driving wheels, an electric motor, a shaft fast to said motor and rotatable thereby, a sleeve slidably mounted on the shaft but secured against rotation relatively thereto, right hand and left hand worms fixed to the sleeve, a worm wheel connected to at least one of the driving wheels and effective for turning it, said worm wheel being selectively engageable by either

of said worms, and means comprising a pair of racks arranged on the locomotive in nonrotative relation to said shaft and either of which is selectively engageable with one of said worms for shifting the position of said worms with respect to said worm wheel as an incident to rotation of said shaft, whereby the direction of rotation of said driving wheels may be controlled.

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