

Dec. 2, 1969

G. D. STOHRER

3,481,072

CAM CONTROLLED TOY VEHICLE

Filed May 1, 1967

3 Sheets-Sheet 1

FIG. 1

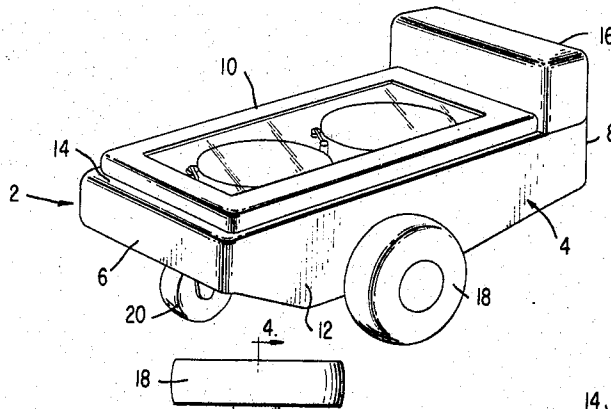


FIG. 2

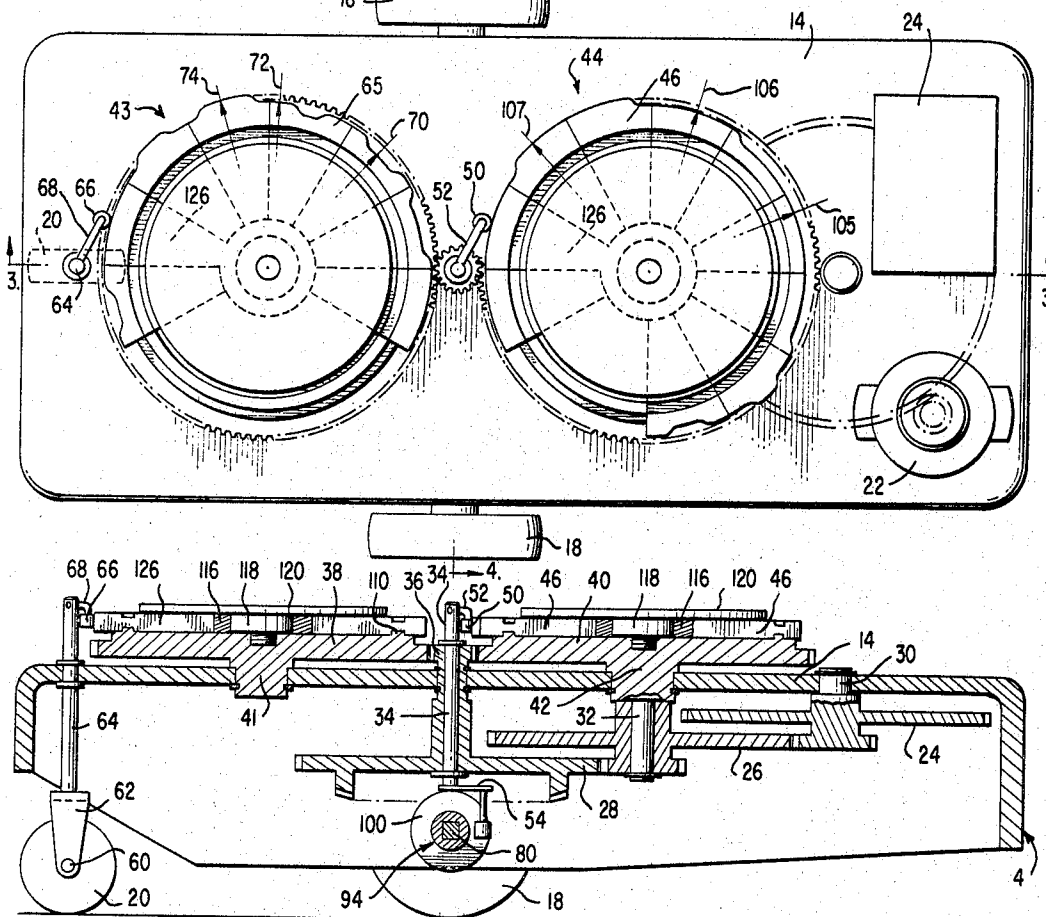


FIG. 3

INVENTOR

GEORGE D. STOHRER

BY *Burns, Doane, Benedict, Swickler & Nathan*

ATTORNEYS

Dec. 2, 1969

G. D. STOHRER

3,481,072

CAM CONTROLLED TOY VEHICLE

Filed May 1, 1967

3 Sheets-Sheet 2

FIG. 4

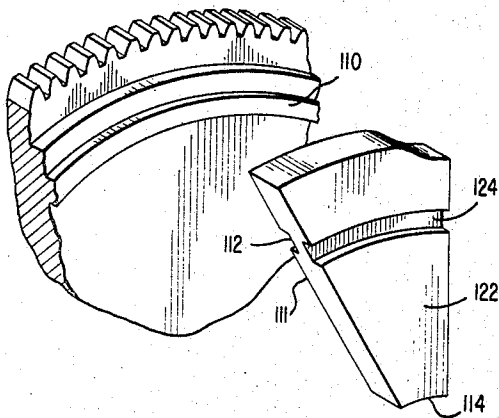
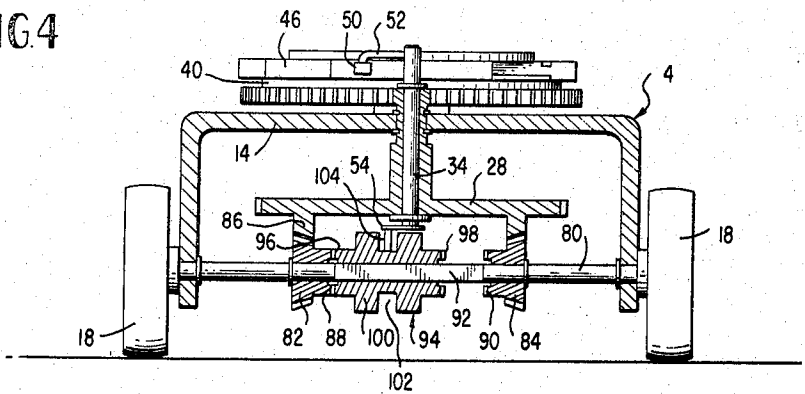


FIG. 5

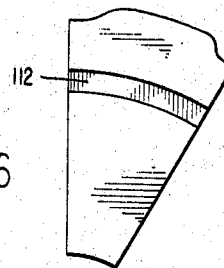


FIG. 6

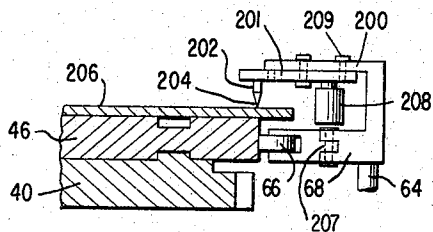


FIG. 11

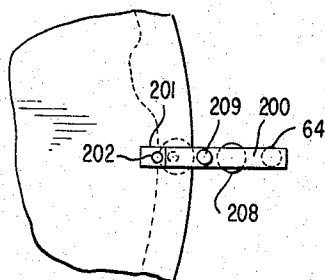


FIG. 12

INVENTOR

GEORGE D. STOHRER

BY *Drum, Doane, Benedict, Swicker & Mathis*

ATTORNEYS

Dec. 2, 1969

G. D. STOHRER

3,481,072

CAM CONTROLLED TOY VEHICLE

Filed May 1, 1967

3 Sheets-Sheet 3

FIG. 7

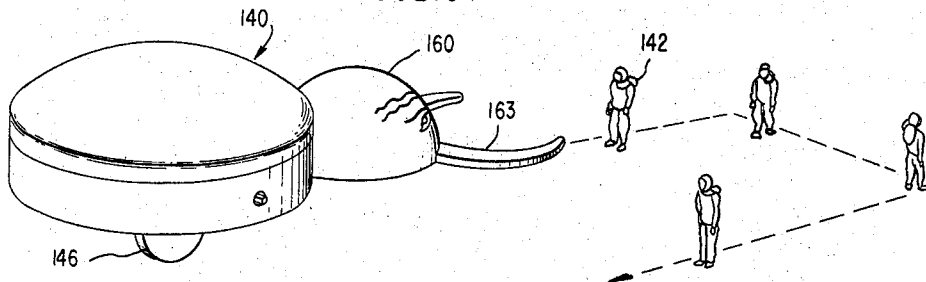


FIG. 8

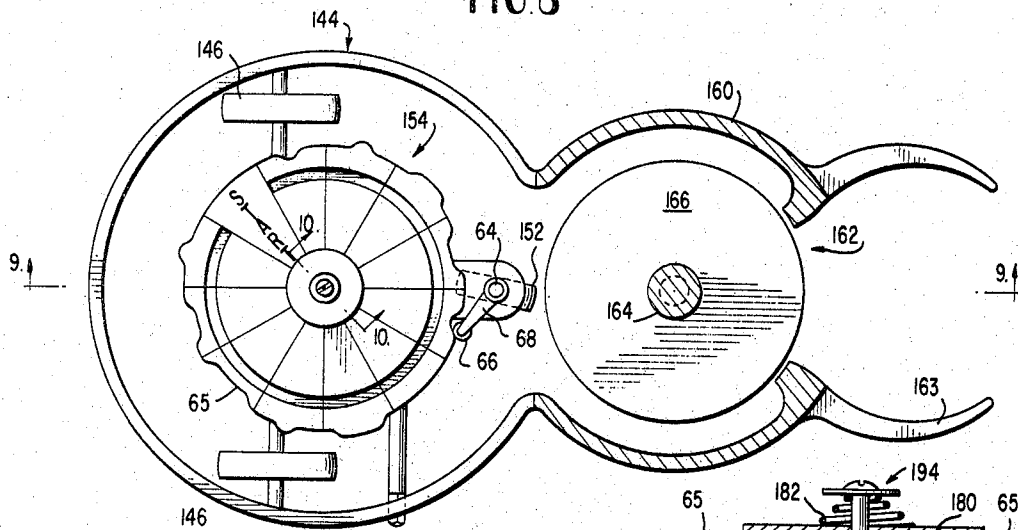


FIG. 9

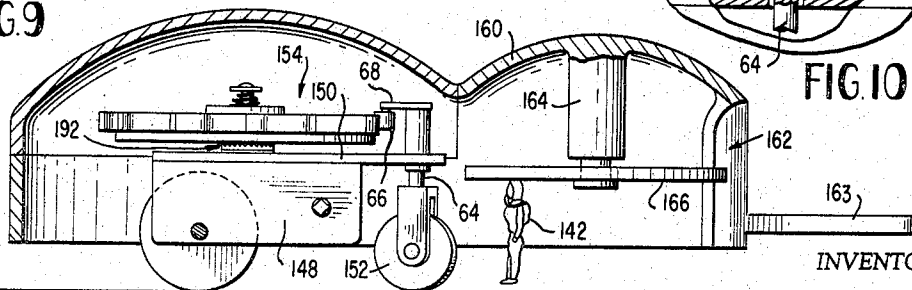
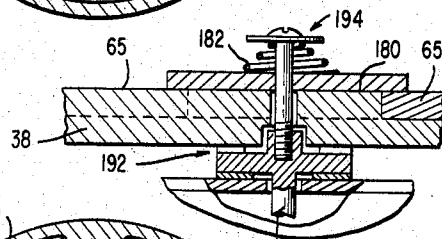


FIG. 10



GEORGE D. STOHRER

BY Burns, Evans, Benedict, Swedler & Matulis

ATTORNEYS

1

2

3,481,072
CAM CONTROLLED TOY VEHICLE
George D. Stohrer, 2810 Bosworth Lane,
Bowie, Md. 20715
Filed May 1, 1967, Ser. No. 635,067
Int. Cl. A63h 33/26

U.S. Cl. 46—244

11 Claims

ABSTRACT OF THE DISCLOSURE

A motor driven toy vehicle which includes selectively operable locomotion means for moving the vehicle in opposite directions. First follower means for selecting the direction of motion of the locomotion means is controlled by first cam means driven in timed relation to the motor. Selectively operable steering means for steering the vehicle is controlled by second follower means operated in response to the motion of second cam means driven in timed relation to the motor. At least one of the first and second cam means includes a base moved along a predetermined path relative to the adjacent corresponding follower means. A plurality of cam members detachably secured to the base have peripheral portions extending different distances outwardly of the path of motion of the base. The peripheral portions of the various cam members successively contact and move the adjacent corresponding follower means which in turn controls the operation of the vehicle in timed relation to the motor.

Background of invention

This invention relates to a toy vehicle and in particular to a toy vehicle whose directions of motion and of steering may be adapted to follow a predetermined sequence.

Toy vehicles adapted to perform a predetermined sequence of movements including forward and reverse motions and various turning or steering motions are generally known. Such toy vehicles usually include steerable wheels turned in various steering directions by a follower controlled by a cam driven in timed relation to the vehicle motor. Such vehicles also frequently include driving wheels whose direction of forward or reverse rotation is controlled by a follower contacting a second cam also driven in timed relation to the vehicle motor.

Such an arrangement, though adequate for the intended purpose, frequently suffers from the major disadvantage that the vehicle is capable of only a single pattern of motion. In this event a child playing with the toy may rapidly lose interest therein once its single pattern of motion has become familiar to him. In addition, such a vehicle may be of little use as an educational toy as the child's inability to change the pattern of motion offers him little opportunity to explore the mechanical principles of control upon which such motion is based by experimenting with different patterns of motion.

Although one attempt has been made to obviate these problems by providing a vehicle capable of performing more than one predetermined pattern of motion by the use of differing, replaceable cams, such prior attempt has proven generally unsuccessful as the number of cams that could be provided at an economic price permitted only a minimal increase in adaptability, and further the usual, fully preformed nature of the cams offered little educational opportunity for the child to experiment with altering the motion of the vehicle.

Summary of invention

It is therefore a general object of the invention to provide a toy vehicle intended to obviate problems of the type previously described.

It is a particular object of the invention to provide a toy vehicle of the type capable of performing a predetermined pattern of motion which may easily be adapted to enable the vehicle to perform an almost unlimited number of differing predetermined patterns of motion.

It is a further object of the invention to provide a toy vehicle provided with control mechanism for effecting a predetermined pattern of motion of the vehicle in which the control mechanism may be easily modified by a child to stimulate his educational development and increase his awareness of mechanical principles.

One aspect of the present invention designed to accomplish at least some of the desired objects entails the provision of a toy vehicle including motor means and selectively reversible locomotion means connected with the motor means for moving the vehicle in opposite directions. Follower means are connected with the locomotion means and may be moved to various predetermined positions including one predetermined position in which the locomotion means moves the vehicle in one direction, and another position in which the locomotion means moves the vehicle in an opposite direction. Movement of the follower means is controlled by cam means which includes a base connected with the motor means. Portions of the base are moved by the motor means in timed relation therewith along a predetermined path located adjacent the follower means. A plurality of cam members are detachably secured to the base with peripheral portions of the cam members successively contacting the follower means during movement of the base. Various peripheral portions of the cam members extend different distances outwardly of the predetermined path of motion of the base to cause movement of the follower means between the various predetermined positions thereof in timed relation to the motor means, thus controlling motion of the vehicle in opposite directions in a predetermined time pattern.

In another significant aspect of the invention steering means for selectively steering the vehicle in a neutral direction and in other directions inclined to the neutral direction are provided. Second cam and follower means similar to those provided for the locomotion control means, control the operation of the steering means to select various steering motions of the vehicle in timed relation to the motor.

By detaching certain of the cam members from the base and replacing them with other, differently configured cam members, an almost unlimited number of different patterns of motion may easily be provided.

The drawings

One preferred embodiment of a toy vehicle constructed in accordance with the present invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a perspective view of the toy vehicle constructed in accordance with the preferred embodiment of the invention;

FIGURE 2 is a top view of the toy vehicle shown in FIGURE 1;

FIGURE 3 is a cross-sectional side view of the toy vehicle shown in FIGURE 2 taken along the lines 3—3 therein;

FIGURE 4 is a cross-sectional end view of the toy vehicle shown in FIGURE 2 taken along the lines 4—4 therein with a clutch forming part of the present invention shown moved to an extreme position of clutching engagement;

FIGURE 5 is a perspective view partially in section of a locomotion cam member and a base forming a part of the present invention;

FIGURE 5 is a top view of another steering cam member forming a part of the present invention;

FIGURE 7 is a perspective view of an alternative embodiment of the invention utilized in performing a game of amusement;

FIGURE 8 is a cross-sectional top view of the alternative embodiment of the invention shown in FIGURE 7;

FIGURE 9 is a cross-sectional side view of the embodiment of the invention shown in FIGURE 8 taken along the line 9—9 therein;

FIGURE 10 is a cross-sectional view of a portion of the invention shown in FIGURE 9 taken along the lines 10—10 therein;

FIGURE 11 is a cross-sectional end view of a marker sheet and follower marking member forming a portion of another alternative embodiment of the present invention; and

FIGURE 12 is a top view of a portion of the alternative embodiment of the invention shown in FIGURE 11.

Detailed description

Referring in more detail to FIGURE 1 one preferred embodiment of the invention there shown comprises a toy vehicle 2 having a generally rectangular body 4. The body 4 includes front and rear ends 6 and 8 respectively, right and left sides 10 and 12, and a horizontally disposed flat upper surface 14. A motor housing 16 extends upwardly from the rear end of the body. The body 4 is supported by locomotion wheels 18 mounted adjacent the midpoint of the body, which are driven by the motor to move the body in forward and reverse directions. A steering wheel 20 is mounted adjacent the forward end of the body. It will be appreciated that other shapes for the body 4 may be provided, such as for example representations of automobiles, animal figures and the like.

Referring to FIGURES 2 and 3, an electrical motor 22 having a vertically mounted driving shaft, and an electric battery for the motor 22, are located on the upper surface 14 within the area of the housing 16. The motor 22 drivingly engages a gear train comprising successively meshing gear wheels 24, 26 and 28 mounted for horizontal rotation about and independently of, respective vertical shafts 30, 32 and 34 extending downwardly from the lower surface of the top plate 14 of the body. The gear wheel 28 may be selectively connected with the locomotion wheels 18 in a manner to be described hereinafter, to move the vehicle in opposite, forward and reverse directions.

A gear wheel 36 concentrically mounted for rotation about and independently of the shaft 34, extends upwardly through the top plate 14, and is integral with and driven by the gear 28. The upper extremity of the gear wheel 36 meshingly engages the peripheries of two, forward and rear base wheels 38 and 40 respectively, rotatably mounted in the top plate 14, for horizontal rotation about vertical axle portions 41 and 42 respectively. The forward and rear base wheels 38 and 40 have secured to their upper surfaces forward and rear circular cams 43 and 44 respectively.

The rear cam 44 comprises a plurality of segmental cam members 46 detachably secured to the upper surface of the rear base wheel 40. The outer peripheral edges of the cam members 46 successively contact a rear follower 50. The rear follower 50 is supported at the free extremity of a first arm 52 extending radially from the upper end of the shaft 34 and is urged constantly against the adjacent cam members by a spring (not shown).

The outer peripheral edges of each cam member 46 extend varying radial distances from the axis of rotation of the base 40 so that movement of the cam members 46 past the follower 50 causes radial motion of the arm 52 and of the shaft 34 about the axis thereof. The turning motion of the shaft 34 moves a second radial arm 54, secured to the lower end of the shaft 34, between various predetermined positions, one of which, as will be described, selects forward driving motion of the wheels 18

while another position selects reverse rotation of the wheels 18.

The previously mentioned steering wheel 20 is mounted for rotation about a horizontal axle 60 supported at the free extremities of a downwardly directed yoke 62. The yoke 62 is fixedly secured to the lower end of a vertical shaft 64 mounted for rotation in the top plate 14 and extending upwardly therethrough. A second, forward follower 66 is urged by a spring (not shown) into continuous contact with successive peripheral portions of the various cam members 65. The follower 66 is supported at the free extremity of a forward radial arm 68 secured to the upper end of the shaft 64. Motion of the various cam members 65 past the follower 66 causes radial motion of the arm 68 and of the shaft 64 about the axis thereof. The turning motion of the shaft 64 causes corresponding steering movement of the wheel 20 in timed relation to the operation of the motor means.

From the foregoing description, it will be apparent that the cam members 46 on the rearward base wheel 40 control the directional motion of the driving wheels 18 in timed relation to the operation of the motor 22, and that the cam members 65 secured to the forward base wheel 38 control the steering motion of the wheel 20 in timed relation to the operation of the motor 22. Thus, particular patterns of interrelated directional and steering motion can be achieved by selection and relative positioning on the base wheels 38 and 40 of suitable, differently peripherally configured cam members. This arrangement, it will be appreciated, provides the toy vehicle with great adaptability for performing an almost unlimited number of differing predetermined sequences of motion. The ability thus provided to effect easy changes in the vehicle's pattern of motion, is such as to stimulate a child's interest in the toy and provides valuable educational instruction in general mechanical principles.

Referring to the steering portions of the vehicle in more detail, it will be seen that the radially outward peripheral portions of the cam members 65 extend along one of three spaced, inner, intermediate and outer radii 70, 72 and 74 respectively, concentric about the axis of rotation of the forward base wheel 38. With the cam follower 66 abutting a portion of a cam member extending along the intermediate radius 72 (as actually shown in FIGURE 2), the shaft 64 is so positioned as to align the steering wheel 20 with the longitudinal axis of the vehicle for straight ahead or neutral steering motion. With the follower 66 contacting a portion of a cam member 65 extending along the outer radius 74, the shaft 64 is turned to a position in which the wheel 20 is inclined to the left. Similarly, contact of the follower 66 with a portion of a cam member 65 extending along the inner radius 70, positions the wheel 20 at an inclination towards the right. Each of cam members 65 includes peripheral portions extending along one or more of the radii 70, 72 and 74 with smooth transitions between portions disposed on different radii. By assembling cam members 65 of different configuration together about the base wheel 38, a desired predetermined sequence of steering motion of the wheel 20 in timed relation to the operation of the motor 22 can be provided.

Referring to FIGURE 4, the manner in which the locomotion wheels 18 are selectively driven in forward and reverse directions may be considered. The locomotion wheels 18 are mounted on a transverse shaft 80 adjacent the extremities, extending laterally of the body 4 and mounted for rotation therein. One of the wheels 18 is fixedly secured to the shaft 80 and functions as a driving wheel when the shaft 80 is rotated, as will be subsequently described. The other wheel 18 is rotatably mounted on the shaft 80 to permit different relative rates of rotation of the locomotion wheels. This is necessary to prevent binding or slipping of the wheels when the vehicle is moving in a turning path, thus requiring the wheel on the outside of the toy to travel faster than that

on the inside, as is well known. The cam sectors may, if desired, also be differently configured to further reduce such relative motion during inside or outside turning relative to the driving wheel.

Mounted on the shaft 80 for rotation relative thereto, but secured against axial movement along the shaft 80, are two, identical, first and second pinion gear wheels 82 and 84. The pinion gear wheels 82 and 84 meshingly engage a ringlike bevel gear 86 extending perpendicularly downwardly from the horizontally disposed lower surface of the previously mentioned gear wheel 28 and concentric with the axis of rotation thereof. Rotation of the gear wheel 28 by the motor 22, through the intermediate gears 24 and 26, causes the bevel wheel 86 to drive the pinion wheels 82 and 84 in opposite rotational directions about the transverse shaft 80. The opposed radial surfaces of the pinion wheels 82 and 84 are provided with radial clutching surfaces 88 and 90 respectively. In the preferred embodiment the clutching surfaces comprise radial gear teeth, but it will be appreciated that other clutching surfaces, such as for example frictional surfaces, may be provided.

An intermediate portion 92 of the transverse shaft 80 extending between the pinion wheels 82 and 84 and having a square cross section, supports a sliding clutch member 94. The member 94 is provided with radial clutching surfaces 96 and 98 (also comprising radial gear teeth) at its axial extremities, adapted to separately, clutchingly engage each of the adjacent radial clutching surfaces 88 and 90 of the first and second pinion wheels 82 and 84. The clutching member 94 is prevented from rotating relatively to the transverse shaft 80 by the cooperating flat faces of the square cross section of the intermediate portion 92, and is also slidable axially along the intermediate portion 92 of the shaft so that either or neither of the pinion wheels 82 and 84 may be clutchingly engaged at any one time.

Extending radially about the outer surface of the clutch 94 is a collar 100 having a central annular groove 102. The previously mentioned second radial arm 54 secured to the lower extremity of the shaft 34, is provided at its radial extremity with a depending vertical pin 104 received within the annular groove 102. As the shaft 34 is turned by the action of the various cam members 46, in the manner previously described, the pin 104 describes an arc about the axis of the shaft 34. The transverse extent of this arc is sufficient to cause the clutch member 94 to move from one extreme position in clutching engagement with the first pinion 82, through a neutral position in clutching engagement with neither pinion, to another extreme position in clutching engagement with the second pinion 84. In the first position, the rotational motion of the first pinion 82 is transferred through the clutch member 94 to the shaft 84 to turn the wheels 18 in one direction while in the second position the rotation of the second pinion gear 84 (previously described as being in the opposite direction to that of the first pinion 82) is transferred through the clutch member 94 to turn the shaft 80 and the wheels 18 in the reverse direction. In the neutral position the clutch 94 engages neither pinion gear and the wheels 18 are not driven by the motor.

In a manner similar to that previously described for the steering control, the cam sections 46 utilized to effect locomotion control also have their radially outer peripheral portions configured to lie on inner, intermediate and outer radii 105, 106 and 107 concentric with the axis of rotation of the base wheel 40. In the preferred embodiment the radii 105, 106, 107 are respectively the same as the radii 70, 72, 74. However, this dimensional similarity may be varied if so desired. Abutment of the follower 50 with peripheral portions of the cam members 46 extending along the intermediate radius 106 positions the pin 104 at the center of its described arc of motion so that the clutch member 94 is located in the neutral

position intermediate the pinions 82 and 84 and not in clutching engagement with either. Contact of the follower 50 with a cam portion extending along the outer radius 107 moves the clutch 94 into clutching engagement with one of the pinion gears to drive the vehicle in one direction as previously described and contact the follower 50 with a cam portion extending along the inner radius 105 to move the clutch member 94 into clutching engagement with the other pinion to drive the vehicle in the opposite direction.

In order to enable the cam members 46 and 65 to be readily secured to the respective base wheels 38 and 40, each of the base wheels 38 and 40 is provided with an integral raised, annular projection 110 of rectangular cross section adjacent and spaced inwardly of the periphery of the base wheel (FIGURE 5). Each of the cam members 46 and 65 is provided with a flat, lower surface 111 having an arcuate, rectangular cross section channel 112 therein configured to receive adjacent portions of the projection 110 to locate the cam member in correct radial position on the base wheel. At its inner extremity each cam member is provided with an arcuate surface 114 adapted to abut an annular collar 116 (FIGURE 3) extending about the shank of a bolt 118 threadedly engageable with the relevant base wheel and having a wide upper flange 120 extending over the major portion of the upper surface of the cam members for clamping the cam members firmly against the base wheel.

To enable the cam members 46 and 65 to be used in a relatively inverted position as well, each cam member 46 and 65 is provided with a flat, upper surface 122 parallel to the lower surface 111, having a second channel 124 also configured to receive portions of the projection 110 on the base wheels. Thus, each of the cam members 46 and 65 may be reversibly mounted on its respective one of the base wheels to enable any of the cam members having a peripherally asymmetric configuration, to be used to provide two different control functions, one when one way up and another when inverted.

The cam members each subtend the same arcuate angle so that a set of cam members fitting snugly together around the axis of rotation of the respective base wheel may be easily provided each time it is desired to assemble such a set.

To provide a convenient start position on each base wheel and to provide an abutment preventing rotational slippage of the cam members about the surfaces of the base wheels, two start sectors 126 are permanently secured by bonding to the upper surface of the two base wheels 38 and 40. Alternatively the start sectors 126 may be integral with the bases, as shown for example in FIGURE 10, or secured to the bases in other conventional ways. At their radially inner extremities each of the start sectors 126 is integral with a respective one of the previously mentioned collars 116. The start sectors 126 on the base wheels 38 and 40 are generally similar in configuration to the cam members 46 and 47 but have their peripheries extending along the respective intermediate radii 72 and 106 so that the start sectors provide neutral control functions for both the steering and directional motion of the vehicle.

It will be appreciated that the cam segments 46 used to control steering may be configured in a similar manner to the cam members 65 used to control direction of locomotion. However, in the preferred embodiment, changes in radial projection of the steering cam members 46 (FIGURE 6) are configured to be generally central of the cam member periphery while changes in radial projection of the locomotion cam members 65 occur adjacent the edges of the cam periphery. This difference in configuration taken in conjunction with the arrangement of the various members of the gear train, ensures that steering changes will not occur concurrently with directional locomotion changes.

An alternative embodiment of the invention shown

7

in FIGURES 7 to 10 provides a toy vehicle 140 shaped as a grotesque figure, such as a crab or the like, which may be caused to move along a predetermined path to collect a plurality of target figures 142, such as for example dummy men, in performing a game of amusement.

The vehicle 140 includes a rear body section 144 (FIGURE 83) including locomotion wheels 146 driven by an engine 148 (FIGURE 9). The engine 148 in the preferred embodiment comprises a clockwork engine, but it will be appreciated that other conventional forms of engine such as for example electric motors may be utilized. Supported on a superstructure 150 connected with the engine 148 is a steering wheel 152 controlled by steering apparatus 154 including a base 38, steering cam members 65, follower 66, radial arm 68 and steering shaft 64 of the type previously described for the steering mechanism of the first embodiment of the invention.

Connected to the rear body 144 is a forward body 160 defining a dome-shaped chamber disposed symmetrically of the longitudinal axis of the vehicle and having a forward opening 162 of sufficient lateral and vertical extent to admit one of the target figures 142. Projecting forwardly and curved arcuately outwardly from the opening 162 are two forwardly projecting, generally horizontal guide members 163 adapted to guide a contacted target figure 142 towards and through the opening 162 during continued forward motion of the vehicle 140.

Depending from the center of the interior of the dome-shaped housing 160 is a vertical shaft 164 supporting at its lower extremity a freely rotatable, horizontally disposed magnetized wheel 166. The wheel 166 is disposed intermediate the vertical ends of the opening 162 with its periphery extending a short vertical distance into the opening 162. As a target 142, which is also of magnetic material, is guided into contact with the wheel 166, it becomes magnetically secured to the underside thereof. Continued forward motion of the vehicle causes the wheel 166 to rotate relatively to the rear so that the target figures are successively stored on the underside of the disc 166 as shown in FIGURE 9.

FIGURES 9 and 10 disclose an alternative form of mounting for the various steering cam members 65 which utilizes a spring loaded clamping plate 180. The clamping plate 180 is urged downwardly against the radially inner upper surfaces of the cam members 65 by a spring 182 extending downwardly from the under surface of a retaining member 194 which includes a bolt and washer. Also included is a selectively rotatable ratchet connection 192 between the shaft 64 and the base wheel 38 which permits the latter to be relatively advanced manually in one direction relative to the shaft so that the start of cam motion may be selectively positioned.

It will be appreciated that by setting up the target figures 142 in a particular pattern, a child may be required to exercise considerable ingenuity in assembling the various steering cam members 65 required to cause the vehicle to be guided in a correct path to successively pick up each of the target figures 142.

Another alternative embodiment of the invention, illustrated in FIGURES 11 and 17, provides a cardlike cam for controlling vehicle motion. In this embodiment the previously mentioned radial arm 68 has secured thereto a rigid extension arm 200 parallel to and spaced above the arm 68. The arm 68 further includes a joint 207 permitting the roller 66 to be swung to an inoperative position out of contact with the cam members 65 during certain operations to be described in the following paragraphs. Underlying and pivotally connected to the arm 200 is a second arm 201 supporting at one extremity a marking instrument 202 having a marking point 204. A horizontal stiff card 206 is supported on the upper surface of the cam members 65 and has its upper surface in contact with marking point 204. The card 206 rests upon and is connected to the cam members (by conventional means not shown) and rotates concurrently

8

therewith. The vehicle may be pushed along a desired path with the steering wheel 20 moved from side to side manually to cause the marking instrument 204 to trace out a line on the card 206, relating steering motion of the wheel 20 to the forward advance of the vehicle. The card 206 may then be removed and cut along the traced line to define a camlike edge. The cut disc 206 is then fixed on and above cam members 65 fixed on the base (taking care that the cam members selected to support the card 206 are not of sufficient radial extent to project beyond the adjacent cut portion of the periphery of the card 206), and the arm 201 is rotated relative to the arm 200. This brings the outer peripheral edge of a vertical roller 208 mounted at the other end of the arm 201 to a position in vertical alignment with that formerly occupied by the point 204 in abutting contact with the cut edge of the disc which may thereafter act directly as a cam edge to control steering motion of the vehicle. The arm 201 is engaged in each of its positions by a sliding locking pin 209.

It will be appreciated that in following the teaching of the present invention, an educational toy having particular value for encouraging appreciation of mechanical principles in children is provided.

In particular, the almost unlimited number of cam configurations that can be provided by utilizing alternative combinations of the cam members permits an almost unlimited number of predetermined patterns of motion to be performed by the vehicle.

Additionally, the provision of cam members which may be reversibly mounted upon the base wheels permits the range of utility of each cam member to be effectively doubled.

Other advantages are provided by the sliding clutch member which permits the direction of motion of the vehicle to be reversed with particular ease and by the marking instrument and removable card which enables particularly desirable combinations of cam members to be recorded.

In addition, the use of the invention as an amusement device for picking up target figures distributed in a predetermined pattern relative to the vehicle provides the user with considerable opportunities for the exercise of skill and for the development in a child of reasoning ability.

Although the invention is described with reference to certain preferred embodiments, it will be apparent to those skilled in the art that additions, deletions, modifications, substitutions and other changes not specifically described or illustrated in these embodiments may be made which will fall within the purview of the appended claims.

What is claimed is:

1. A toy vehicle comprising:

motor means,

selectively reversible locomotion means connected with said motor means for moving the vehicle in opposite directions,

locomotion control means including,

follower means connected with said locomotion means and movable between various predetermined positions, said follower means in a first predetermined position thereof causing said locomotion means to move the vehicle in one direction, said follower means in a second predetermined position thereof causing said locomotion means to move the vehicle in the opposite direction,

cam means including,

a base connected with said motor means said base including,

a base portion operable to be moved by said motor means in timed relation to said motor means along a predetermined path located adjacent said follower means, and

a plurality of cam members detachably secured to

said base, with camming portions of said cam members being operable to successively contact said follower means during movement of said base, and with various of said camming portions of said cam members extending different distances from said predetermined path and being operable to cause movement of said follower means between said various of said predetermined positions thereof in generally timed relation to said motor means.

2. A toy vehicle as defined in claim 1 wherein, said base is operable to be rotated about an axis by said motor means, and said camming portions of said cam members are operable to successively contact said follower means and are spaced at different radial distances from said axis.

3. A toy vehicle as defined in claim 1 wherein said locomotion means includes

wheel means adapted to support the vehicle for motion,
a shaft fixedly secured to said wheel means for rotating said wheel means,
first and second gear means spaced axially of said shaft and concentric therewith, each of said gear means being freely rotatable relative to said shaft,
transmission means connected with said motor means for rotating said first and second gears in opposite directions concurrently, and
clutching means slidable axially of said shaft, said clutching means selectively slidable into alternative clutching engagement with each of said first and second gear means and into a position disconnected from each of said gear means, said clutching means being fixed against rotation relative to said shaft;

said follower means includes

a shaft rotatably mounted in the vehicle, a first arm extending radially from one end of said shaft, said first arm having a free extremity contacting successive camming portions of said cam members, and
a second arm extending radially from the other extremity of said shaft, the free extremity of said second arm contacting said clutch means to slide said clutch means axially of said shaft between and into clutching engagement with each of said first and second gear wheels and with neither of said gear wheels in response to movement of the free extremity of said first radial arm by said cam members.

4. A toy vehicle comprising:

motor means,
actuating control means for selectively actuating the toy vehicle in various diverse manipulations, said actuating control means including,

follower means movable between various predetermined positions, said follower means in each of said predetermined positions thereof causing said vehicle to be actuated in a different mode of operation,

cam means including,

a base connected with said motor means, with a portion of said base being operable to be moved along a predetermined path located adjacent said follower means by said motor means, and
a plurality of cam members detachably secured to said base, with camming portions of said cam members being operable to successively contact said follower means during movement of said base, and with various camming portions of said cam members extending different distances from said predetermined path and being operable to move said follower means to various of said predetermined positions.

5. A toy vehicle as defined in claim 4 wherein, said base is operable to be rotated about an axis by said motor means, and said camming portions of said cam members are operable to successively contact said follower means and are spaced at differing radial distances from said axis.

6. A toy vehicle as defined in claim 4 wherein

said actuation control means comprises steering means including

a body having a first axis,
wheel means,
axle means supporting said wheel means for rotation about a wheel axis, and
means mounting said axle means in said body, said mounting means supporting said axle means in a neutral position in which said wheel axis is perpendicular to said first axis of said vehicle, and said mounting means supporting said axle means for steering motion relative to said first axis to other positions in which said wheel axis is differently inclined to said first axis, and

said follower means includes

a shaft mounted for rotation relative to said body, a first arm extending radially from one end of said shaft, said arm including a free extremity, means urging said free extremity into continuous contact with successive peripheral edges of said cam members, which define said camming portions, during motion of said base, and
a second arm extending radially from the other end of said shaft, said second arm connected with said mounting means for moving said axle means relative to the said first axis of the vehicle between said neutral position and said other positions.

7. A toy vehicle including:

motor means,
selectively reversible locomotion means connected with said motor means for moving the vehicle in opposite directions,

locomotion control means including,

first follower means connected with said locomotion means and movable between various predetermined positions, said first follower means in one predetermined position thereof causing said locomotion means to move the vehicle in one direction and said follower means in another predetermined position thereof causing said locomotion means to move the vehicle in the opposite direction, and

first cam means contacting said first follower means for causing motion of said first follower means between said predetermined positions in timed relation to the operation of said motor means;

selectively operable steering means for steering the vehicle in a neutral direction and in other directions inclined to said neutral direction,

steering control means including;

second follower means connected with said steering means and movable between various predetermined positions, said second follower means in a neutral predetermined position thereof causing neutral steering motion of the vehicle and in other predetermined positions thereof respectively causing steering motion, in other directions inclined to said neutral direction,

second cam means continuously contacting said second follower means for causing motion of said second follower means between said predetermined positions thereof in timed relation to the operation of said motor means;

each of said first and second cam means including,

a base connected with said motor means, said base including

11

- a base portion operable to be moved by said motor means in generally timed relation to said motor means along a predetermined path located adjacent the follower means which is contacting said one of said cam means, 5
- a plurality of cam members detachably secured to said base, with camming portions of said cam members being operable to successively contact the corresponding said follower means during movement of said base, and 10
- some of said camming portions of said cam members extending relatively different distances from said predetermined path of motion of said base and being operable to cause motion of said follower means, which is contacting said one of said cam means, between said various predetermined positions thereof in generally timed relation to said motor means. 15
8. A toy vehicle as defined in claim 7 wherein, each said base is operable to be rotated about an axis by said motor means, 20
- the camming portions of the cam members associated with each base are operable to successively contact said follower means associated therewith and are spaced at differing radial distances from the axis of the associated base. 25
9. A toy vehicle as defined in claim 8 wherein each of said cam members includes, 30
- a base surface abutting an adjacent surface portion of its associated base, and
- a peripheral edge defining a said camming portion and facing generally radially of said axis

12

- of its associated base and extending generally perpendicular to the base surface; and
- each said base and each of said cam members detachably secured thereto includes, 5
- interengaging portions for locating the peripheral edge of the cam members in a predetermined radially spaced position in relation to the axis of the base.
10. A toy vehicle as defined in claim 9 wherein each said cam member further includes; 10
- another surface parallel to and spaced from the base surface of the cam member,
- said other surface of the cam member being engageable with one of said bases to enable the cam member to be mounted on said one of said bases in a relatively inverted position.
11. A toy vehicle as defined in claim 7 wherein at least some of said cam members detachably secured to one of said bases may be selectively interchanged with others of said cam members secured to said one of said bases, whereby the motion of the vehicle in generally timed relation to said motor means may be changed. 20

References Cited

UNITED STATES PATENTS

3,102,363	9/1963	Ferriot	46—244
3,131,508	5/1964	Brown	46—244
3,252,247	5/1966	Miller et al.	46—244

ANTONIA F. GUIDA, Primary Examiner

R. F. CUTTING, Assistant Examiner