March 15, 1966 G. A. TOTEFF ETAL 3,239,962

REMOTELY CONTROLLED ELECTRICALLY DRIVEN AND STEERED TOY VEHICLE

Filed March 29, 1962

3 Sheets-Sheet 1

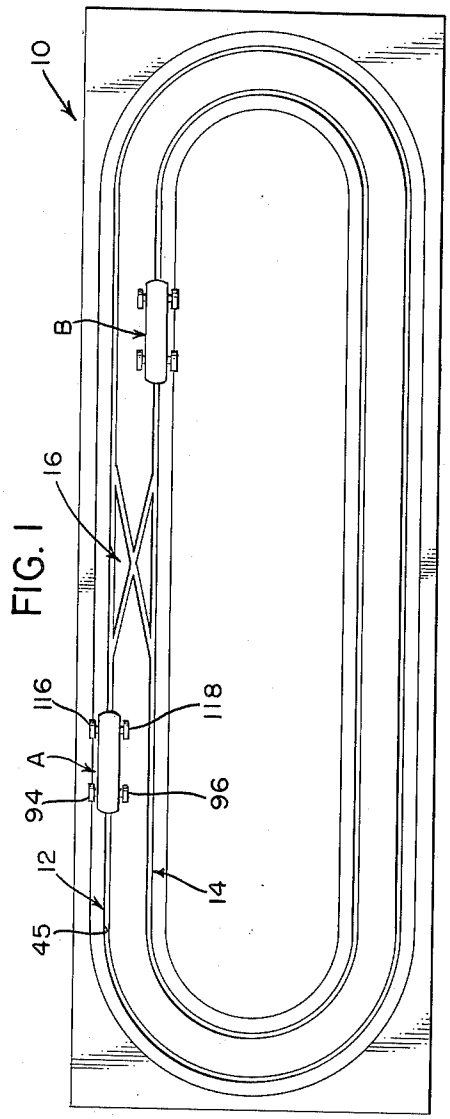


FIG. 1

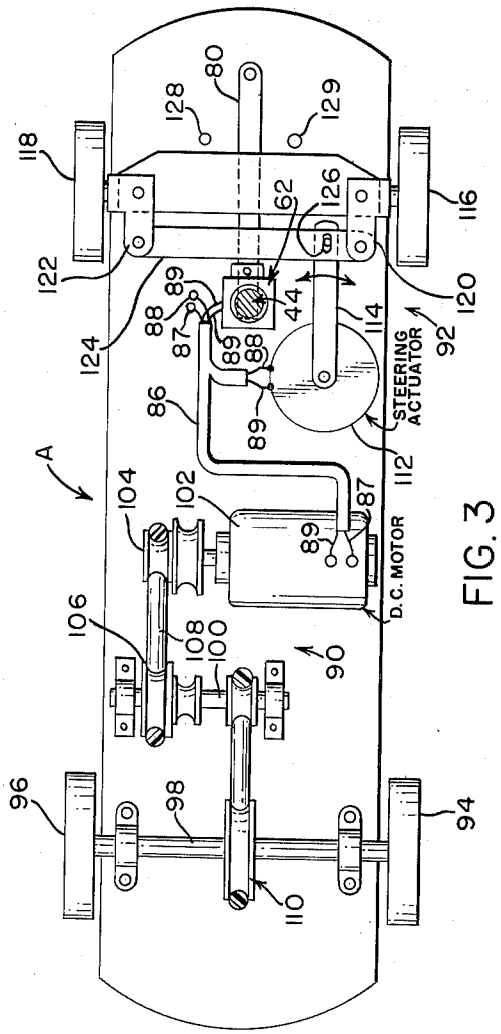


FIG. 3

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3 Sheets-Sheet 2

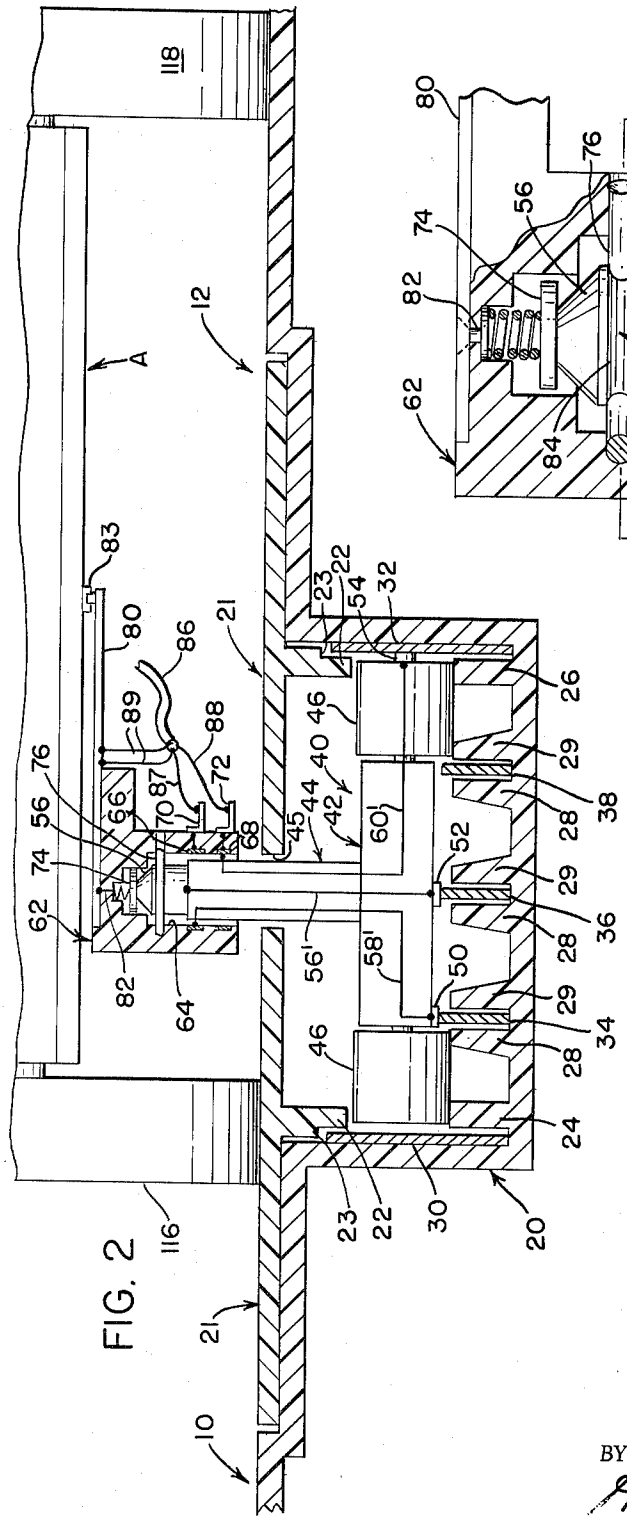


FIG. 2

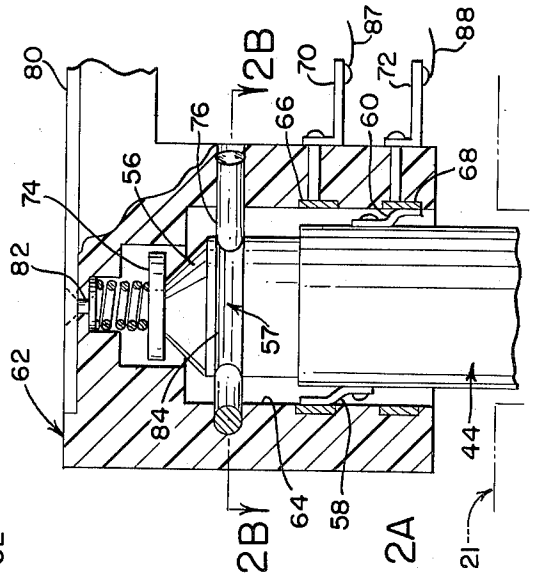


FIG. 2A

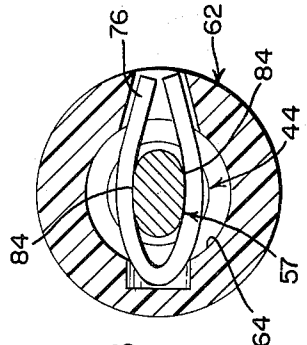


FIG. 2B

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3 Sheets-Sheet 3

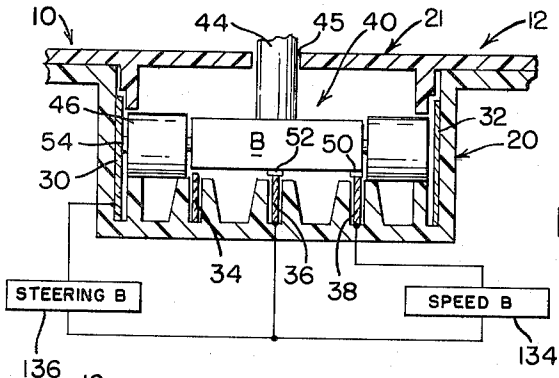


FIG. 4A

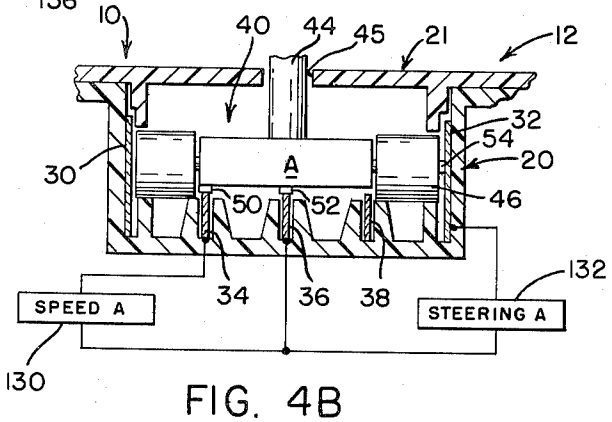
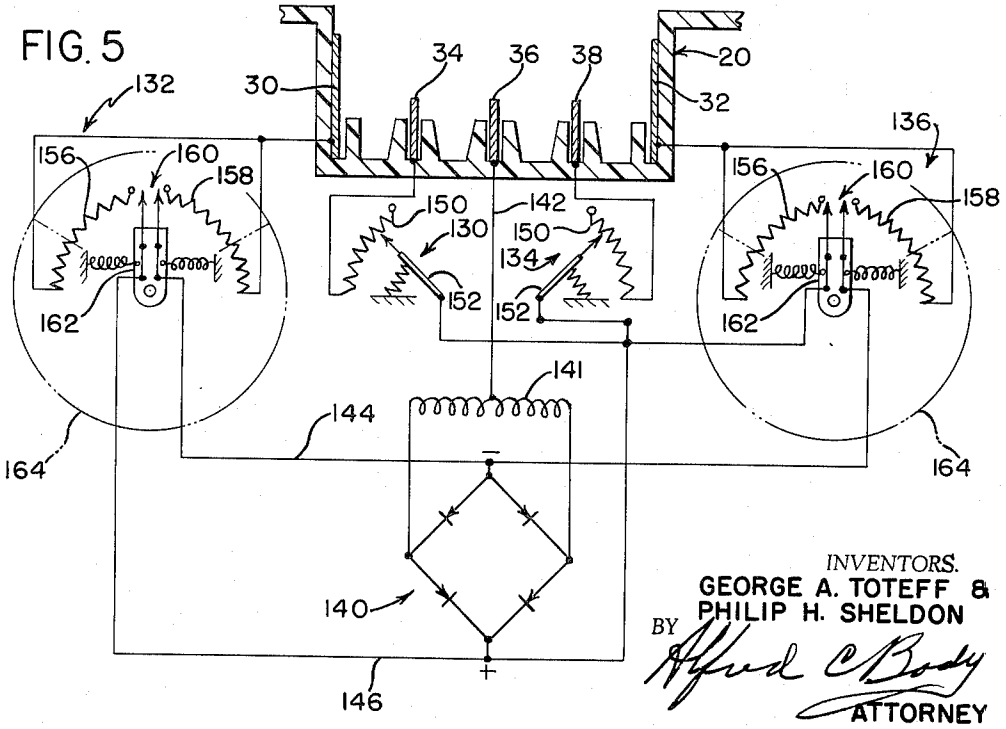


FIG. 4B

FIG. 5



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REMOTELY CONTROLLED ELECTRICALLY DRIVEN AND STEERED TOY VEHICLE

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5 Claims. (Cl. 46—244)

This invention pertains to the art of remotely controlled toys, and more particularly to a remotely controlled miniature vehicle adapted to follow along a trackway.

This invention is particularly adapted for use in controlling a miniature automobile, hereinafter referred to as a car, as it travels along a trackway; however, it is to be appreciated that the invention has much broader applications and may be used for a wide variety of remotely controlled toys adapted to travel along a trackway or similar guide means.

It has been known to provide remotely controlled cars which travel along a trackway extending in a predetermined path whereby the speed of the vehicle could be controlled by a manual rheostat. By providing two or more side-by-side trackways, one car could be driven on each trackway and the speed of the cars could be independently controlled so that the toy was adapted for use as an auto racing game. Although these auto racing games, or other remotely controlled cars adapted to follow along a trackway have become popular, they have been characterized by certain limitations. For instance, they are not versatile, and in order to obtain independent control of two or more cars, it was necessary to provide a separate trackway for each car. If more than one car were traveling in the same trackway, they were, by necessity, driven at the same speed; and variation in the speed of one car resulted in a corresponding variation in the speed of any other car in the same trackway. A further limitation of prior remotely controlled toys of the type having a car traveling along a trackway, is that the cars followed along the exact path of the trackway in a manner similar to the cars of a toy train. Consequently, the operation of these prior remotely controlled toys did not require a substantial degree of skill, and after a short time, the novelty was lost and the toy no longer held the attention of the operator.

The present invention is directed to a remotely controlled toy not subject to the above-mentioned limitations wherein the speed of the car and, more importantly, the steering of the car can be controlled by a remotely positioned console. By constructing a remotely controlled toy in accordance with the present invention, the toy remains a challenge to the skill of the operator and provides an infinite number of variations in the manipulation of the car. Accordingly, operation of the remotely controlled toy is quite similar to the operation of an automobile and the combination of speed and steering control requires operation of the car under conditions approximating an actual automobile driving situation.

In accordance with the present invention, there is provided a remotely controlled toy comprising a generally flat, plate-like cover having a slot extending in a predetermined path, a trackway having electrical rails below said slot and coextensive therewith, a car movable on the cover and having an electrically controlled driving device thereon, a dolly movable in the trackway and having rail engaging contacts and a member extending through the slot and above the cover, means for connecting the member onto the car and means for electrically connecting the dolly contacts to the driving device.

In accordance with another aspect of the present invention, there is provided a remotely controlled toy of the general type described comprising a car, a trackway, a dolly movable along the trackway, a swingable member connecting the car onto the dolly to allow movement of the car transversely in relationship to the trackway, electrically controlled driving and steering devices mounted on the car and remote means for controlling the energization of these devices.

The primary object of the present invention is the provision of a remotely controlled toy of the general type described having cars adapted to ride along a trackway wherein the operation of the cars approximates the operation of an automobile and allows both speed and steering control.

A further object of the present invention is the provision of a remotely controlled toy of the general type described wherein a dolly riding in a trackway is connected onto a car riding along a surface above the trackway wherein the trackway is provided with electrical rails engageable with contacts on the dolly to provide electrical connections with the car.

Another object of the present invention is the provision of a remotely controlled toy of the type having an electrically controlled car adapted to ride along a trackway with a dolly riding in the trackway and connecting electrical rails in the trackway to electrically operated devices on the car, wherein the car has dirigible wheels and a current responsive actuator for steering these wheels.

Still a further object of the present invention is the provision of a remotely controlled toy of the type having an electrically operated car adapted to ride along a trackway with a dolly riding in the trackway and connecting electrical rails in the trackway to electrically operated devices in the car, wherein the car has a swingable link member joining the dolly onto the car so that the car may be steered in a direction transverse of the trackway.

Still a further object of the present invention is the provision of a remotely controlled toy of the type having an electrically operated car adapted to ride along a trackway with a dolly riding in the trackway and connecting electrical rails in the trackway to electrically operated devices on the car wherein the car has a swingable member joining the dolly onto the car and a follower means which tends to turn the dolly as the car wheels are turned to assist in making a crossover from one track to an adjacent track.

These and other objects and advantages will become apparent from the following description used to illustrate the preferred embodiment of the invention as read in connection with the accompanying drawings in which:

FIG. 1 is a plan view illustrating a remotely controlled toy of the type to which the invention is directed;

FIG. 2 is a partial cross sectional view illustrating the preferred embodiment of the present invention;

FIG. 2A is a partial enlarged view of the connection between the post and cap;

FIG. 2B is a partial cross sectional view taken along line 2B—2B of FIG. 2A;

FIG. 3 is a somewhat schematic view illustrating the underside of a remotely controlled car constructed in accordance with the present invention;

FIG. 4A is a schematic view illustrating the dolly in a first position in the trackway;

FIG. 4B is a schematic view illustrating the dolly in a reversed position from that shown in FIG. 4A; and

FIG. 5 is a somewhat schematic wiring diagram for controlling the preferred embodiment of the present invention.

Referring now to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, FIG. 1 shows a remotely controlled toy constructed in accordance with the invention wherein vehicles A, B, hereinafter referred to as cars, are operably associated with a base 10 which in the preferred embodiment comprises a number of separate sections which are aligned to provide a continuous base having at least two trackways 12, 14. To allow crossover from one trackway to another, at least one crossover 16 is provided between the separate trackways. By electrical control of cars A, B, the cars are propelled on the base 10 and generally along the trackways 12, 14. The present invention is directed toward the mechanisms for controlling the movement of these cars.

Referring to FIGS. 2 and 2A, each trackway 12, 14 is substantially identical in construction and, for the purposes of simplicity, the construction of trackway 12 will be discussed in detail; however, it is appreciated that this discussion will apply equally to the construction of trackway 14. Although two side-by-side trackways are illustrated in the preferred embodiment, the number of trackways may be changed without departing from the intended scope of the present invention. Trackway 12 comprises a generally rectangularly shaped recessed channel 20 which is closed by a two-piece cover 21 having downwardly depending flanges 22 with shoulders 23. The channel and cover are preferably constructed of a molded electrical insulating material; and adjacent the bottom of the channel 20 there is provided upwardly extending ribs 24, 26 spaced downwardly from depending flanges 22 at opposite sides of the channel. Molded integrally with the channel, are a plurality of rail supports 28, 29 spaced transversely along the bottom of the channel. Along the opposite sides of the channel 20, electrically conductive rails 30, 32 are so positioned to extend along the general pathway followed by the channel. These rails are positioned below shoulders 23 and coact with three longitudinally extending base rails 34, 36 and 38 secured between the supports 28, 29 to provide electric energization of the cars A, B in a manner to be hereinafter described in detail.

To connect the electrical rails 30–38 with electrically controlled devices within the cars, there is provided a dolly 40 adapted to ride along the trackway 12 and comprising a carriage 42, an upwardly extending post 44 protruding outwardly through a slot 45 between the two pieces of the cover 21, a set of support wheels 46 located at the corners of the carriage and adapted to ride between the flange 22 and rails 24, 26, and sliding contacts 50, 52 and 54 adapted to engage two of the bottom rails and one of the side rails in a manner shown in FIG. 2. Although the wheels have been shown below flanges 23, it is within the contemplation of the invention to have the wheels ride under cover pieces 21 so that the wheels could bear against the underside of one cover piece during turning of the dolly. Adjacent the upper portion of post 44 is a center stud 56 which is connected to the sliding contact 52 by an appropriate means which is represented schematically as lead 56'. Also, there is provided on the stud 56 a generally circumferentially extending groove 57, the functions of which are described later. Adjacent the upper portion of post 44 are side spring contacts 58, 60 spaced axially from each other and electrically connected onto sliding dolly contacts 50, 54 through the dolly as is schematically represented by leads 58' and 60'.

A cap 62 is adapted to be slipped over the outwardly extending end of post 44 and is provided with an inner bore, or recess, 64 having axially spaced slip rings 66, 68 which ride against contacts 58, 60 irrespective of the angular position of cap 62 with respect to the post 44. Extending outwardly from the cap 62 are a pair of terminals 70, 72 electrically connected with slip rings 66, 68 respectively. Consequently, the terminals 70, 72 are in continuous electrical contact with the rails 34, 32 respectively through the electrical connection in the cap and dolly. Adjacent the upper portion of cap 62, a biased contact 74 is urged into engagement with the stud 56 to complete an electrical connection between the contact 74 and the base rail 36. To secure the cap over the post 44, appropriate means are provided, such as a snap ring or other spring means 76 adapted to be received within groove 57. Of course, other means could be provided for securing the cap onto the post without departing from the spirit and scope of the invention.

Adjacent the upper portion of cap 62 is a longitudinally extending swingable member 80 which can assume an infinite number of angular positions with respect to post 44 of the dolly 40. The swingable member 80 is connected with the center base rail 36 by an electrical connection 82 on the biased contact 74. Adjacent the uppermost end of this swingable member there is provided a swivel joint 83 which connects the member onto the under portion of car A. It is to be appreciated that the swivel connection could be made with car B since these cars are identical in construction.

To assure travel from one track to another at the crossover 16, there is provided a follower means for forcing the dolly 40 in the direction in which the member 80 is turned with respect to the post 44. Although various means could be provided for this purpose, in accordance with the preferred embodiment, the cap and post 44 are interconnected by the spring 76 which is U-shaped and engages a cam block 84 provided in the groove 57. See FIG. 2B. Thus, the action of the cam block 84 and the spring 76 biases the movement of member 80 with respect to the post 44 so that the post tends to follow the angular movement of the member. The member or link 80 allows transverse movement of car A with respect to the trackway 12 so that the car may be steered in a manner to be described later. Although a link swiveled onto the dolly and the car is preferred, various other link members may be used. For instance, a chain, cable, rope, wire, etc., could be used to allow transverse movement of the car with respect to the trackway. It is even within the scope of the invention to use a slot or guide channel adjacent the lower portion of car A or on the dolly and a pin or similar protruding element extending from the dolly or car into the slot or guide channel. This follower means does not form a part of the present invention and it is the subject of a copending patent application by Philip H. Sheldon, Serial No. 186,550, filed April 10, 1962, and assigned to the same assignee as this application.

To direct the electrical signals of the rails 32, 34 and 36 to the car A, there is provided a harness 86 made up of wires 87, 88 connected to terminals 70, 72 respectively and two wires 89 connected onto the link 80. It is appreciated that the connection of wires 89 with the contact 74 could be made without using the link 80. As will be explained later, the center base rail 36 is a common rail for grounding or otherwise completing an electrical circuit through all electrically responsive elements on the car A; therefore, in accordance with the preferred embodiment, two wires 89 are provided for completing the electrical circuit through the two electrically responsive devices to be described later. According to the construction so far described, the car is connected onto the swingable link 80 at a point spaced from the pivot point of the link and a harness 86 directs the electrical signals to the car A.

To better understand the operation of the car A, FIG. 3 shows the under side of the car wherein two electrical responsive devices, drive device 90 and steering device 92, are provided for control of the car as it passes along the upper surface of base 10 and in general proximity

with the trackways 12, 14. The drive device 90 comprises drive wheels 94, 96 fixedly secured onto the opposite ends of an axle 98, an idler shaft 100 and a D.C. motor 102 connected with wires 87, 89 from the harness 86. A drive pulley set 104 positioned opposite idler pulley set 106, and connected therewith by a drive belt 108, furnishes power to the idler shaft 100 which drives the axle 98 by an appropriate pulley and belt arrangement 110. Accordingly, the speed of the wheels 94, 96 is determined by the electrical signal received from base rails 34, 36 in the lower portion of channel 20 of the trackway 12. By changing belt 108 from one pair of pulleys to the other pair of pulleys in sets 104, 106, the speed ratio of the car may be conveniently changed. It is believed that there has never been a two speed drive train in a car adapted to ride along a trackway.

Referring now to the steering device 92, it is provided with an actuator 112 having an outwardly extending swinging control arm 114. The actuator is so constructed that the direction and magnitude of the current received through wires 88, 89 electrically connected with rails 32, 36, determines the direction and amount of displacement of the arm 114. Dirigible wheels 116, 118 are actuated by steering knuckles 120, 122 interconnected by an appropriate tie rod 124. By providing a sliding connection 126 between the tie rod 124 and the control arm 114, movement of the control arm determines the steering of the dirigible wheels. Adjacent the base of the car A, it is possible to provide stops 128, 129 to limit the amount of angular movement between the swingable link 30 and the car A. Of course, these stops can be eliminated without departing from the intended scope of the invention and when a chain or cable connection is provided between the dolly and car, no stops are used.

Various constructions may be used for the steering actuator 112, and in the preferred embodiment the actuator is responsive to a change in the polarity and magnitude of a voltage across rails 32, 36. It is appreciated, that the particular rails through which the signal is directed for the steering and drive devices could be reversed without seriously limiting or changing the operation of the car; however, the particular arrangement described in connection with the preferred embodiment has proven quite satisfactory in practice.

Referring to FIGS. 4A, 4B, the speed control 130 for car A is connected across base terminals 34, 36 which are engaged by contacts 50, 52 of the dolly 40. Variations in the voltage across the speed control 130 changes the speed of the car by changing the speed of motor 102. It is possible to reverse the polarity of the speed control 130 to reverse the motor 102. Steering control 132 for car A is connected across side rail 32 and base rail 36. The steering control is characterized by providing an electric current having variable magnitudes and reversible polarity so that movement of arm 114 is controlled to steer car A. The speed control 134 for car B is connected across rails 36, 38 and the steering control 136 for car B is connected across side rail 30 and base rail 36. The controls 130–136 are simultaneously connected onto the five rails extending along the channel 20. The arrangement of the contacts 50–54 on the dolly 40 is such that the dolly may be rotated 180° with respect to the channel 20 and thus engage a different set of speed and steering controls. In this manner the dollies 40 for the cars A, B are identical in construction and the only difference is that they are reversed when placed within the channel 20 of the trackways 12, 14. The center rail 36 is a common rail for the control of both the speed and steering of both cars. It is appreciated, that the use of five rails is a convenient means for providing simultaneous control of separate cars traveling in one channel 20; however, it is within the contemplation of the invention to provide various numbers of rails positioned in the channel 20 as long as they allow a common dolly to be reversed in the trackway to provide separate control of two cars traveling in the same trackway. Essentially, the channel is provided with two sets of electrically conductive rails and a guide means, which in this case is the channel itself, and the dolly is provided with one set of electrical contacts adapted to engage a selected set of electrically conductive rails according to the position of the dolly within the channel 20. The reversibility of the dollies 40 and the simultaneous control of dollies A and B in one trackway is not the invention of the present application. This invention is the subject of a copending patent application by George A. Toteff and Thomas J. Bacsanyi, Serial No. 183,887, filed March 30, 1962, and assigned to the same assignee as this application.

Referring to FIG. 5, a representation of one power supply unit for the rails 30–38 is disclosed. It is to be appreciated that various other devices could be used to obtain the desired characteristics of the speed and steering control devices. In accordance with the schematic representation, a full wave rectifier device 140 is powered by a secondary winding 141 of a transformer and the center tap of the secondary winding is connected onto the common rail 36 by a lead 142. The negative terminal of the full wave rectifier device is connected to lead 144 and the positive terminal is connected to lead 146. Speed controls 130, 134 for the cars A, B respectively comprise a rheostat 150 having a manual, or foot operated, actuator 152 which changes the voltage across the rheostat and thus changes the current through the D.C. motor 102. This changes the speed of the cars in any commonly known manner. The actuators 152 are connected onto the positive lead 146; however, it is possible to connect the actuators 152 onto the negative lead 146 and thus reverse the direction of the motor 102.

The steering controls 132, 136 provide a reversible, variable magnitude current for steering the cars A, B respectively. Each of these devices comprises an appropriate electrical means for accomplishing this result; however, in the schematic representation a positive rheostat 156 and a negative rheostat 158 are contacted by one of the set of pointers 160 mounted on a spring centered arm 162 and angularly controlled by steering wheel, or similar device, 164. Movement of the steering wheel 164 changes the polarity and magnitude of the current to the steering device 92 of the particular car being controlled so that steering of the car is possible.

The present invention has been discussed in connection with a particular embodiment thereof; however, it is to be appreciated that the invention is not intended to be limited thereby. To the contrary, various structural changes may be made in the preferred embodiment without departing from the intended spirit and scope of the invention as defined in the appended claims.

Having thus described our invention, we claim:

1. A remotely controlled toy comprising a generally flat, plate-like cover having a slot extending in a predetermined path, a trackway having electrical rails below said slot and coextensive therewith, a car movable on said cover and having an electrically controlled driving means, a dolly movable in said trackway and having rail engaging contacts and a member extending through said slot and above said cover, first means for connecting said member onto said car and second means for electrically connecting said dolly contacts to said driving means, said car includes an electrically controlled steering device, a remote means for controlling said steering device, and said first means comprises a third means for allowing transverse movement of all portions of said car with respect to said trackway.

2. A remotely controlled toy as defined in claim 1 wherein said third means comprises a swingable link member and means joining said link member onto said car and said dolly.

3. A remotely controlled toy as defined in claim 1 wherein said third means comprises a slot on said dolly and a pin on said car, said pin adapted to slide in said slot.

4. A remotely controlled toy as defined in claim 1 wherein said third means comprises a flexible member extending between said dolly and said car.

5. A remotely controlled toy comprising a car having dirigible front wheels, a base having a surface extending in a given plane, a submerged track within said base extending in a predetermined path, a dolly movable along said trackway, a swingable member extending from said dolly and connected onto said car, electrical steering means mounted on said car for remotely steering said dirigible wheels and a second electrical means for remotely controlling the speed of said car along said trackway, said second electrical means including electrical signal responsive control devices mounted on said car, electrical rails coextensive with said trackway, electrical means connected onto said rails for varying an electrical signal to said rails, and connection means on said dolly for electrically connecting said rails with said devices, said connection means comprising contacts on

said dolly slidably engaging said rails, an upwardly extending post on said dolly, a first and second axially spaced contact on said post, a cap rotatably mounted on said post and having inner slip rings adapted to contact said first and second contacts, means for moving said member onto said cap and means for electrically connecting said slip rings onto said devices.

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