United States Patent

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[54] **TOY VEHICLE**
5 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** ..... **46/244 D,** 46/213
[51] **Int. Cl.** **A63h 29/22**
[50] **Field of Search** ..... 46/213, 244 R, 244 D; 74/436

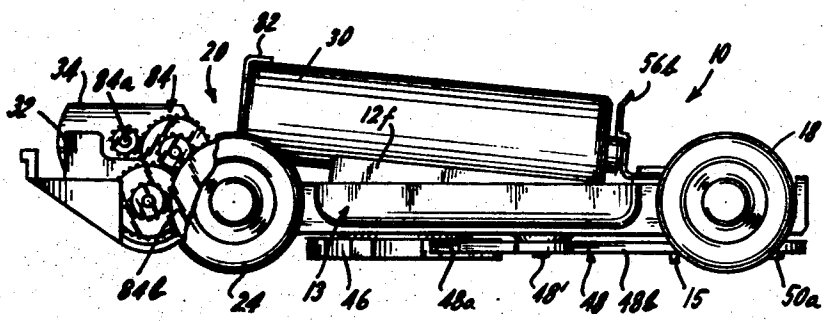
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Assistant Examiner—Robert F. Cutting
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ABSTRACT: A battery-operated toy vehicle with a programmed automatic front-wheel assembly steering mechanism. The vehicle includes a chassis with an insert plate mounting a motor cradle and a battery cradle, a motor and batteries for driving the vehicle, a gear train for imparting motion to the rear wheels of the vehicle, a front-wheel assembly and drive train means for programming and providing steering action to the front-wheel assembly from the motion of the rear wheels.



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SHEET 1 OF 2

FIG. 1.

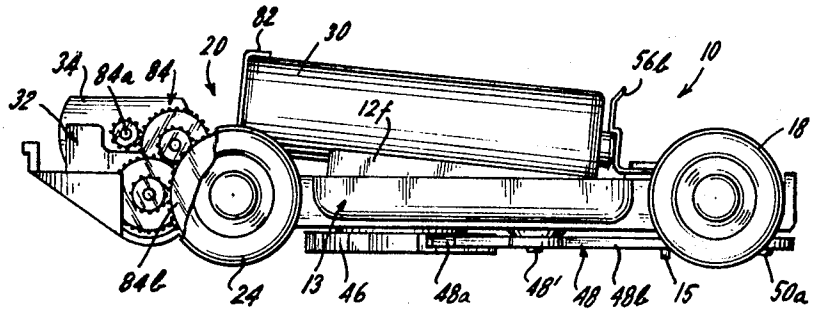
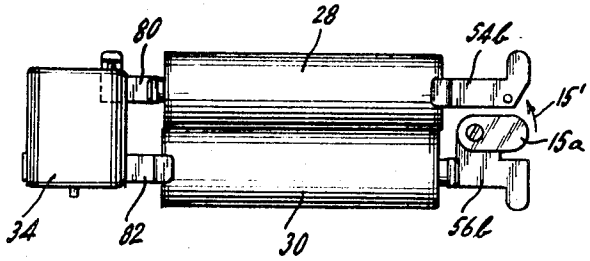


FIG. 5.



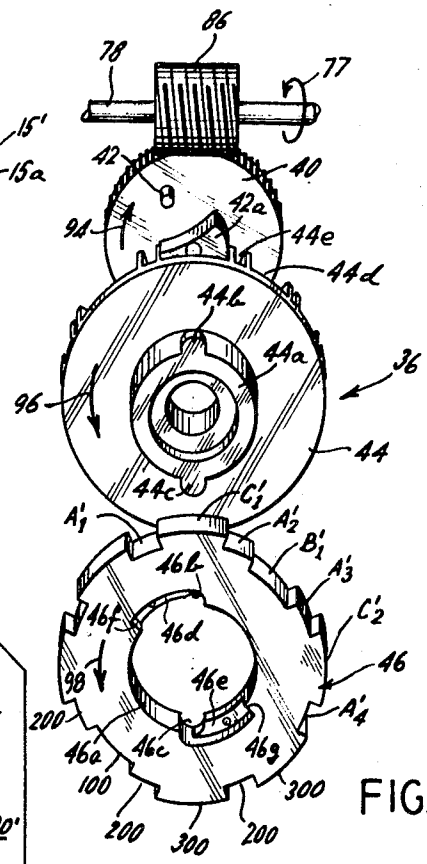


FIG. 6.

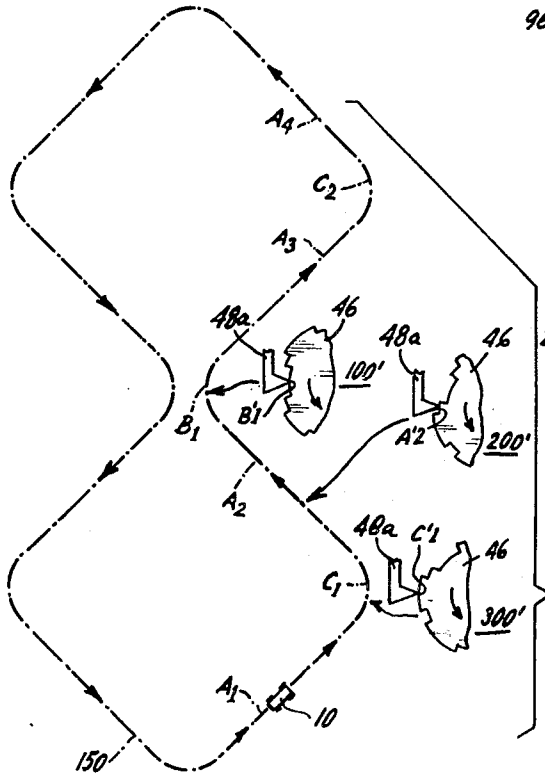


FIG. 7.

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FIG. 2.

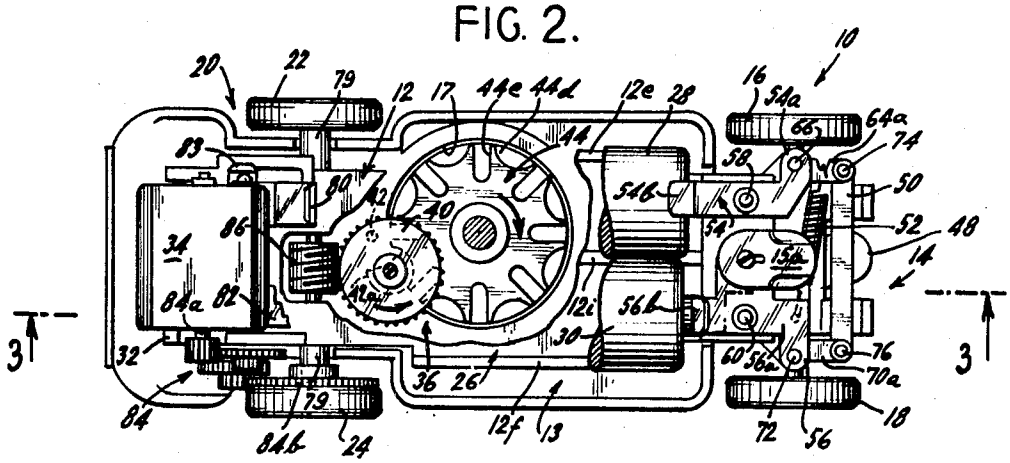


FIG. 3.

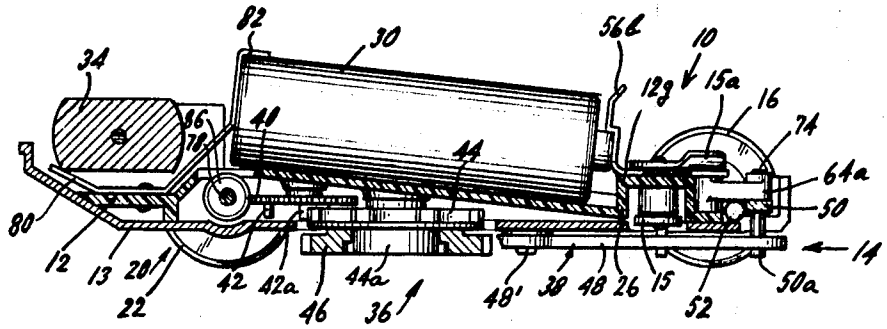
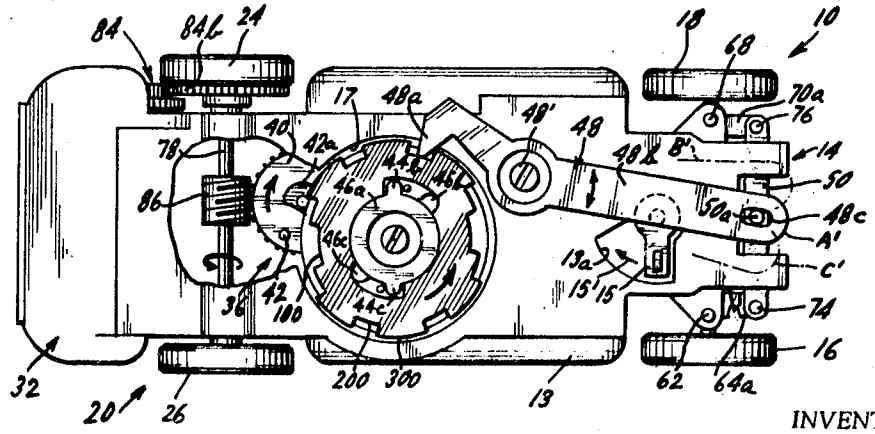


FIG. 4.



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TOY VEHICLE

The present invention relates generally to toys, and in particular, to a chassis therefor including an automatic steering mechanism.

Battery-powered toy vehicles or the like are easily operated on a track having a usual guide groove therein by permitting a depending guide or track follower on such a vehicle to extend into the guide groove and thus cause the vehicle to follow the guide groove curvature and otherwise perform on the track. To increase the play value of the vehicle, it is desirable that provision be made for operating the vehicle on a floor, table or other such conventional riding surface which, of course, does not have a guide groove. Thus, it is customary for use on conventional riding surfaces to provide the vehicle with appropriate steering structure to hold the front wheels in one of several positions and to move them between those positions. In this manner the vehicle is forced to follow a prescribed path, either circular or straight on the conventional riding surface. In known toy vehicles, designed for use without a track, the play value of the toy vehicle is somewhat restricted in that the steering structure on the vehicle holds the front wheels in only one position and changes of that position usually involve removing the vehicle from its riding surface and manually altering the position or, in the alternative, the manual substitution of different cams in an involved mechanism to selectively choose and hold a different position for the front wheels.

Broadly, it is an object of the present invention to provide a toy vehicle having an improved steering mechanism overcoming the foregoing and other shortcomings of the prior art.

Specifically, it is an object to provide an improved steering mechanism for a toy vehicle which is primarily adapted to provide a multiplicity of front-wheel positions in a programmed, prescribed path, either circular or straight, or both, on a conventional riding surface.

It is a further specific object of the present invention to provide an improved steering mechanism including steering control structure adapted to providing a plurality of complex paths for the vehicle by the inclusion of a plurality of complex, path-providing, interchangeable elements, with each forcing the vehicle to follow a prescribed path including both left-circular, right-circular, and straight-path segments on a conventional riding surface.

A toy vehicle demonstrating objects and advantages of the present invention includes a usual chassis with an insert plate having a front-wheel assembly mounted adjacent one end thereof and a rear-wheel assembly including right and left rear wheels and a rear axle adjacent the other end, the rear axle being driven by a conventional toy vehicle motor. The insert plate mounts a motor, batteries, a gear train between the motor and rear axle, a front-wheel assembly and a drive train for programming and providing motion for the steering action of the front-wheel assembly. The drive train includes a worm gear on the rear axle for driving a pinion gear having an upstanding pin and collar. The upstanding pin and collar are arranged and constructed to drive a Geneva wheel, upon which is mounted a removable main cam, secured to the Geneva wheel by a cap. A cam follower assembly is pivoted on a bottom plate of the vehicle, underlying the insert plate. The rear end of the cam follower assembly engages the main cam. At its other or forward end, the cam follower assembly engages a tie rod of the front-wheel assembly such that movement of the cam follower assembly will cause side motion of the tie rod and attendant turning motion of the front wheels. The cam follower assembly further includes a spring for biasing the cam follower against the main cam. Thus, by providing a toy vehicle structure including conventional rear-wheel driving means, a front-wheel assembly including a usual pair of left and right wheels and a tie rod connected therebetween to provide pivotal movement of the pair of front wheels in unison, a Geneva mechanism having a programming main cam operatively connected to the rear wheels and a cam follower assembly for controlling the motion of the tie rod, a toy vehicle with increased play value is provided. The main cam of the structure is attached in a removable fashion so that it is interchangeable with other main cams for altering the steering program.

The above brief description, as well as further objects, features and advantages of the present invention will be more fully appreciated by reference to the following detailed description of a presently preferred, but nonetheless illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side elevational view, with parts broken away, showing a chassis embodying features of the present invention;

FIG. 2 is a top view of the chassis of FIG. 1 with parts broken away to illustrate a portion of the Geneva mechanism according to the present invention;

FIG. 3 is a side elevational sectional view taken along the line 3–3 of FIG. 2;

FIG. 4 is a bottom view, with parts broken away, showing the mechanism of the present invention and particularly the main cam of the Geneva mechanism and its cam follower assembly;

FIG. 5 is a top view of the electrical system useful with a toy vehicle according to the present invention;

FIG. 6 is an isometric exploded view of a drive train including a Geneva mechanism useful in the present invention; and

FIG. 7 is a schematic representation of a typical path programmed and controlled by a drive train according to the present invention with the main cam and cam follower shown diagrammatically along the path at characteristic locations to illustrate the programming action thereof.

Reference is now made to the drawings and in particular FIGS. 1 through 6, wherein there is shown a vehicle chassis embodying features of the present invention, the chassis being generally designated by the reference numeral 10. The chassis 10 is constructed to be detachably secured to any one of a number of small-scale or miniature replicas of a wide variety of vehicle bodies. The scale in the illustrative drawings is approximately twice that contemplated for vehicles embodying features of the present invention. In a typical construction, the overall length of the chassis will be of the order of inches. Notwithstanding such miniaturization, the chassis 10 will have the necessary functional attributes to enable the provision of a self-contained battery drive and the capability of steering the vehicle in a preprogrammed manner.

Referring now specifically to FIGS. 1 through 4, the chassis 10 is seen to include an elongated insert plate 12 having front and rear ends. A front-wheel assembly, generally designated by the reference numeral 14 and having left and right front steerable wheels 16, 18, is mounted on the insert plate 12 adjacent to the front end thereof. Disposed rearwardly of the front-wheel assembly 14 is a rear-wheel assembly, generally designated by the reference numeral 20, which includes nonsteerable left and right rear wheels 22, 24. The reference throughout the specification to "left" and "right" components is intended to orient such components as viewed from the position of the driver when seated in the vehicle.

Intermediate the front and rear-wheel assemblies 14, 20, and in a position corresponding to the main body of the vehicle, there is provided a battery cradle, generally designated by the reference numeral 26, which in this illustrative assembly is constructed to receive side-by-side batteries 28, 30. The batteries extend lengthwise of the insert plate 12 and are substantially hidden from view by the vehicle body (not shown) when it is assembled with the chassis 10.

Disposed rearwardly of the rear-wheel assembly 20 in the trunk region of the vehicle, there is provided a motor cradle, generally designated by the reference numeral 32, which receives a battery-operated miniature motor 34. As will be subsequently described, the motor 34 is operatively connected to the right rear wheel 24 of the rear-wheel assembly 20 for

imparting drive thereto. Also, the motor is connected in an energization circuit (FIG. 5) with the batteries **28 30**, the circuit capable of being selectively completed and interrupted.

Circuit control is provided by an on-off switch **15** (shown in its "off" position in FIG. 4), the switch **15** being movable in the direction designated by the arrow **15'** to provide the "on" position. The switch **15** is coaxially attached to switchplate **15***a* (FIGS. 2 and 5) to complete the motor-battery circuit. Motion of the switch **15** in direction **15'** provides corresponding motion **15'** to the plate **15***a* as shown in FIG. 5 to electrically complete the circuit.

A bottom plate, generally designated **13**, defines a lower housing for the chassis **10** and further defines an opening **13***a* for the on-off switch **15** and an opening **17** for the main cam **46** (FIG. 4) to be described subsequently. Therefore, it may be seen that the entire chassis **10** including front and rear-wheel assemblies **18, 20**, motor **34**, the drive train, and the batteries **28, 30**, are carried on the insert plate **12** with only the cam follower **48** being mounted externally on the bottom plate **13**.

As best seen in FIGS. 2 through 4 and 6, the features leading to the improved play value of a vehicle constructed according to the present invention reside in the cooperative provision with the foregoing generally conventional structures, a drive train including a Geneva mechanism, generally designated **36**, and a cam follower assembly, generally designated **38**. The Geneva mechanism includes a worm gear **86** on the rear axle **78**, a pinion gear **40**, from which is upstanding a Geneva pin **42** and a collar **42***a* for engagement with a Geneva wheel **44**. Removably mounted on the Geneva wheel is a main cam **46** protruding through bottom plate **13**. The cam follower assembly **38** includes a cam follower **48** whose respective ends are for engagement with the main cam **46**, and tie rod **50** of the front-wheel assembly, a cam follower pivot **48'** for mounting the cam follower **48** on bottom plate **13**, and a spring **52** for biasing the cam follower **48** in the direction of engagement with the main cam **46**.

As the description proceeds and from the foregoing explanation of the general arrangement, it will be appreciated that there is provided an exceptionally compact construction lending itself to programmed steering of a toy vehicle along a multiposition path, the program of the steering being selectively changeable by selective replacement of a single element of the vehicle drive train mechanism.

As seen best in FIGS. 1 through 4, the front-wheel assembly **14** includes left and right front mounting and contacting members **54, 56** which are of nearly identical construction and are fabricated of an electrically conductive material, such as bronze stampings. The left front mounting and contacting member **54** includes a planar base **54***a* which rests against and is secured to the underlying portion of the insert plate **12** and is secured thereto as by rivet **58**. The member **54** further includes an upstanding resilient left front battery contact **54***b* which is positioned at the corresponding forward end of the battery cradle **26** in position to engage the center terminal of the battery **28**. Similarly, the right front mounting and contacting member **56** is secured to the insert plate **12** by rivet **60** and includes a planar base **56***a* and an upstanding resilient right front battery contact **56***b* located at the corresponding forward end of the battery cradle **26** in position to contact the center terminal of the battery **30**.

The left front wheel **16** of the front-wheel assembly **14** is journaled on a left front axle **62** which extends horizontally and is attached to a knuckle **64** (FIG 3) journaled on a left front kingpin **66**. Thus, the wheel **16** is capable of rotating about its corresponding horizontal wheel axis, and may be turned about the vertical steering axis defined by the kingpin **66** (which also serves to avoid rotation of member **54**). Similarly, the right front wheel **18** is journaled on a right front axle **68** which is secured to a right front knuckle **70** (not shown) journaled on a right front kingpin **72**. Provision is made for coordinating the front wheels **16, 18** for adjustment about the steering axes defined by the kingpins **66, 72** so that the vehicle may take different courses as programmed by the main cam **46**. Specifically, the knuckles **64, 70** have respective knuckle arms **64***a*, **70***a*, which are interconnected by a tie rod **50** extending transversely of the insert plate **12** across the front end thereof. One end of the tie rod **50** is connected to the knuckle arm **64***a* by the tie rod pin **74** and the other end of the tie rod **50** is connected to the knuckle arm **70***a* by tie rod pin **76**. Thus, the attitude of the wheels **16, 18** in relation to the chassis can be changed by moving the tie rod **50** in either a left or right direction and it is thereby possible to have the vehicle move on a straight path, traverse a course to the left, or traverse a course to the right.

The wheels **16, 18** of the front-wheel assembly **16** and the wheels **22, 24** of the rear-wheel assembly **20** are all substantially identical in construction and conventional for toy vehicles of this type.

The rear-wheel assembly **20** includes a rear axle **78** which extends transversely of the chassis intermediate the battery cradle **26** and the motor cradle **32**. The axle **78** is retained on the chassis by integral bearings **79** or journals, such as are conventional for vehicles of this type. The left and right rear wheels **22, 24** are journaled on the rear axle **78** with at least the left rear wheel **22** being arranged to freewheel.

The battery cradle **26**, details of which are best seen in FIGS. **1, 2**, and **3**, is defined by flanges molded integrally with the insert plate **12** of the chassis including a left marginal flange **12***e*, a right marginal flange **12***f* and a transverse flange **12***g*. With reference to FIG. **2**, it will be seen that the insert plate **12** is provided with a central, longitudinally extending reinforcing rib **12***i* which medially partitions the battery cradle **26** into two side-by-side compartments adapted to receive the batteries **28, 30**. The batteries **28, 30** are releasably secured in the battery cradle **26** by battery holddown and motor-contacting clips **80, 82** which are fabricated of electrically conducting material, preferably bronze stampings. The clips **80, 82** in cooperation with side clip **83** serve to releasably secure the motor **34** to the chassis, orient the motor **34** relative to the rear-wheel assembly **20** to establish drive thereto, and establish electrical connections between the batteries **28, 30** and the motor **34** as shown in FIG. **5**. The motor **34** is of the fractional horsepower battery-operated type and is of generally known construction. Such motors are commercially available from a number of sources.

The motor cradle **32** further mounts a gear train **84** from the motor **34** to the right rear wheel **24**. The gear train includes gears of various diameters well known in the art in order to provide drive from the motor shaft **84***a* to a wheel gear **84***b* coaxial with the right wheel **24**.

Referring particularly to FIGS. **2** through **4** and **6**, a drive train for programming and controlling the front wheel assembly steering mechanism according to the present invention is shown as including a Geneva mechanism **36** and a cam follower assembly **38**. The Geneva mechanism **36** includes a worm gear **86** disposed approximately centrally of the rear-wheel axle **78**, the worm gear **86** meshing with pinion gear **40** in approximately a 30:1 reduction to provide rotation thereof. The pinion gear **40** includes an upstanding pin **42** and an upstanding collar **42***a* for engaging a Geneva wheel **44**. Removably secured to and coaxial with the Geneva wheel is a main cam **46** which is retained in place by a retaining cap **44***a* extending from the Geneva wheel **44**. The retaining cap **44***a* has retaining cap lugs **44***b*, **44***c* extending laterally thereof for accomplishing the retaining function. The main cam **46** defines at its central portion an opening **46***a*, the opening including lug-receiving slots **46***b*, **46***c* and lug tracks **46***d*, **46***e*. It may be seen therefore, that the lugs **44***b*, **44***c* are intended for insertion to the lug-receiving slots **46***b*, **46***c* and for movement along the tracks **46***d*, **46***e* to motion-limiting lug walls **46***f*, **46***g* of the main cam to lock the main cam **46** in place.

The cam follower assembly **38** includes cam follower **48** defining a cam contacting follower tip **48***a*, a tie rod arm **48***b* and a pivot at **48'** so that the cam follower **48** moves about the point **48'** relative to the bottom plate **13**. The tie rod arm **48***b*

of the cam follower defines a tie rod slot **48***c* for receiving a downwardly protruding pin **50***a* from the tie rod **50**.

Operation of the entire Geneva mechanism **36** and the motion imparted thereby to the cam follower assembly **38** may be described as follows with particular reference to FIG. **6**: As the worm gear **86** rotates with the rear-wheel axle **78** in the direction **77** shown, a motion designated by the arrow **94** is imparted to the pinion gear **40**. As the pinion gear **40** rotates in direction **94**, a similar motion is assumed by the pinion gear collar **42***a* and the pin **42**. The Geneva wheel **44** is constructed to define both dwell slots **44***d* and index slots **44***e*, the collar **42***a* of the pinion gear riding in successive dwell slots **44***d* and the pin **42** of the pinion gear **40** intended for insertion to successive indexing slots **44***e*. As the pinion gear **40** rotates, the collar **42***a* rotates in a dwell slot **44***d* until the pin **42** is rotated to a position for insertion to an indexing slot **44***e*. When the pin **42** arrives at the entrance position of an indexing slot **44***e*, it may be seen that the partially truncated collar **42***a* will be in a position out of the dwell slot **44***d*. At this pint, a rapid indexing (approximately 45) of the Geneva wheel **44** will take place as the pinion gear **40** continues to rotate. Such indexing imparts rapid motion in the direction **96** to the Geneva wheel **44** until the pin **42** has rotated to a position where it passes out from the indexing slot **44***e*. At this point, the collar **42***a* will again be passed into the next successive dwell slot **44***d*, at which point the Geneva wheel **44** will cease moving until the pin **42** is inserted to the next successive indexing slot **44***e*. Repetitions of such motions continue to occur with alternate dwell periods and rapid indexing periods provided to the Geneva wheel **44**. Since the main cam **46** is attached to the Geneva wheel **44** with lugs **44***b*, **44***c* bearing against lug walls **46***f*, **46***g*, the alternating dwell and rapid indexing motion of the Geneva wheel **44** is imparted positively to the main cam **46**. It may be seen further from FIG. **6** that the main cam **46** defines edge surface portions **100**, **200**, **300** of varying depth and length for producing the follower actions labeled **100'**, **200'**, and **300'** in FIG. **7**. The timing of such action by the cam follower tip **48***a* is programmed by the alternate motion and timing in direction **98** of the main cam **46** as dictated by the motion of the Geneva wheel **44** and the balance of the Geneva mechanism **36**.

To further describe the Geneva mechanism **36**, the structure of the Geneva mechanism elements in the illustrative embodiment are shown with the pinion **40** having a dwell ratio of approximately 2 to 1. That is, the dwell-causing collar **42***a* is in contact with a dwell slot **44***d* for twice as much of the pinion gear rotation as the pin **42** is in contact with an indexing slot **44***e*. Stated differently, the collar **42***a* is active for 240° of a single rotation of the pinion gear **40** and the pin **42** is active for 120°. Construction of the Geneva wheel **44** is such that the indexing slots **44***e* occur every 45° along the periphery of the Geneva wheel. Also, the main cam **46** is designed to include edge surface portions **100**, **200**, and **300** with the portions **100** subtending an arc of 30° along the periphery of the main cam, portions **200** subtending an arc of 15° and the portions **300** subtending an arc of 30°. Particular reference to FIGS. **4**, **6**, and **7** indicate that the closest edge surface portions to the center of the main cam **46** are portions labeled **100**, the furthest portions from the center are those labeled **300** and the intermediate surface portions are labeled **200**. When the cam follower tip **48***a* is contacting the deepest surface portions **100**, the cam follower tip **48***a* will be at its furthest extent to the left of the vehicle. The tie rod arm **48***b* of the cam follower **48** will therefore be at the position B' denoted by ghost lines in the drawing of FIG. **4**. This B' position is the furthest right position for the tie rod arm **48***b* and the tie rod **50**. In this position, therefore, the vehicle front-wheel assembly will be steered to the right since the rightward motion of tie rod **50** pivots the knuckle arms **70***a* and **64***a* about the kingpins **72** and **66**, respectively. Likewise, the wheels **18**, **16** are thereby turned to a rightwardly steering position for the vehicle.

Conversely, when the cam follower tip **48***a* is contacting the surface portions **300** (furthest away from the center of the main cam **46**), the tie rod arm **48***b* of the cam follower **48** is moved to the position denoted by ghost lines C' in FIG. **4**. Such action produces leftward motion of the tie rod **50** causing the vehicle to turn to the left. It may be seen clearly that the straight-ahead position of the tie rod arm **48***b* of the cam follower **48** is the position shown in FIG. **4** and denoted by the label A'. Such straight-ahead orientation of the elements shown is assumed when the cam follower tip **48***a* is contacting an intermediate depth portion **200** on the main cam **46**.

In order to provide a clear understanding of the construction of a toy vehicle according to the present invention, a brief description of the operation will now be provided. At the beginning of the operational cycle it is assumed that the collar **42***a* is inserted to a dwell slot **44***d* of the Geneva wheel **44** and in the midposition thereof, so that the pinion gear **40** is rotating without imparting any motion to the Geneva wheel. This is considered, therefore, the midposition of the dwell period since the collar **42***a* rotates with a clearance relationship to the dwell slot **44***d*. At that point, the pin is on the opposite side of the axis of the pinion gear **40** from the structural center of the collar **42***a*. Also, in the assumed initial position, the toy vehicle chassis **10** is at the midpoint of its straight path as shown at point A_1, in the lower right segment of the total path **150** programmed for the vehicle. The initial position for the cam follower tip **48***a* relative to the main cam **46** is at the middle of an edge portion **200** designated A_1'.

As the motor continues to operate through gear train **84** to rotate the rear-wheel axle **78**, the worm gear **86** will rotate in direction **77** and cause, with a 30-to-1 reduction, the rotation of pinion gear **40** in direction **94**. Since the pin **42** is 60° from insertion to an indexing slot **44***e*, or one-third rotation therefrom, it will require approximately 10 full rotations of the rear-wheel axle **78** to reach that insertion point. During that one-third rotation of the pinion gear **40**, the Geneva wheel **44** will remain stationary, thus maintaining a straight path for the vehicle, which was its orientation initially.

As soon as the pin **42** enters the indexing slot **44***e*, the Geneva wheel **44** begins rapid indexing for approximately 45° of its rotation. During the rapid indexing, the main cam **46** also rapidly rotates 45°, thus moving the cam follower tip **48***a* (relative to the main cam **46**) past the midpoint C_1' of the next successive edge surface portion **300** to the midpoint A_2' of the following edge portion **200**. As discussed previously, the edge portion **300** defines a left-turn orientation for the front wheels **16**, **18**. The positions of the main cam **46** and cam follower tip **48***a*, as shown in the position labeled **300'** in the drawing of FIG. **7**, are therefore passed quickly during indexing and the vehicle chassis **10** quickly proceeds past position c_1, in the path **150**.

After the rapid indexing of 45° rotation by the main cam **46** and the Geneva wheel **44**, the pin **42** will be in a position to exit from the indexing slot **44***e* which it had entered. During the indexing period, the pinion gear **40** had rotated by an amount equal to 120° of rotation which corresponds to 10 full rotations of the rear wheels **22**, **24**. As the pin **42** exits from the indexing slot **44***e*, the vehicle chassis **10** is in the position A_2 of the total vehicle path **150** in FIG. **7**. The Geneva mechanism now assumes a period of dwell as the collar **42***a* enters a dwell slot **44***d*, causing the vehicle chassis, and particularly the front wheels thereof to maintain a straight position for 20 full rotations of the rear wheels and two-thirds of a rotation of the pinion gear **40**. The vehicle maintains the straight position until the pin **42** again enters an indexing slot **44***e* causing the main cam **46** to rapidly index approximately 45° to point A_3' in FIG. **6**. During the indexing, the cam follower tip **48***a* passes the midposition B_1' of an edge portion **100**, which dictates a right turn for the chassis **10**. The chassis, therefore, quickly traverses a right run through point B_1 of path **150** (cam follower tip **48***a* and main cam **46** positions for B_1 shown in FIG. **7** as **100'**). With point A_3' contacting the cam follower tip **48***a* at the end of the indexing, the vehicle will then assume a straight path and hold the straight path during the ensuing dwell period of the Geneva mechanism. The

straight path will be maintained during the dwell period for approximately 20 full rotations of the rear wheels. The path **150** of the vehicle chassis **10** then continues through points C_2, A_4, etc. corresponding to main cam surface portion midpoints C_2', A_4', etc. in the same manner with alternate dwell and indexing periods.

In accordance with the foregoing description of structure and operation, a toy vehicle chassis **10** has been described as using programmed and controlled steering operation. By interchanging main cam **46** with others of various designs and edge surface configurations, the path **150** may be altered almost without limit. For instance, the illustrative main cam **46** described herein provided intermediate-depth edge portions **200** to correspond with dwell periods. It may be seen that arcs of turn having much greater extent than those shown in path **150** may be obtained by synchronizing dwell periods of the Geneva wheel with other edge surface portions **100**, **300**. Also, the Geneva wheel can be replaced by a mutilated gear or other programming means to provide intermittent motion.

Furthermore, it should be understood that the toy vehicle may be used to simulate typical city driving where long straight runs and rapid turns are the rule. Also, the simulation of toy boats and planes is accomplished with the present invention by merely using a different body configuration for attachment to the chassis shown.

What I claim is:

1. For use in programming the direction of movement of a toy vehicle of the type including a chassis, drive means mounted on the chassis for propelling the vehicle and a steering member mounted on the chassis for movement between a plurality of steering positions, a programming means comprising: a programming cam, a Geneva mechanism for providing interrupted, rotative movement for said cam including dwell periods and indexing periods, a cam follower operatively connected to said cam and said Geneva mechanism for translating said interrupted, rotative movement with said periods into movement for positioning said steering member for a long period in one of its steering positions and for a short period in another of its steering positions.

2. For use in programming the direction of movement of a toy vehicle of the type including a chassis, drive means mounted on the chassis for propelling the vehicle and a steering member mounted on the chassis for movement between a number of steering positions, a steering mechanism comprising: a programming means, means for driving said programming means, which provides interrupted rotative movement including dwell periods and indexing periods and cam means translating said interrupted rotative movement with said periods into movement for positioning said steering member for a long period in one of its steering positions and for a short period in another of its steering positions, said cam means including a cam follower and said programming means including a replaceable cam and a Geneva mechanism having a Geneva wheel, said Geneva wheel and said cam being coaxial and removably attached for rotating together and for replacement of said cam, said cam follower being operatively connected to said steering mechanism at one of its ends and contacting said cam at the other of its ends.

3. A drive train for a vehicle chassis having a front-wheel turning assembly, a rear-wheel assembly, a motor and a drive connection between said motor and one of said wheel assemblies, said drive train comprising a Geneva mechanism operatively connected to the motor and a cam follower assembly operatively connected to turn said front-wheel turning assembly and operable therewith to alter the orientation of the vehicle chassis, said cam follower assembly including a cam follower and said Geneva mechanism including a cam for contacting and rotating relative to said cam follower and thereby imparting motion thereto said Geneva mechanism further including a Geneva wheel attached to said cam and rotatable therewith.

4. The invention according to claim **3** wherein a pinion gear is provided to impart motion to said Geneva wheel, said pinion gear having a pin and collar upstanding therefrom and said Geneva wheel defining pin-receiving index slots and collar-receiving dwell slots, said dwell slots and said collar defining a clearance therebetween.

5. The invention according to claim **4** wherein the rear-wheel assembly is driven by the motor and said Geneva mechanism further includes a rear-wheel axle worm gear for driving said pinion gear.