Nov. 23, 1971 D. V. BOSLEY ET AL 3,621,608

PROGRAMMABLE STEERING TOY VEHICLE

Filed March 2, 1970 4 Sheets-Sheet 1

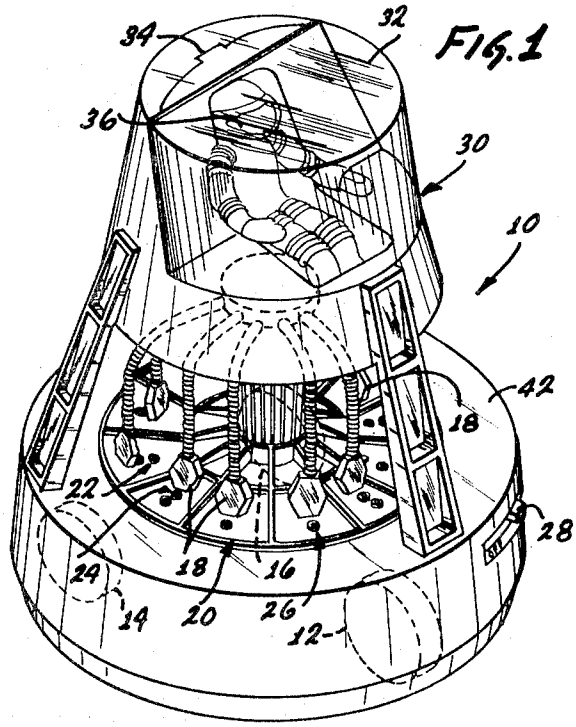


FIG. 1

FIG 5

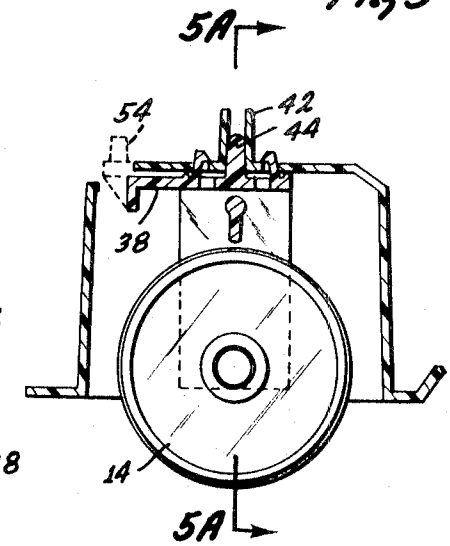
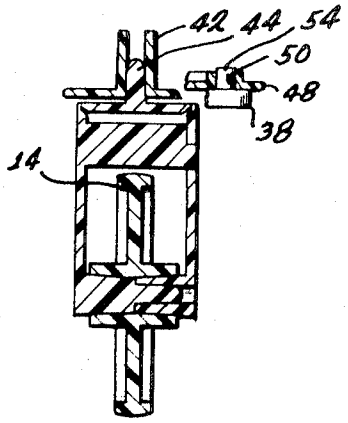


FIG. 5A



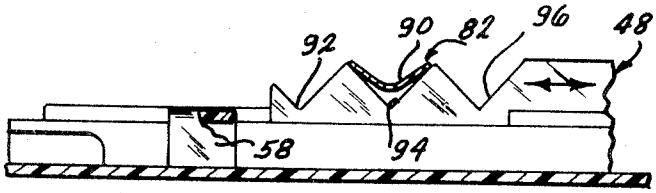


FIG. 4

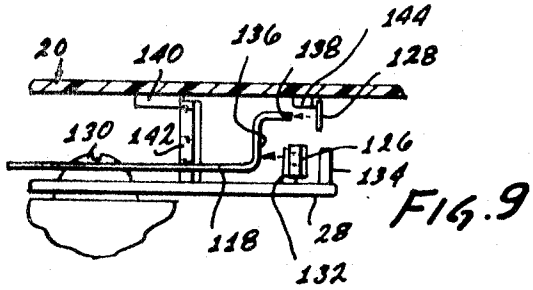


FIG. 9

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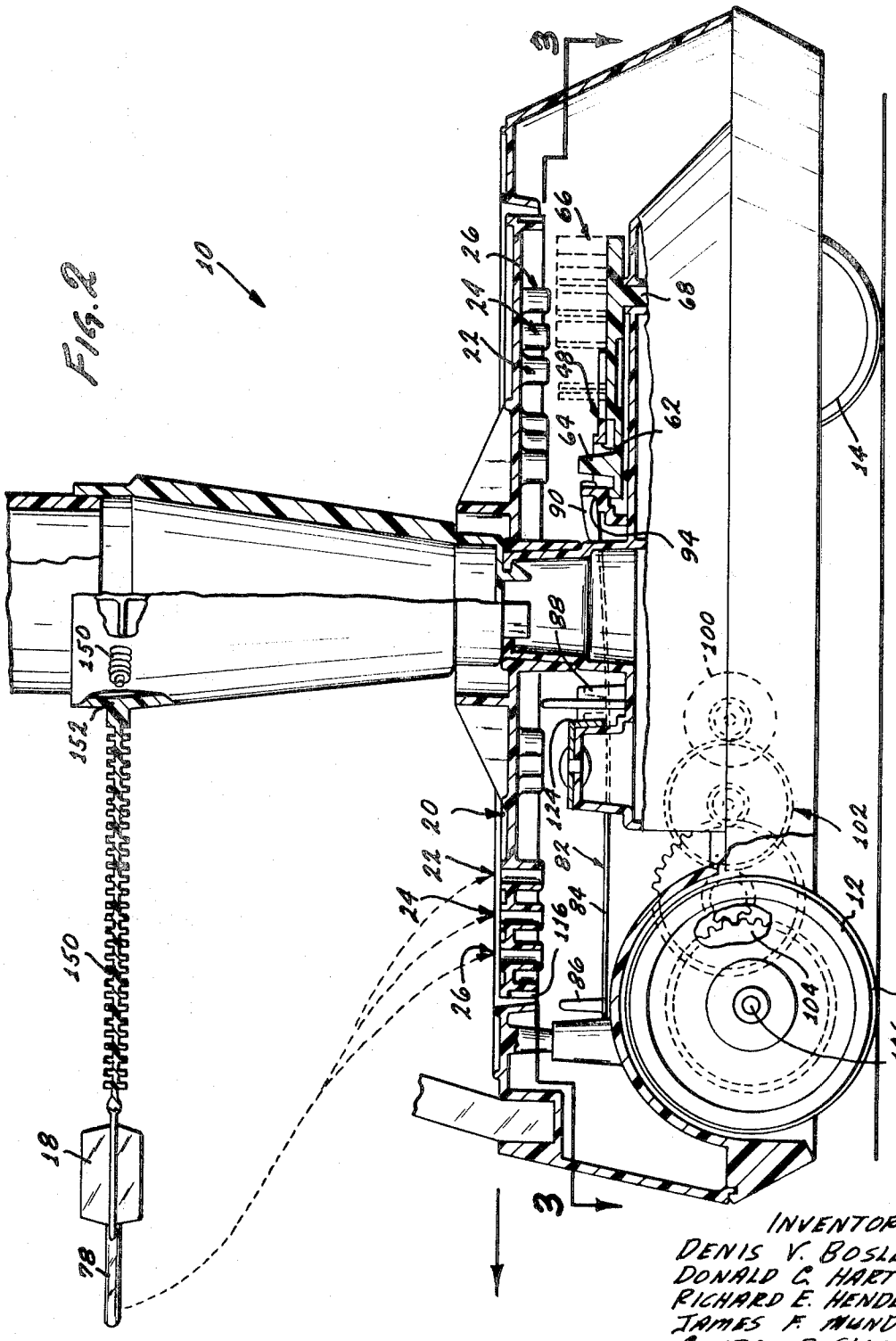
Fig. 2



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PROGRAMMABLE STEERING TOY VEHICLE

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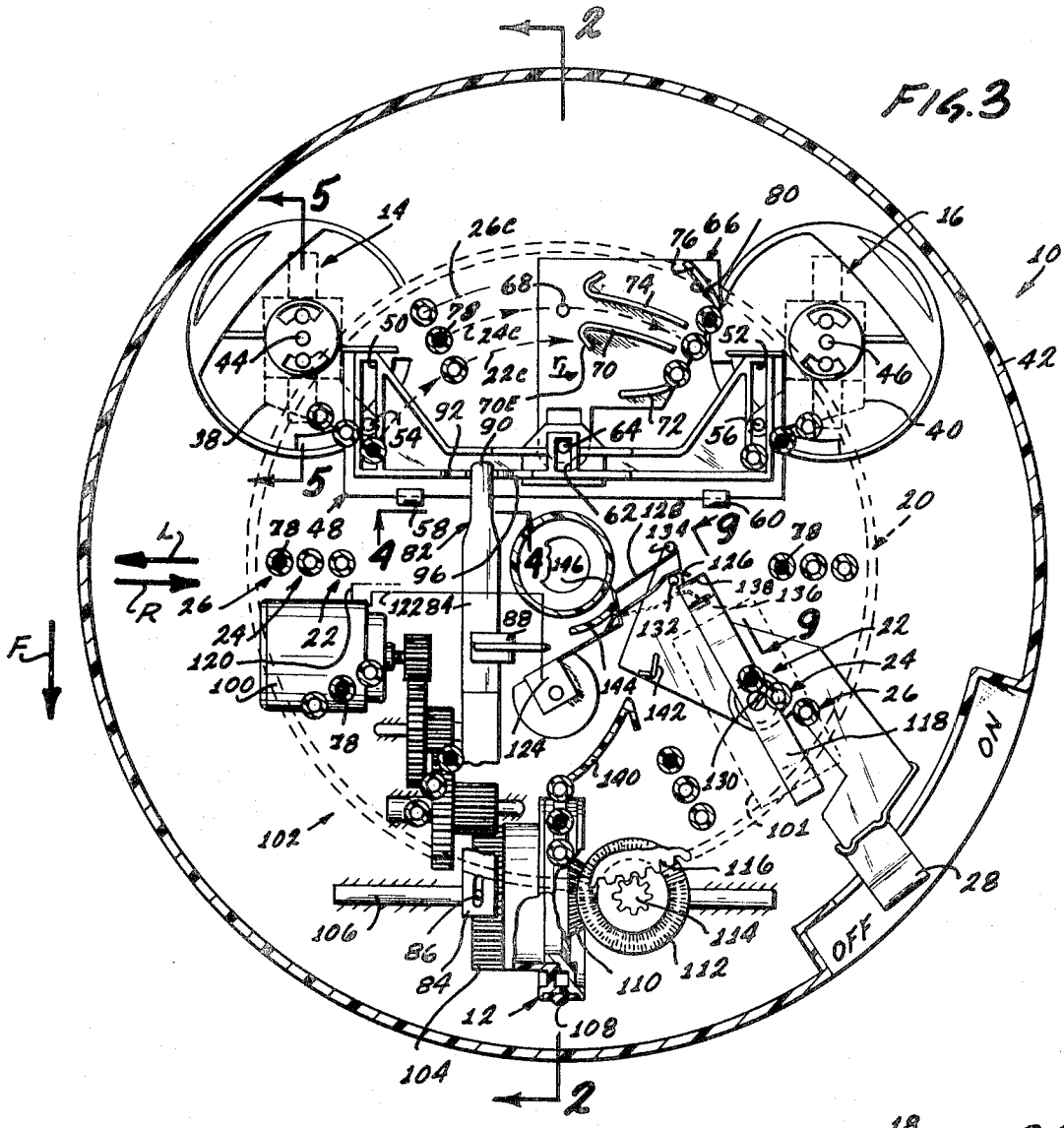

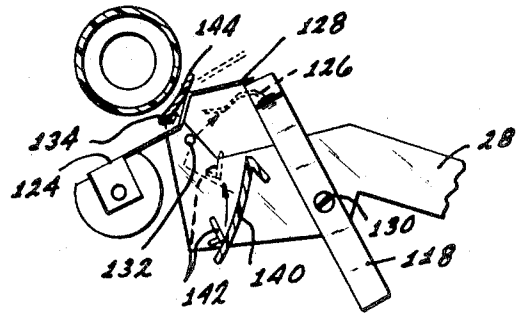

FIG. 8

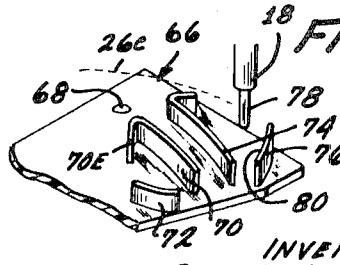

FIG. 3A

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PROGRAMMABLE STEERING TOY VEHICLE

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FIG. 6

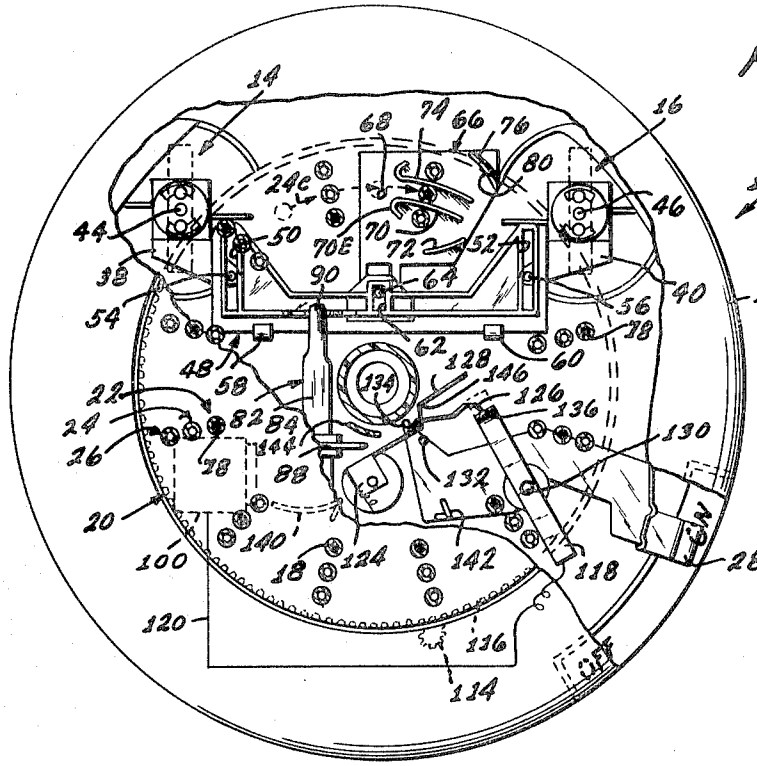
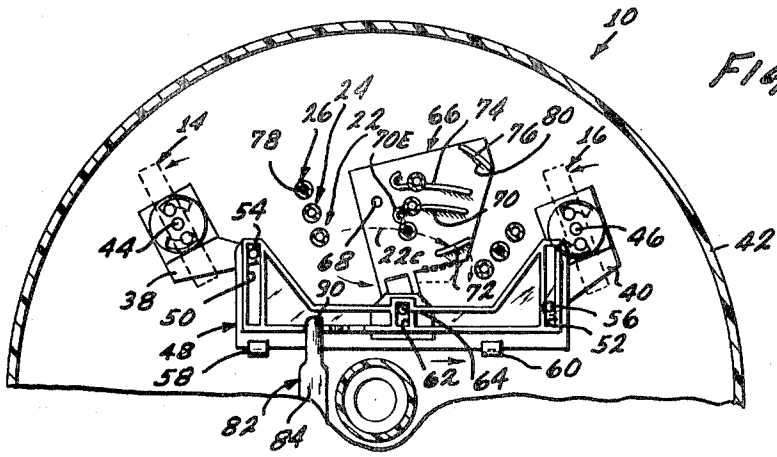


FIG. 7



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3,621,608

PROGRAMMABLE STEERING TOY VEHICLE

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U.S. Cl. 46—206 10 Claims

ABSTRACT OF THE DISCLOSURE

A toy vehicle which can be programmed to move in a desired course, by inserting plugs into appropriate holes in a programming wheel. The programming wheel has three concentric groups of holes, to receive plugs to designate a left turn, right turn, or straight-ahead movement. The programming wheel is slowely turned so that it makes one revolution while the vehicle makes one complete run along its route, the wheel bringing the plugs successively into position to direct the course of the vehicle. Two sets of cams positioned below the programming wheel are moved by the plugs to turn the vehicle wheels, each set of cams including a turning cam which can steer the vehicle at a predetermined angle, and a return cam which is struck by a plug a predetermined time after the turning cam is struck, to return the vehicle to its straight-ahead position after the vehicle has turned approximately 90° from its previous direction.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to toy vehicles, and more particularly, to toy vehicles which can be programmed to move along a predetermined route.

(2) Description of the prior art

A highly entertaining toy is provided by a vehicle which can be programmed to move along a variety of routes. In order to facilitate programming of the route by a child, it should be possible to accurately define a route by making simple choices about several parts of the route, such as whether the vehicle will turn left or right or continue straight ahead during each of several intervals. It is also desirable that the vehicle be capable of accurately repeating a program, so that once a route is established and tested, a child can know with confidence that the vehicle will accurately repeat that route.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a toy vehicle which can be programmed in a simple manner to follow a desired route.

Another object is to provide a programmably steerable toy vehicle which can accurately repeat a route for which it has been programmed.

In accordance with one embodiment of the present invention, a toy vehicle is provided which has a motor-driven traction wheel for moving it along the ground and a pair of steering wheels which can be pivoted to turn the vehicle to the left or right as well as steer it straight ahead. A programming wheel is rotatably mounted on the vehicle and is driven by the motor so that it makes one complete revolution each time the vehicle moves along a programming course. The programming wheel can receive programming elements that pivot the steering wheels in a desired direction, the programming elements successively coming into position to operate the steering wheels as the programming wheel turns.

The steering wheels are held by a yoke that can be shifted to the left or right to steer the vehicle, the yoke being shifted by a steering lever which lies under the programming wheel. The steering lever carries two pairs of cams, one pair being operated for a left turn and the other for a right turn. A programming element positioned to dictate a turn first strikes a left or right turning cam to cause the steering wheels to steer a predetermined angle away from a straight-ahead direction. After the vehicle has moved a predetermined distance whereby it has turned 90° from its previous direction, the same programming element strikes a return cam which causes the steering wheels to return to a straight-ahead position. The programming elements are plugs which can be inserted down through holes in the programming wheels so that their lower ends are in the path of the cams.

The novel features of the invention are set forth with particularity in the appended claims. The invention will be best understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a programmable vehicle constructed in accordance with the present invention;

FIG. 2 is a side view of the vehicle of FIG. 1, partly in elevation and partly in section, and is a view which is taken on the line 2—2 of FIG. 3;

FIG. 3 is a view taken on the line 3—3 of FIG. 2;

FIG. 3A is a partial perspective view of the steering lever of FIG. 3, showing the manner in which the cams engage a plug;

FIG. 4 is a view taken on the line 4—4 of FIG. 3, showing the apparatus for latching the steering wheels;

FIG. 5 is a view taken on the line 5—5 of FIG. 3;

FIG. 5A is a view taken on the line 5A—5A of FIG. 5;

FIG. 6 is a view similar to FIG. 3, but showing a programming element passing between a pair of turning cams;

FIG. 7 is a partial view similar to FIG. 6, but showing the vehicle undergoing a right turn;

FIG. 8 is a partial view showing the electrical switch apparatus immediately prior to the end of a vehicle run; and

FIG. 9 is a view of the electrical switch apparatus taken on the line 9—9 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a programmable vehicle **10** constructed in accordance with the invention, which includes a traction wheel **12** at the front that is motor driven to move the vehicle along the ground, and a pair of steerable wheels **14**, **16** at the rear which steer the vehicle. The vehicle can be programmed to follow a desired course by inserting each of eleven plugs **18** into holes in a programming wheel **20**. The vehicle can then be started on a run of given length such as 20 feet. During the run, the programming wheel **20** makes one complete revolution so that each of the eleven plugs **18** moves past a mechanism that can steer the steerable wheels **14**, **16**. Thus, by the time the vehicle has completed its run, it traverses a course with up to eleven turns in it. The course may be set up so that the vehicle returns to the same spot from which it started. Upon completion of the run of predetermined length, the vehicle automatically stops.

In order to program the vehicle for a run, a child inserts each of the eleven plugs **18** into one of three holes in the programming wheel. The holes are arranged in three concentric circles, including a radially inner circle of holes **22** for commanding right turns, a middle row of holes **24** for commanding the vehicle to continue straight

ahead, and a radially outer circle of holes **26** for commanding left turns. After establishing a program, a child places the vehicle on the ground and facing in the direction desired for the start of the run, and he turns a switch lever **28** to an "ON" position to start the vehicle. The vehicle then moves forward a limited distance and then either turns or continues straight ahead in accordance with the placement of the first of the eleven plugs **18**. After each interval of travel, such as 20 inches, the vehicle may be commanded to make a turn, by reason of the placement of a plug **18** in a particular one of three holes. After each turn, the vehicle is traveling in a direction which is perpendicular to the direction of travel prior to the turn. After the vehicle has traversed eleven of the predetermined intervals, it continues a short distance and stops. In many instances, a child may program the vehicle so that it stops at the same position at which it started.

At the end of each run, the switch lever **28** is automatically moved to an "OFF" position. A child can start the vehicle on another run by merely moving the lever **28** to the "ON" position again. If the program has not been changed, i.e., if none of the plugs **18** have been installed in different holes, and if the vehicle is started at the same location and in the same initial direction as in the previous run, then it will accurately traverse the same course which it traversed in the previous run.

In order to enhance the entertainment value of the toy, it is constructed as an astronaut vehicle, and carries a capsule **30** at its top. The capsule has a transparent cover **32** which can be opened by pivoting it upwardly about a hinge area **34**, to install or remove an astronaut figure **36** therefrom. The capsule not only provides a way for placing the doll on the vehicle to simulate an astronaut driving the vehicle, but helps to indicate which direction is the forward direction, so a child knows which is the straight-ahead direction.

FIG. 3 illustrates the mechanism which enables the plugs to steer the vehicle. Each steerable wheel **14, 16** is rotatably mounted on a wheel-holding member **38, 40** that is pivotally mounted on the housing or frame **42** of the vehicle, at pivot points **44, 46**. A yoke **48** has opposite ends with slots **50, 52** that engage pins **54, 56** extending from the wheel-holding members **38, 40**. With the vehicle traveling in the forward direction indicated by arrow F (note that the steerable wheels are in the rear), a shifting of the yoke **48** in the direction L causes it to pivot both wheel-holding members **38, 40** clockwise. This causes turning of the steerable wheels **14, 16** in a manner that steers the vehicle to the left (with respect to forward vehicle movement). On the other hand, a shifting of the yoke **48** in the direction R causes it to pivot both wheel-holding members to turn the vehicle to the right. Thus, left and right shifting of the yoke **48** steers the vehicle. The yoke is mounted for sideward sliding by several slider bearings including bearings **58, 60**.

The center of the yoke has a slot **62** which receives a pin **64** that extends from a steering lever **66**. The steering lever **66** is pivotally mounted at **68** on the frame **42**. When the steering lever pivots in the direction of arrow *r*, it shifts the yoke **48** to the right, causing the steerable wheels to steer the vehicle to the right. Similarly, pivoting of the steering lever **66** in a direction opposite to arrow *r* causes the vehicle to steer to the left.

The steering lever **66** carries four cams, which can also be seen in FIG. 3A. These include a right turning cam **70**, a right return cam **72**, a left turning cam **74**, and a left return cam **76**. Each plug **18** has a pin **78** which can move along a path to strike the cams. The pins move along paths which may be referred to as right, straight, and left steering circles **22C, 24C** and **26C**, respectively. A pin moving along the right turning circle **22C** contacts the leading edge portion **70E** of right turning cam **70** to rotate the steering lever **66** in the direction of arrow *r*. This causes the steering lever to shift the yoke **48** in direction R, causing both wheel-holding members **38, 40** to pivot in a counter clockwise direction, and pivot both steerable wheels **14, 16** to steer the vehicle to the right. A short time later, the pin which contacted cam **70** contacts the right return cam **72**, and pushes it to return the steering lever to its original position. This causes the steering lever to shift the yoke **48** back to its original position to cause both steerable wheels to turn back to a straight-ahead steering position. In a similar manner, a pin moving along the left steering circle **26C** contacts the leading portion of left turning cam **74** to pivot the steering lever in a direction to turn the vehicle to the left. A short time thereafter, the same pin contacts the left return cam **76** to return the wheels to a straight-ahead position. FIG. 3A illustrates the situation where a pin **78** moving along the left steering circle **26C** has already passed the left turning cam **74** and is moving toward the left return cam **76** which it will contact at the point **80**. It may be noted that pins moving along the straight steering circle **24C** move between the turning cams **70, 74** and have no effect on the steering.

As described above, the cams on the steering lever **66** can cause the steerable wheels **14, 16** to steer to a predetermined angle to the left or right and then back to a straight-ahead position. However, it is possible for the steerable wheels to wander away from the angles to which they are pivoted during the periods inbetween engagement of a pin **68** with a cam. A latch **83** is provided to positively hold the steerable wheels at each of the three positions (right, left, and straight-ahead) to which they can be pivoted by engagement of the plug pins **68** with the cams. The latch **82** includes a latching spring **84** held at an inner end **86** and a middle portion **88** thereof, so that its outer end **90** is biased downwardly towards the yoke **48**. The yoke **48** is constructed with a pair of teeth that form three recesses **92, 94** and **96** that can receive the outer end **90** of the spring latching member **84**, as also shown in FIG. 4. When the yoke **48** has been shifted for a right turn, the latching end **90** of the spring falls into the recess **92** in the yoke to hold it in that shifted position. The latching end **90** maintains the yoke very close to a predetermined position so that the angle of steering to which the steerable wheels have been turned is accurately fixed. This angle is fixed regardless of the fact that the pin **78** may be skewed slightly and may have pushed the cams slightly too far or not far enough. Similarly, the latching end **90** accurately holds the yoke in a left-turning or straight-ahead position. Latching the steerable wheels at precisely known angles is important in assuring accurate and repeatable programming, as will be discussed below.

As shown in FIG. 3, the driving or traction wheel **12** and programming wheel **20** are driven by an electric motor **100** that can be energized by a battery indicated at **101** that is carried in the vehicle frame. The motor **100** drives a speed reducing gear train **102** which drives a gear **104** fixed to the traction wheel **12**. The traction wheel **12** and gear **104** are fixed to each other and rotatably mounted on a shaft **106** that is fixed to the frame. The traction wheel carries a tire **108** that increases its traction on the ground. A bevel gear **110** is fixed to the traction wheel **12**, and it turns another bevel gear **112** and a pinion **114** that engages gear teeth **116** on the programming wheel **20**. Thus, the programming wheel **20** is turned in direct proportion to turning of the traction wheel **12**. The large speed reduction employed in driving the programming wheel **20** causes it to rotate only once in each vehicle run, during which the traction wheel **12** rotates many times to drive the vehicle a long predetermined distance such as 20 feet.

As previously mentioned, energization of the motor **100** is accomplished manually by moving a switch lever **28** towards an "ON" position, while termination of motor energization at the end of a run is accomplished automatically. The battery **101** (often two batteries are provided) has one terminal connected to a conductive strip **118** that is fixed to the vehicle frame, and another terminal that is

connected by a wire (not shown), to a terminal 120 of the motor 100. The other terminal 122 of the motor must be electrically connected to the conductive strip 118 in order to complete the motor energization circuit. A conductive leaf spring 124 is provided whose inner end is connected to motor terminal 122, and whose outer end is split into two conductive members 126 and 128. The switch lever 28 which is pivotally mounted at 130 on the housing, has a pair of pins 132, 134 which hold the conductive members 126, 128 away from the conductive strip 118. However, if the switch 28 is moved to the "ON" position, as shown in FIG. 6, then pin 132 releases the conductive member 128 and pin 134 forces the member 128 into contact with a portion of the conductive strip 118 to complete the motor energizing circuit. FIG. 9 illustrates details of the conductive strip, showing a pair of contact surfaces 136, 138 thereon which can be contacted by the conductive members 126 and 128, respectively.

Referring again to FIG. 3, when the switch lever 28 has been manually turned to the "ON" position, the motor is energized and it powers the traction wheel 12 to make the vehicle move while rotating the programming wheel 20. Near the end of a vehicle run, when the programming wheel 20 has nearly completed one turn, the mechanism should operate to automatically turn the switch lever 28 to an "OFF" position and to de-energize the motor. Movement of the switch lever to an "OFF" position is accomplished by a de-energizing cam 140 that is fixed to the underside of the programming wheel 20. When the switch lever 28 is in an "ON" position, a projection 142 on the lever 28 is in the path of the de-energizing cam 140. The cam 140 pushes the projection 142 to rotate the lever 28 in a clockwise direction to its fully "OFF" position. This causes the pin 132 on the lever to push the contact member 126 away from the conductive strip 118.

It would be possible to rely solely on the de-energizing cam 140 to turn off the motor at the end of a vehicle run, if it could be known at which rotational position the cam 140 will move projection 142 far enough. However, the precise rotational position of the programming wheel at which the conductive member 126 just breaks contact with the conductive strip 118, cannot be accurately known. As a result, the vehicle may move a different distance for different runs, and the vehicle cannot be relied upon to accurately repeat a run. Accurate repeating or duplication of a run is important where the vehicle may have to pass around a complicated series of barriers. In order to more accurately define an end of a run, an auxiliary energizing cam 144 is provided on the programming wheel, which pushes the other conductive member 128 against the conductive strip 118 and releases it therefrom at precise times near the end of a run.

The conductive member 128 is formed with a sharp bend at 146 to assure an accurate location at which it disengages from the auxiliary engaging cam 144. Near the end of a run, and prior to movement of the projection 142 by the de-energizing cam 140, the auxiliary cam 144 contacts the conductive member 128 and pushes it outwardly to touch the conductive strip 118. A short time thereafter, the de-energizing cam 140 moves the projection 142 to rotate the switch lever 28 to a fully OFF position to break contact between conductive member 126 and conductive strip 118. However, the other conductive member 128 continues to be pushed against the conductive strip 118 by the auxiliary cam 144. A short time thereafter (i.e., after the programming wheel 20 has turned several degrees further), the trailing edge of the auxiliary cam 144 passes over the sharp bend 146 in the conductive member 128. The conductive member 128 then quickly springs radially inwardly. In springing inwardly, the member 128 breaks contact with the conductive strip 118 and opens the motor energizing circuit. The rotational position at which the auxiliary cam 144 will release the conductive member 128 is highly repeatable, and therefore the vehicle will travel a highly repeatable route for a given program.

FIG. 2 shows the manner in which the pin 78 of a plug 18 can be selectively inserted through any one of three holes 22, 24, 26 of the programming wheel 20. The plug 18 is held by a flexible member 150 whose inner end is tied to a member 152 that rotates with the programming wheel 20. The coupling member 150 serves to hold the plugs 18 to the vehicle so that they cannot be lost. It would be possible to eliminate the radially center row of holes 24 that command a continuation of straight-ahead motion, but then the plugs 18 would be dangling in a manner that was not neat. The provision of the holes 24 also help to emphasize the fact that a decision as to whether the vehicle must turn left or right or continue straight-ahead must be made for each sector of the programming wheel.

In order to set up the vehicle to follow a desired path, a child inserts the pins of each of the eleven plugs into one of the three holes corresponding to that plug. The vehicle can be programmed to return to the same spot from which it started. By appropriately placing the de-energizing cam 140 and auxiliary cam 144 with respect to the switch lever 28 and conductive spring 124, the vehicle turns itself "OFF" at a time approximately halfway between the position when the last turn of a run is ended and the time when the first turn of a run can begin. Thus, the vehicle is always moving in a straight-ahead direction for at least the first few inches of motion at the beginning of a run.

In order to simplify programming, each turn moves the vehicle very close to 90° (to the left or right) away from the direction in which it was traveling prior to the beginning of the turn. This is accomplished by steering the steerable wheels quickly to a predetermined angle away from a straight-ahead direction at the beginning of a turn, holding the wheels accurately at that angle during the entire turn, and quickly straightening out the wheels at the end of the turn. In addition, the vehicle must move a precisely known distance during each turn so that the wheels are straightened out when the vehicle has moved far enough along the turn to change its direction by 90°.

The rapid turning of the steerable wheels is accomplished by construction of the turning cams 70, 72 with steeply angled leading edges. Normally, such steeply angled leading edges of a cam would result in uncertainty as to the precise angle to which the wheels have been turned. However, the precision of angle is determined by the latching end 90 of the latching member 84 lying in the center of one of the recesses 92, 94 or 96 of the yoke 48.

The movement of the vehicle a predetermined distance along a turn is assured by the fact that the traction wheel 12 which moves the vehicle along the ground is coupled by gears to the programming wheel 20, so that they move in a precise proportional relationship. Thus, if the motor 100 turns slower or faster, and the vehicle therefore moves slower or faster, the distance covered during a turn still remains constant.

The rapid return of the steerable wheels to a straight-ahead position at the end of a turn is assured by the fact that the return cams 72, 76 are steeply angled, so that they are quickly moved once they are contacted by a pin. Of course, the distance through which the vehicle moves during a turn is determined by the spacing of a return cam from its corresponding turning cam, but this can be made accurate by accurate construction of the steering lever 66. The return of the steerable wheels to a straight-ahead position is again assured by accurate reception of the latching end 90 of the latching member 84 in the center recess 94 of the yoke. Thus, even though the programming wheel 20 turns slowly, each turn can be made relatively accurately. Low cost mass produced programmable vehicles can be constructed to hold each vehicle turn to within about 5° from a precise right angle turn.

Thus, the invention provides a vehicle which can be easily programmed to follow a variety of courses during

a run of given length, and is constructed so that it can accurately repeat a programmed run. The vehicle can be programmed in an entertaining manner by merely inserting plugs in easily accessible holes, the plugs being held so that they are not lost during play by a child. The vehicle is constructed in an attractive manner, and it can carry astronaut figures which can be easily installed or removed therefrom. The figures are positioned so that they appear to be operating the vehicle. The vehicle is also constructed so that it moves along a run of given length, and automatically shuts itself off after the run. Accordingly, even if a child neglects the vehicle after starting it, the batteries will not be run down.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art and, consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:

1. A programmably steerable toy vehicle comprising:
a vehicle frame;
a plurality of wheels for at least partially supporting said frame;
wheel holding means rotatably supporting at least one of said wheels, said wheel holding means mounted on said frame for pivoting between a first position to steer said vehicle in a straight-ahead path and a second position to turn said vehicle to a predetermined angle away from a straight-ahead path;
a generally flat programming wheel rotatably mounted on said frame;
a plurality of programming elements selectively positionable on said programming wheel in selectively different radial positions thereon;
means for turning said programming wheel so that said elements move in a circular path;
first means positioned along the path of programming elements at one radial position on said wheel, said first means responsive to engagement by and movement of a programming element at said one radial position for pivoting said wheel holding means from said first position to said second position;
second means positioned further along the path of said programming elements than said first means, said second means being responsive to engagement by and movement of said programming element for pivoting said wheel holding means from said second position to said first position; and
releasable latching means for retaining said holding means accurately in said first and second positions.

2. The toy vehicle described in claim 1 wherein:
said programmable wheel has an upper surface which is open to view, and plurality of holes spaced about its axis of rotation;
said first and second means are located below said programmable wheel; and
said programming elements include plugs having pins for insertion through said holes in said programmable wheel so their lowest ends can contact said first and second means; and including
a plurality of flexible members, each having an outer end tied to one of said plugs and an inner end tied to said programmable wheel to rotate therewith, whereby said pins are always close to a hole in which they can be inserted and their insertion positions are readily apparent from viewing said vehicle.

3. The toy vehicle described in claim 1 including:
a driving wheel rotatably mounted on said frame to drive said vehicle along the ground;
a motor coupled to said driving wheel to turn it;
a manually operable switch member for movement between an on position to turn on said motor, and an off position to stop said motor;
a first cam mounted on said programmable wheel for moving said switch member to said off position when said programming wheel reaches a predetermined position near the end of a vehicle run;
auxiliary switch means operable to keep said motor on; and
a second cam mounted on said programming wheel to close said auxiliary switch means continuously from a time prior to said programming wheel reaching said predetermined position to a time after said wheel reaches said predetermined position, whereby to assure stopping of said motor at a precisely determined position of said programming wheel.

4. The toy vehicle described in claim 1 wherein:
said programmable wheel is rotatably mounted about a substantially vertical axis and is disposed above said first and second means, said programmable wheel also having holes therein; and
said programming elements include plugs with pins for insertion through said holes so their lower ends can contact said first and second means.

5. The toy vehicle described in claim 1 wherein:
said means for turning said programming wheel includes means for moving said vehicle frame and said programming wheel at a constant ratio with respect to each other; and
said first and second means are positioned to steer said wheel holding means at an angle and for a distance of movement of said vehicle frame along the ground to effect a substantially 90° turn of said vehicle between the time said first means pivots said wheel holding means from said first to said second positions and the time said second means pivots said wheel holding means from said second to said first positions.

6. The toy vehicle described in claim 1 wherein:
said frame has a substantially round perimeter, and includes a capsule for holding a toy figure in a position to face in a straight-ahead direction when said vehicle is moving in a straight-ahead path.

7. The toy vehicle described in claim 1 including:
motor means for driving said vehicle along the ground; and
means for automatically terminating the operation of said motor means at a time after said second means pivots said wheel holding means to said first position and before said first means pivots said wheel holding means to said second position, whereby to cause said vehicle to start out in a straight-ahead direction when it begins a new run.

8. A toy vehicle for steering in accordance with the placement of programming elements comprising:
a housing;
a first wheel rotatably mounted on said housing for propelling it along the ground;
motor means for driving said first wheel;
a pair of wheel-holding members pivotally coupled to said housing;
a pair of steerable wheels, each rotatably mounted on one of said wheel-holding members;
a yoke having opposite ends coupled to said wheel-holding members to pivot them to steer said vehicle to the left and right;
a lever having a first portion pivotally mounted on said housing and a second portion coupled to said yoke;
a left turning cam mounted on said lever, and operable by said programming elements to pivot said lever in a first direction to move said yoke so it pivots said wheel-holding members in a direction to steer to the left;
a left return cam mounted on said lever and operable by said programming elements to pivot said lever in a second direction opposite to said first direction;
a right turning cam mounted on said lever, and operable by said programming elements to pivot said

lever in said second direction to move said yoke so it pivots said wheel-holding members to steer to the right;

a right return cam mounted on said lever, and operable by said programming elements to pivot said lever in said first direction; and

means for holding said programming elements and moving them in a path to successively contact one of said turning cams and then one of said return cams.

9. The toy vehicle described in claim 8 wherein:

said means for holding said programming elements includes a member for holding said elements which is driven by said motor means, so that said member moves by distances directly proportional to the rotation of said first wheel;

each of said turning cams is positioned to steer said steering wheels from a straight-ahead direction to a predetermined angle away from a straight-ahead direction; and

each of said return cams is located a distance downpath from its respective turning cam to return said steering wheels to a straight-ahead position when said steering wheels have carried said housing far enough along a curved path to rotate said housing substantially 90° from the orientation it had prior to pivoting of the respective turning cam.

10. The toy vehicle described in claim 8 wherein:

said programming elements comprise plugs with pins therein; and

said means for holding said programming elements comprises a wheel with a plurality of plug-receiving holes arranged in first and second concentric circles radially spaced from each other, said wheel rotatably mounted about a substantially horizontal axis above said cams, so that the pins of said plugs project downwardly from a lower side of said wheel and move in paths that cross the positions of said turning cams when said vehicle is steering straight-ahead and that cross the position of one of said return cams when said vehicle is moving away from a straight-ahead direction.

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