

April 22, 1969

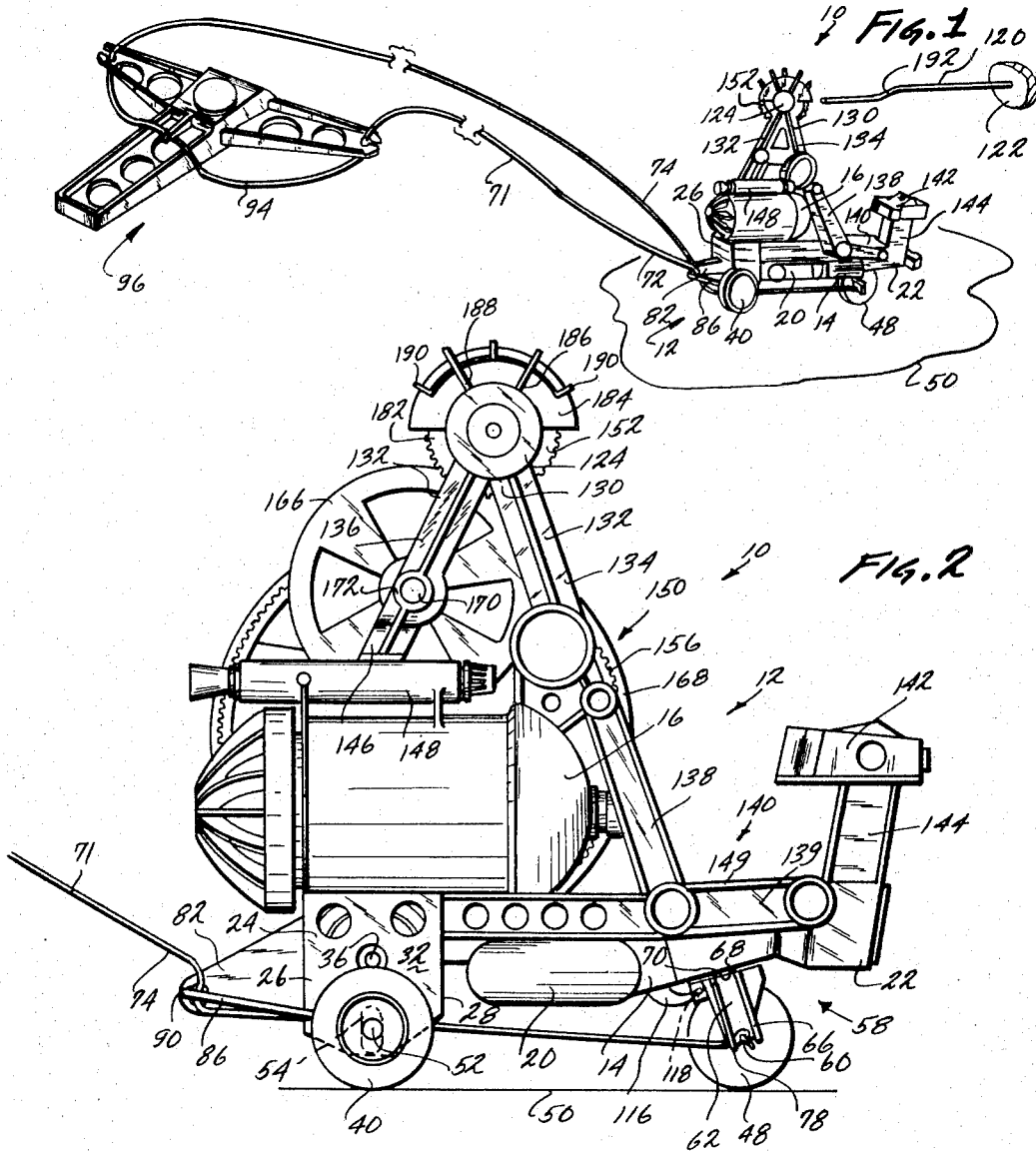
J. W. RYAN ET AL

3,439,448

STRING MONORAIL

Filed Feb. 8, 1967

Sheet 1 of 3



INVENTORS
FIG. 3 JOHN W. RYAN
ALBERT R. BAGINSKI

BY *Henry, Walter Blackham*
ATTORNEYS

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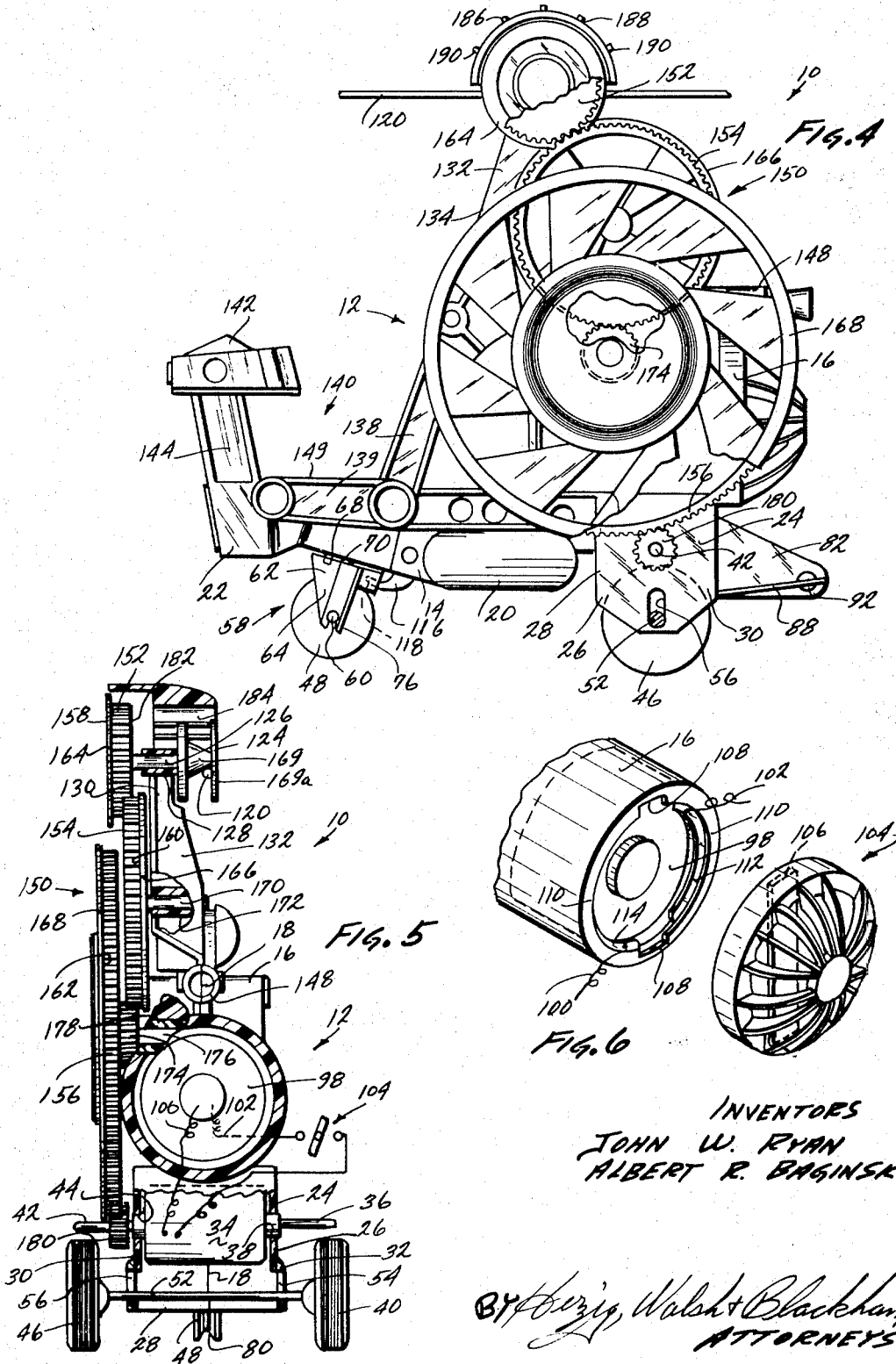
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Sheet 2 of 3



INVENTORS
JOHN W. RYAN
ALBERT R. BAGINSKI

By *Byrd, Walsh & Blackham*
ATTORNEYS

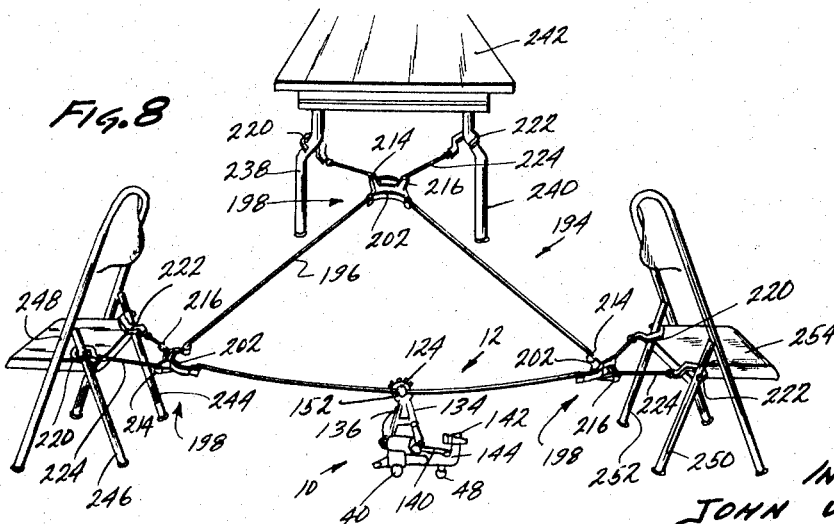
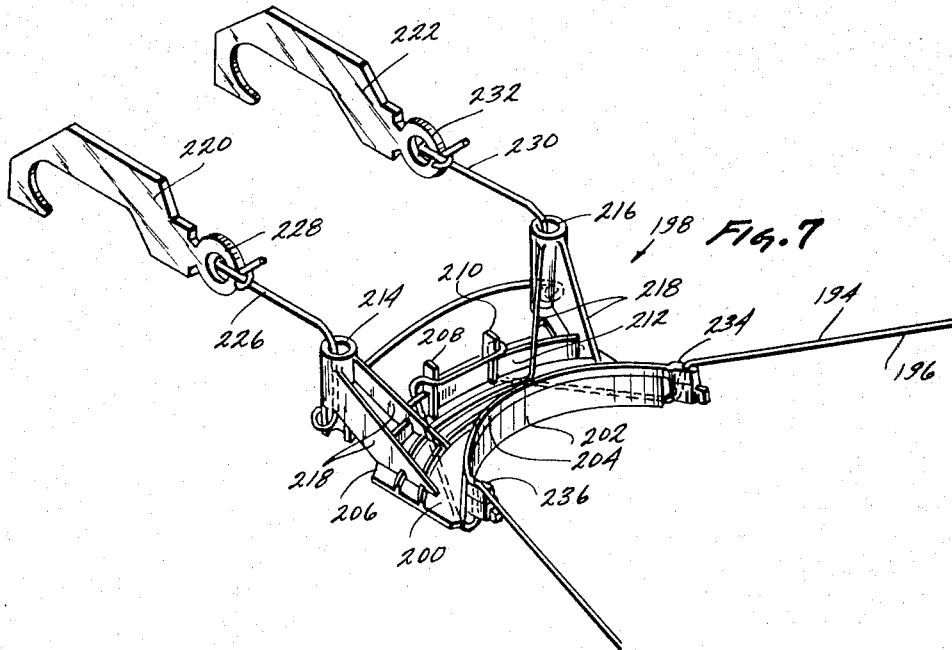
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Sheet 3 of 3



INVENTORS
JOHN W. RYAN
ALBERT R. BASINSKI

By *Henry, Walsh & Blackham*
ATTORNEYS

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3,439,448

STRING MONORAIL

John W. Ryan, Los Angeles, and Albert Baginski, Torrance, Calif., assignors to Mattel, Inc., Hawthorne, Calif., a corporation of California

Filed Feb. 8, 1967, Ser. No. 614,584

Int. Cl. A63h 29/22, 30/00, 31/00

U.S. Cl. 46—243

10 Claims

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ABSTRACT OF THE DISCLOSURE

A three-wheeled toy vehicle may be driven over a suitable surface by an electric motor having output shafts engaging the outer periphery of the rear wheels while the vehicle is steered by a child-user manipulating a string attached to the single front wheel. Alternatively, the vehicle may be driven on an elevated string forming a rail engageable by a pulley on the vehicle. The pulley is driven through a gear train including a pinion gear affixed to one of the output shafts. Upon elevation of the vehicle the rear wheels drop out of driving engagement with the output shafts.

CROSS-REFERENCE TO RELATED APPLICATION

The mounting for the rear wheels and axle assembly herein shown and described is also shown and described in copending application Ser. No. 470,148, now Patent No. 3,337,985, filed July 7, 1965.

BACKGROUND OF THE INVENTION

The background of the invention will be set forth in two parts:

Field of the invention

The present invention pertains generally to the field of driving means for wheeled toy vehicles and more particularly to means for selectively driving a toy vehicle on a surface and on an elevated rail means through a motor output shaft which directly engages a vehicle wheel for driving it on the surface and which carries a gear connected to a pulley by a gear train for driving the vehicle on the elevated rail means.

Description of the prior art

Mechanical devices adapted to operate on elevated rail means in the form of a string, a rail or the like are known from such prior art patents as United States Patents Nos. 1,346,985; 2,481,686; 2,551,317 and 3,000,138. In addition, United States Patent No. 2,941,332 shows that it is old to move toy vehicles along a floor about a fixed course defined by an endless belt attached to the vehicles. Of these prior art patents, only Patent No. 2,481,686 discloses a toy vehicle which may be selectively operated on an elevated rail means and on the floor.

While generally satisfactory, toy vehicles of the type disclosed in Patent No. 2,481,686 do have certain disadvantages. One disadvantage resides in the fact that the rail means must be disassembled before the vehicle can be removed therefrom when it is desired to operate the vehicle on the floor.

Another disadvantage resides in the fact that the portion of the vehicle which is adapted to operate on the rail means must be inverted and connected to another portion of the vehicle which is adapted to operate only upon the floor.

In view of the foregoing factors and conditions characteristic of toy vehicles having driving means for selectively driving the vehicle on a suitable surface and on an elevated rail means, it is a primary object of the present invention to provide a new and useful driving means for

a toy vehicle not subject to the disadvantages enumerated above and being especially designed for selectively driving a toy vehicle on a surface and on an elevated rail means efficiently, safely and expeditiously.

Another object of the present invention is to provide a driving means for a toy vehicle which includes clutch means for automatically disengaging the driving means from the vehicle wheels when the vehicle is operated on an elevated rail means.

Yet another object of the present invention is to provide a driving means for a wheeled toy vehicle which includes a new and useful elevated rail means.

A further object of the present invention is to provide a new and useful driving means for a wheeled toy vehicle which includes gear train means operatively connected to an output shaft adapted to drive one wheel of the vehicle and to a pulley means adapted to be connected to an elevated rail means.

SUMMARY OF THE INVENTION

According to the present invention, a driving means is provided in combination with a three-wheeled toy vehicle. The vehicle includes a front, castered wheel which may be steered by a child-user of the vehicle through a pair of strings connected to the front wheel. Each rear wheel is rotatably mounted on an axle which, in turn, is mounted in slots for reciprocation with respect to a motor output shaft extending directly above each wheel for reducing drag on the motor when the vehicle negotiates curves on the floor and for disengaging the wheels from the output shafts when the vehicle is operated on an elevated rail.

The driving means includes a pulley which may be engaged on an elevated rail means in the form of a string. The pulley is rotated by a gear train which is connected to a pinion which, in turn, is affixed to one of the motor output shafts. Thus, one of the motor output shafts selectively drives the vehicle on a suitable surface and on an elevated rail means.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which like reference characters refer to like elements in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view, with parts shown in elevation, of a toy vehicle and driving means combination constituting a presently preferred embodiment of the invention;

FIGURE 2 is an enlarged, partial side-elevational view of the combination shown in FIGURE 1;

FIGURE 3 is an enlarged perspective view of the front wheel of the vehicle of FIGURE 1;

FIGURE 4 is an elevational view of the side opposite that shown in FIGURE 2 with parts broken away to show internal construction;

FIGURE 5 is an end elevational view looking in at the right hand side of FIGURE 4 with parts broken to show internal construction;

FIGURE 6 is an enlarged, exploded perspective view of a portion of the battery housing and electric switch for the toy shown in FIGURE 1; and

FIGURES 7 and 8 are perspective views of a modified rail means for the combination of FIGURE 1.

Referring again to the drawings, and more particularly to FIGURES 1-3, a toy vehicle and driving means com-

bination forming a presently preferred embodiment of the invention, generally designated 10, includes a self-propelled toy vehicle 12 having a chassis 14 and a body 16 which may be molded in two pieces from a suitable rigid plastic and joined together along a parting line 18 (FIGURE 5).

The chassis 14 includes a frame 20 having a front end 22 and a rear end 24. The rear end 24 is provided with a motor housing 26 having a front wall 28 and a pair of side walls 30, 32 (FIG. 5) and houses an electric motor 34. The electric motor 34 includes a first output shaft 36 extending out through an aperture 38 provided in side wall 32 to a position directly above a rear wheel 40 and a second output shaft 42 extending out of housing 24 through an aperture 44 provided in side wall 30 to a position directly above another rear wheel 46. The wheels 40, 46 cooperate with a single front wheel 48 for moving the vehicle 12 over a suitable surface 50 and are each rotably mounted on a rear axle 52 which is rotably and reciprocally mounted in elongated slots 54, 56 provided in side walls 30 and 32, respectively. The front wheel 48 includes a wheel member 58 carrying a shaft 60 which is rotatably mounted in a U-shaped bolster 62 having parallel arms 64, 66 and a bight portion 68 (FIGURE 3). The wheel 48 may be pivotally connected to the front end 22 of frame 20 by a pivot pin 70 and may be turned for guiding the vehicle 12 on surface 50 by a cord 71 having ends 72, 74 connected to arms 76, 78, respectively, extending outwardly from associated arms 64, 66 on bolster 62. The wheel member 58 has a periphery 80 which is U-shaped in cross-section so that the vehicle 12 may be guided by a single-track system of the type disclosed in said copending application Ser. No. 470,148, now Patent Number 3,337,985.

The frame 20 also includes a rearwardly-extending flange 82 which is reinforced by a pair of ribs 86, 88 (FIGURES 2 and 4) which are provided with apertures 90, 92, respectively, through which the ends 74, 72, respectively, may be trained before they are connected to arms 78, 76, respectively. The cord 71 includes a bight portion 94 which may be connected to a Y-shaped control member 96 which, in turn, may be held by a child-user of the vehicle 12 to steer it along surface 50. The vehicle 12 may be propelled on surface 50 by rotation of the output shafts 36, 42 by electric motor 44 which receives current from a suitable dry cell means 98 mounted in body 16 and connected to motor 34 by electrical leads 100 and 102 through a switch 104. The switch 104 also constitutes a cover member for the body 16 and may be connected thereto by a leaf spring 106 (FIGURE 6) which may be engaged in notches 108 and seated in flanges 110 by rotating switch 104 through a partial revolution. A circuit may then be completed from battery 98 to motor 34 by rotating switch 104 until spring 106 engages contacts 112, 114 connecting leads 102 and 100 respectively, to flanges 110. The output shafts 36 and 42 are caused to frictionally engage associated rear wheels 40 and 46 by the weight of the vehicle 12 moving frame 20 downwardly with respect to axle 52 so that axle 52 floats freely in the slots 54 and 56, as shown for the slot 56, in FIGURE 2. As pointed out in said copending application Ser. No. 470,148, now Patent Number 3,337,985, this feature combined with the fact that each rear wheel is rotatably mounted on axle 52 minimizes drag on motor 34 when vehicle 12 negotiates turns because the outboard shaft 36, 42 will be lifted with respect to its associated wheel permitting the outboard wheel to rotate at the speed dictated by the turning radius. This turning radius may be limited somewhat by a hook 116 which depends from frame 20 and which includes a free end 118 extending between arms 64 and 66 on bolster 62 for limiting the rotation thereof.

It will be apparent from the foregoing that the motor 34, output shafts 36, 42 and wheels 40, 46 comprise

means for driving the vehicle 12 on surface 50. Referring now more in particular to FIGURES 1-2 and 4-5, the motor 34 and output shaft 42 also comprise means for driving the vehicle 12 on an elevated rail means 120 which may comprise a fixed rod supported by a suitable support means indicated schematically at 122 in FIGURE 1. The vehicle 12 may be propelled along elevated rail means 120 by rotation of a pulley 124 affixed to a shaft 126 (FIGURE 5) journaled in a bushing 128 formed in an apex portion 130 of an A-frame 132. The frame 132 is formed integrally with one of the pieces comprising one half of the assembly formed by the chassis 14 and the body 16 and includes a first leg 134 extending from apex 130 to frame 20 and a second leg 136 extending from apex 130 to body 16. The lower portion 138 of leg 134 may also serve as a backrest for a seat 149 formed by the portion 139 and the front end 22 of frame 20. A child-user of the vehicle 12 may position a doll on seat 140 with the doll facing a simulated control panel 142 connected to the front end 22 of frame 20 by a post 144. The leg 136 includes a lower end 146 which may be connected to body 16 by a simulated rocket engine 148.

The pulley 124 is driven through a gear train 150 comprising first, second and third gears 152, 154 and 156, respectively, which have their exposed faces 158, 160 and 162 respectively, covered with annular flanges 164, 166 and 168, respectively, for minimizing the likelihood that a child-user of toy 10 will get material caught in gear train 150. In addition, the pulley 124 includes a frustoconical spindle 169 and an outer flange 169a for minimizing yawing of vehicle 10 as it travels along rail means 120 by maintaining the rail means 120 at the small end of spindle 169 against flange 169a so that flange 169a will remain in stabilizing contact with rail means 120 during rotation of pulley 124.

The gear 152 is affixed to shaft 126 for imparting rotation to pulley 124 and is meshed with gear 154 for being rotated thereby. The gear 154 is affixed to a shaft 170 journaled in a bushing 172 formed integrally with the leg 136 and meshes with a small-diameter gear 174 formed integrally with the gear 156 and carried by a shaft 176 journaled in a bushing 178 formed integrally with body 16. The gear 156 meshes with a pinion gear 180 affixed to output shaft 42 for rotation thereby. Thus, the pulley 124 is rotated by output shaft 42 through pinion gear 180 and gear train 150. The inner face 182 of gear 152 is protected by a semicircular plate 184 affixed to apex 130 by a pair of ribs 186, 188. The plate 184 carries a plurality of inwardly-extending fingers 190 which cage the upper portion of pulley 124.

Since the output shaft 42 drives both wheel 46 and gear train 150, the toy 10 may be selectively propelled on the surface 50 and the elevated rail means 120. For example, the cord 71 may be employed to steer vehicle 12 on surface 50 to a position where pulley 124 engages rail means 120. Continued rotation of pulley 124 will propel vehicle 12 along rail means 120 once an elevated portion 192 thereof is reached causing wheels 40, 46 and 48 to be elevated above surface 50. At this time, axle 52 will drop to the bottom of associated slots 54, 56 bringing rear wheels 40, 46 out of engagement with their associated output shafts 36, 42. Thus, the arrangement of axle 52 in slots 54, 56 constitutes a clutch means disengaging wheels 40, 46 when vehicle 12 is operated in its elevated mode.

Referring now more in particular to FIGURES 7 and 8, the elevated rail means 120 shown in FIGURES 1, 4 and 5 may be replaced by an elevated rail system 194 comprising an endless cord 196 arranged in a triangular pattern by a plurality of connectors 198. Each connector 198 may be molded from a suitable rigid plastic material and includes a base plate 200 having an inwardly concave, front edge 202 along which an upstanding rail member 204 is affixed for forming a curve in track means 194. The plate 200 also includes a rear, outwardly-convex edge 206

to which a pair of upstanding pegs 208, 210 are affixed by an arcuate flange 212. A pair of hollow, cylindrical posts 214, 216 are also affixed to the plate 200 by associated flanges 218 for connecting associated hooks 220, 222 to connector 198 by a cord 224 which is trained through posts 214, 216 and which has a first end 226 connected to an eye 228 provided in the hook 220 and a second end 230 connected to an eye 232 provided on the hook 222. The cord 196 is attached to each connector 198 by passing cord 196 downwardly through a first aperture 234, provided in one end of rail member 204, under plate 200, upwardly and around pegs 208 and 210, under plate 200 and upwardly through an aperture 236 provided in the other end of rail member 204, all as shown in FIGURE 7.

The rail means 194 may be elevated by connecting a first set of hooks 220, 222 to legs 238, 240, respectively, on a table 242, a second set of hooks 220, 222 to the legs 244, 246, respectively, on a first chair 248 and a third set of hooks 220, 222 to the legs 250, 252, respectively, on a second chair 254.

In use, the toy 10 may be connected to the elevated rail means 194 by engaging the pulley 124 over cord 196. The switch 104 may then be closed energizing motor 34 which imparts rotation to output shaft 42 thereby rotating pinion gear 180. Rotation of pinion gear 180 imparts rotation to gear 156 and gear 174. Rotation of gear 174 causes gear 154 to rotate which, in turn, rotates gear 152, thereby rotating shaft 126. Rotation of shaft 126 imparts rotation to pulley 124 propelling vehicle 12 around the course defined by cord 196 and connectors 198.

What is claimed is:

1. In combination with a toy vehicle having wheel means for moving said vehicle over a suitable surface, driving means comprising:

- motor means having an output shaft engageable with said wheel means for imparting rotation thereto;
- gear train means operatively connected to said output shaft;
- pulley means connected to said gear train means for rotation thereby; and
- elevated rail means engageable with said pulley means, whereby said output shaft selectively drives said vehicle on said surface and on said rail means.

2. A combination as stated in claim 1 including clutch means for disengaging said wheel means from said output shaft when said pulley means is engaged with said elevated rail means.

3. A combination as stated in claim 1 wherein said wheel means includes a single, pivotally-mounted wheel for steering said vehicle, said single wheel including a wheeled member rotatably mounted in a U-shaped bolster having parallel arms, a steering arm affixed to each of said parallel arms and extending outwardly therefrom normal thereto, said combination including a cord connected to each of said steering arms for manipulation by a child-user of said vehicle to steer said vehicle.

4. A combination as stated in claim 1 wherein said elevated rail means comprises:

- an endless cord forming a closed path;
- connector means for connecting said cord to an elevated member, said connector means including a U-shaped rail member forming a curve in said cord; and
- hook means connecting said connector means to said elevated member.

5. A combination as stated in claim 1 wherein said pulley means is positioned on the uppermost part of said vehicle and wherein said elevated rail means comprises a

fixed rod having a free end engageable with said pulley means when said vehicle is travelling on said surface, said fixed rod including a raised portion for raising said vehicle above said surface, said wheel means including a steerable wheel for steering said vehicle into alignment with said free end of said rod.

6. A combination as stated in claim 1 wherein said vehicle includes a frame having a pair of spaced-apart vertical slots provided therein below said output shaft, said wheel means including a pair of wheels mounted on an axle, said axle being reciprocally mounted in said slots, whereby said wheels drop away from said output shaft when said output shaft drives said vehicle on said rail means.

7. A combination as stated in claim 6 wherein said vehicle includes an A-frame having an apex portion defining the uppermost part of said vehicle, said pulley means being rotatably mounted in said apex portion, said gear train including a first gear connected to said pulley means for imparting rotation thereto, a second gear rotatably mounted on said A-frame in driving engagement with said first gear, a third gear rotatably mounted on said vehicle in driving engagement with said output shaft for being rotated thereby and a small-diameter gear connecting said third gear to said second gear.

8. A combination as stated in claim 6 wherein each of said rear wheels is rotatably mounted on said axle, said output shaft including a separate shaft extending from said motor to a position above one of said rear wheels, whereby drag on said motor means will be minimized when said vehicle negotiates curves while travelling on said surface.

9. A combination as stated in claim 8 wherein said frame includes a front end and a rear end, said frame having a motor housing provided at said rear end, said motor housing including a front wall and a pair of spaced-apart side walls, one of said slots being provided in each of said side walls, said motor means being mounted in said housing, one of said output shafts extending through one of said side walls above an associated slot and the other of said output shafts extending through the other of said side walls above an associated slot, said vehicle including an A-frame having an apex portion defining the uppermost part of said vehicle, said pulley means being rotatably mounted in said apex portion, said gear train including a plurality of gears rotatably mounted on said A-frame for connecting said pulley means to said output shaft.

10. A combination as stated in claim 9 wherein said wheel means also includes a single, front wheel pivotally connected to the front end of said frame for pivoting movements about a vertical axis, said vehicle including steering means connected to said front wheel for pivoting said front wheel about said vertical axis from a remote location.

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F. BARRY SHAY, *Primary Examiner.*

C. R. WENTZEL, *Assistant Examiner.*

U.S. Cl. X.R.

46-202, 210