

[54] **REMOTELY CONTROLLED TOY HAVING
A NON-FREQUENCY DISCRIMINATING
RECEIVER**

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[58] Field of Search **343/225-228;
318/581, 587, 626, 62, 466, 468; 46/210,
211, 213**

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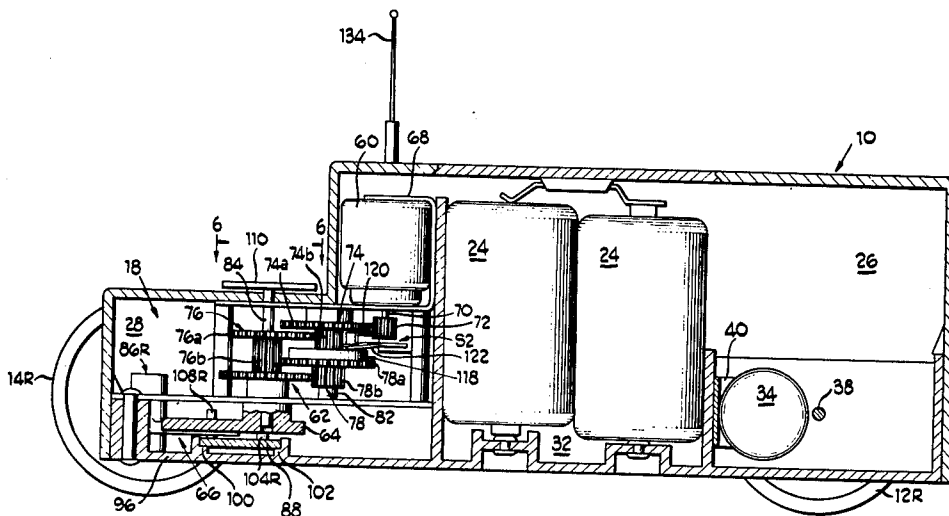
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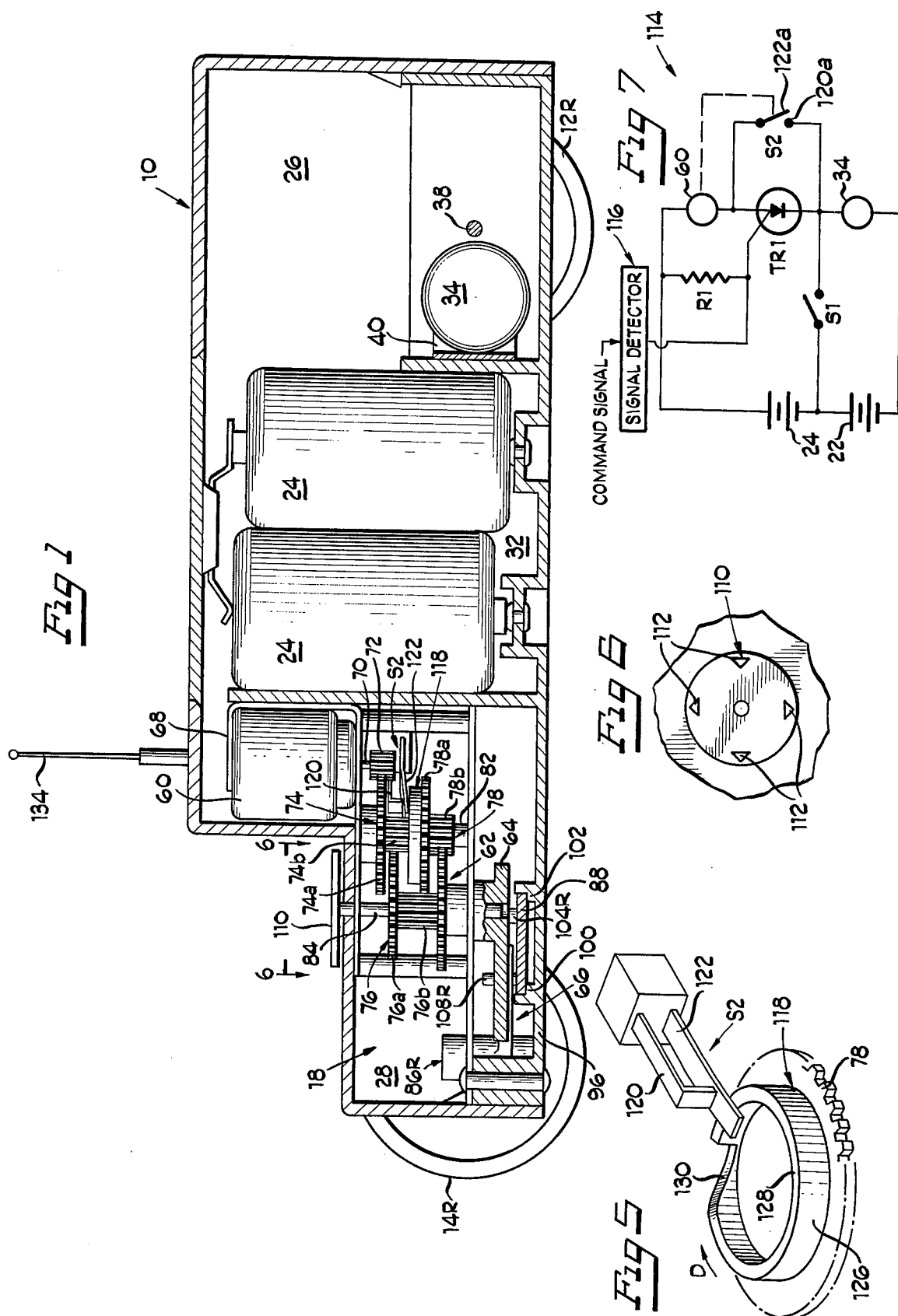
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[57] **ABSTRACT**

An electronically remotely controlled system for use in a toy such as a vehicle wherein the vehicle is steered or otherwise controlled in response to a command signal. The vehicle has a receiver including a circuit having a multifrequency electronic switch in the form of a transistor for determining when electricity is to flow through the circuit. Connected with the transistor is a cycle interrupter switch for turning the transistor off after it has been initially actuated as well as terminating a cycle of operation of the vehicle. Mechanical apparatus is provided for translating the command signal into desired mechanical action and includes a switch cam mounted for movement against the interrupter switch for moving the interrupter switch between on and off positions. an electric motor also is included in the circuit to drive the mechanical apparatus and switch cam whenever the circuit is conducting. The mechanical apparatus also includes a steering linkage having front wheels mounted thereon. The wheels are movable between different positions in response to the rotation of a steering cam associated with the linkage. The cam also is associated with the motor and is designed so that the wheels complete a cycle of turns or wheel positions during one rotation of the cam.

22 Claims, 12 Drawing Figures





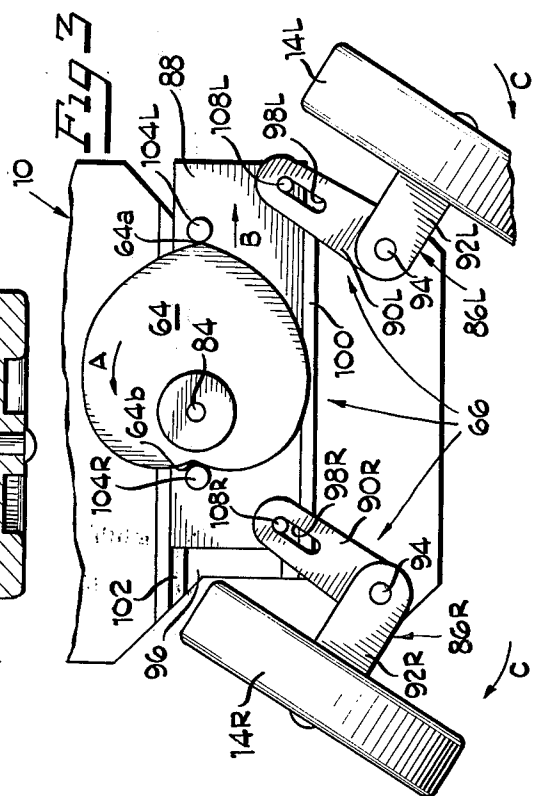
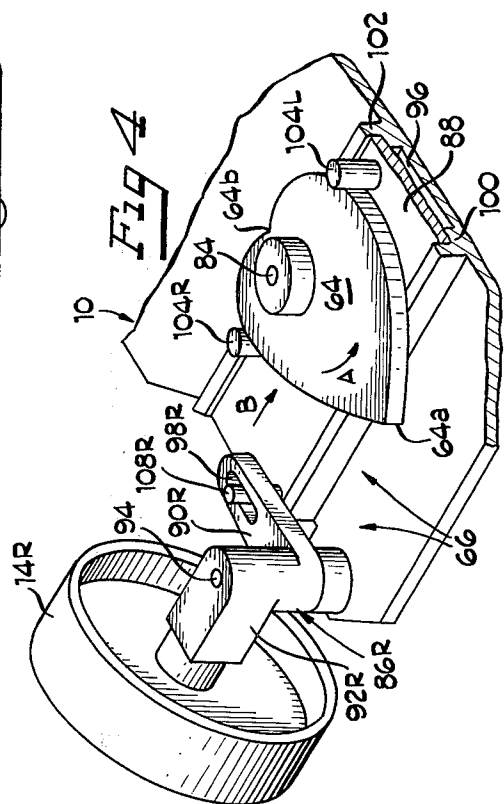
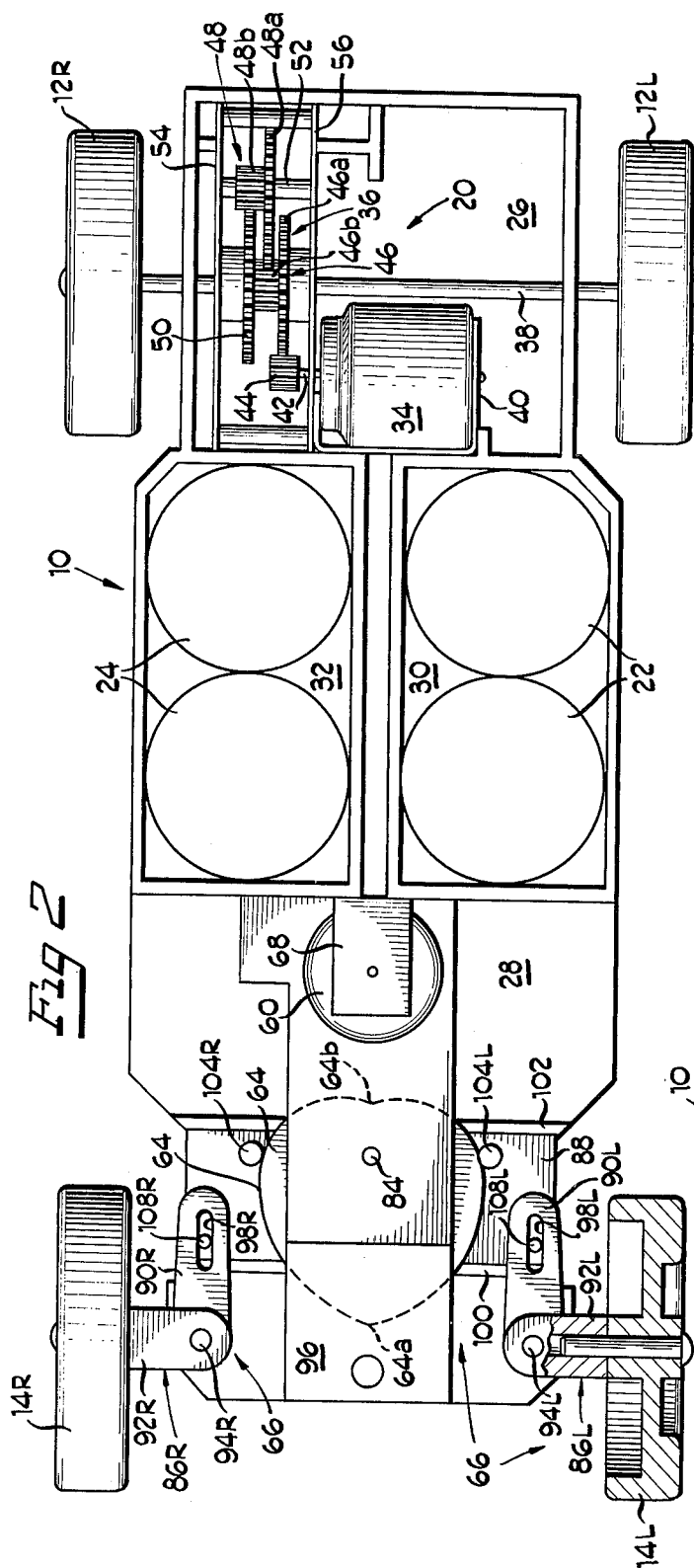


Fig 8

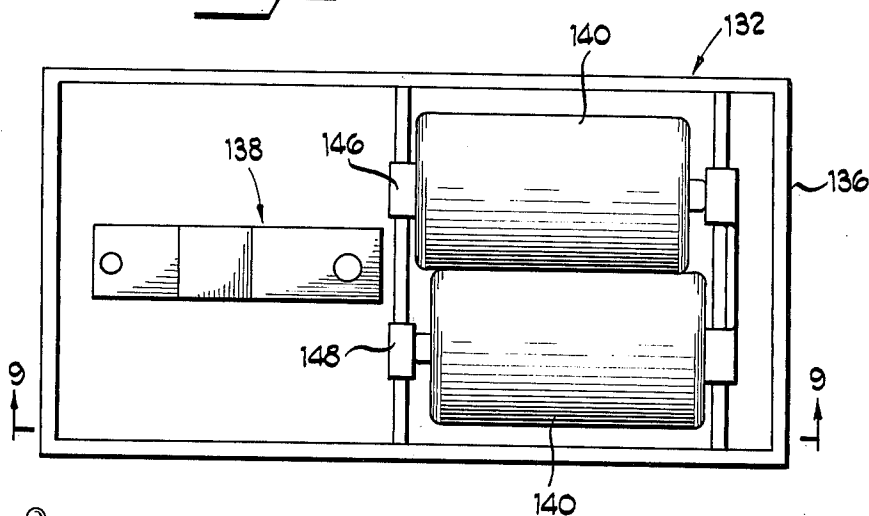


Fig 9

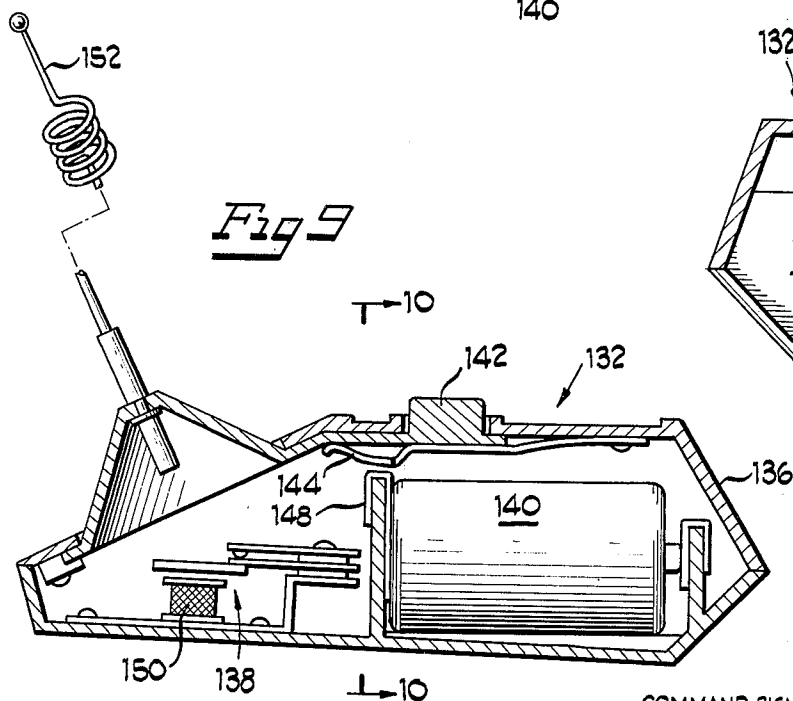


Fig 10

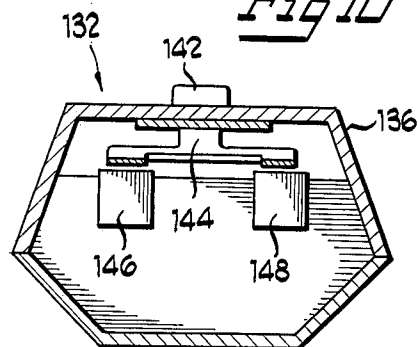


Fig 11

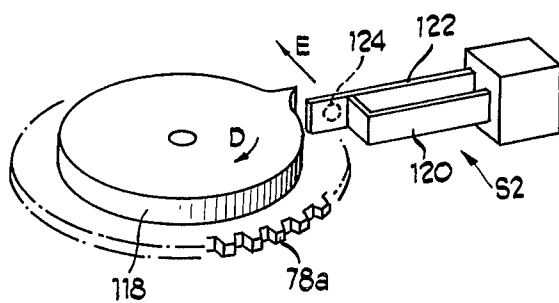
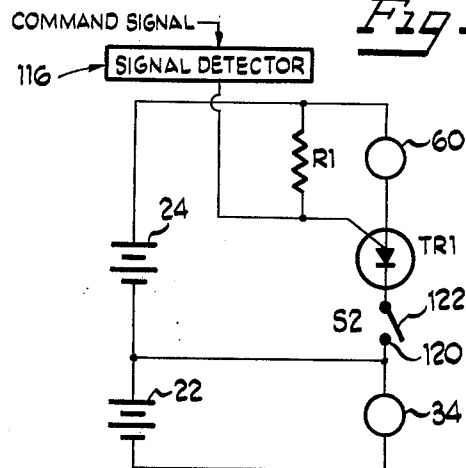


Fig 12



REMOTELY CONTROLLED TOY HAVING A NON-FREQUENCY DISCRIMINATING RECEIVER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to remote control toys.

2. Brief Description of the Prior Art

Remotely controlled toys such as racing cars and the like have enjoyed a great deal of popularity especially during recent years. One common function a remote control system can effect is that of steering a toy such as a vehicle. In a conventional remotely controlled car or vehicle, there is included a vehicle structure, means separate from the vehicle structure for generating a command signal, a receiver carried on the vehicle structure having an electrical power source connected to an electric control circuit to receive the signal and steering means to steer the vehicle in response to the command signal.

In the past, a transmitter operated by the child was employed in order to generate the command signal. In the usual case the signal generated by such a transmitter was of a given frequency. In order for the vehicle to respond to the command signal it thus was necessary for the receiver to be tuned-in to this frequency. Thus, in the past, it was necessary that both the transmitter and receiver be tuned to the same frequency or, put another way, the circuit of the receiver had to be a "tuned" circuit. Whereas tuned circuits perform sufficiently in a remotely controlled toy, one certain disadvantage is always present: tuned circuits are by their nature expensive for use in toys.

In addition, the steering linkages forming a part of the steering means are usually connected either directly or indirectly to a motor which, in turn, is connected to the control circuit as outlined above. In order that a vehicle be steered from left to right and back again, in the past it was necessary that the polarity of the motor be reversed thus changing the rotation of the steering linkage which is connected to the wheels. Constructing mechanism and circuit which would respond to changing polarities also is relatively complex and expensive.

SUMMARY OF THE INVENTION

It is a principal object of this invention to provide a new and improved, simple and relatively inexpensive remote control system that can be employed for a toy such as a vehicle.

One feature of the present invention is that the control circuit of the vehicle signal receiving means is untuned thereby making it a nonfrequency discriminating device sensitive to a broad band of frequencies. This feature and other objects of the invention are accomplished by an improvement in the structure of the receiver. One embodiment of the receiver currently contemplated generally includes a multi-frequency electronic switch for determining when electricity is to flow through the circuit, an interrupter switch connected to the electronic switch, mechanical means for translating a command signal into desired mechanical action including a switch cam, and an electric motor connected to the electronic switch and the interrupter switch to drive the mechanical means.

The electronic switch is changeable between a normally "off" or non-conducting state wherein electricity

is prevented from flowing through the circuit and an "on" or conducting state wherein electricity is allowed to flow through the circuit driving the electric motor. The electronic switch changes from its off state to its on state in response to the command signal which can be within a broad band of frequencies. The interrupter switch is connected to the electronic switch and changes the electronic switch from its on back to its off state after the circuit commences to conduct electricity.

In one embodiment of the invention the interrupter switch is connected in series with the electronic switch and is movable between a normally on or "closed" position and an off or open position. The switch cam is movable by the electric motor against the series connected interrupter switch to instantaneously change the switch from an on to an off position. The electronic switch then shifts from its on to its off state in response to the series interrupter switch moving from its on position to its off position.

In another embodiment of the invention, the interrupter switch is connected in parallel across the electronic switch and is movable between a normally off or open position and an on or closed position. The switch cam is movable by the electric motor against the parallel connected interrupter switch to change the parallel interrupter switch from an off position to an on position. The electronic switch shifts from its on to its off state whenever the parallel connected interrupter switch moves from its off position to its on position.

In both embodiments the switch cam determines the length of time the circuit is to conduct electricity after the electronic switch is turned on.

Another feature of the present invention resides in a new and improved means of steering the remotely controlled toy vehicle so that the vehicle is steered in a given number of predetermined directions in response to a single command signal. This feature is effected by providing a normally nonconducting electrical control circuit, a steering linkage having two ground engaging wheels mounted thereon, and mechanical means for translating the command signal into the desired steering action.

The control circuit includes a uni-directional electric motor having a drive shaft which rotates in the same direction whenever electricity is conducted through the circuit. The circuit commences to conduct electricity for a predetermined time period in response to the command signal.

The steering linkage is movable between a "center" position wherein the wheels are facing straight and a "left" position wherein the wheels are turned to the left and a "right" position wherein the wheels are turned to the right. In this manner the vehicle is steered.

The mechanical means is operatively associated between the motor drive shaft and the steering linkage. The mechanical means includes a steering cam mounted for rotation in response to rotation of the motor drive shaft. The steering cam moves the steering linkage from the center to the left positions during a given time period of operation. The steering cam moves the steering linkage from the left back to the center positions during the next successive time period, then moves the steering linkage from the center to the right positions during the next successive time period and finally moves the steering linkage from the right back to the center positions during the next successive

time period. All of this is accomplished without a change in polarity of the electricity powering the electric motor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational sectional view of a remotely controlled vehicle embodying the concepts of the present invention;

FIG. 2 is a bottom plan view of the remotely controlled vehicle of FIG. 1;

FIG. 3 is a cutaway top plan view of a portion of the steering mechanism of the vehicle;

FIG. 4 is a cutaway perspective view of the mechanism shown in FIG. 3;

FIG. 5 is a perspective view of an interrupter switch and switch cam employed in the present invention;

FIG. 6 is a fragmentary top plan view taken generally in the direction of line 6—6 of FIG. 1;

FIG. 7 is a schematic electrical diagram of the control circuit employed in the present invention;

FIG. 8 is a cutaway top plan view of the transmitter employed in the present invention;

FIG. 9 is a sectional view of the transmitter taken generally along the line 9—9 of FIG. 8;

FIG. 10 is a sectional view taken generally along the line 10—10 of FIG. 9;

FIG. 11 is a perspective view of another form of interrupter switch and switch cam employed in the present invention; and

FIG. 12 is a schematic electrical diagram of a control circuit employed with the switch of FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The remote control system of the present invention can be used in many different toys or amusement devices. One such use is in a remotely controlled vehicle as shown in FIGS. 1—6. In the instant preferred embodiment, the vehicle has a body, generally designated 10, rear ground engaging wheels 12L and 12R and front ground engaging wheels 14L and 14R mounted on the body 10. Mounted within the body 10 is a receiver (which is shown by the schematic circuit diagrams of FIGS. 7 and 12) and mechanical steering means, generally designated 18, for translating a command signal to the receiver into desired steering action. In addition, the present embodiment has drive means, generally designated 20, for driving the vehicle through rotation of the rear wheels 12L and 12R and power means in the form of two pairs of batteries 22 and 24, respectively, for powering the vehicle.

The vehicle body 10 is divided into four general compartments. Looking at FIGS. 1 and 2, there is a rear drive compartment 26, a front steering mechanism compartment 28 and two intermediate battery compartments 30 and 32, the latter housing the batteries 22 and 24, respectively.

The rear drive compartment 26 houses an electric motor 34 which is powered by one pair of the batteries 22 and 24. The motor 34 is operably connected through a speed reducing or stepdown gear train, generally designated 36, to a rear axle 38 which is rotatably received through the body 10. The rear axle 38 has the rear wheels 12L and 12R mounted on the ends thereof outside the body.

The drive motor 34 is mounted in the rear drive compartment 26 on a motor support bracket 40. A rotat-

able drive shaft 42 extends outwardly from the motor 34 and has a drive gear 44 mounted on the end of the shaft 42 for rotation therewith. The drive gear 44 is operably associated with the gear train 36.

The gear train 36 includes two stepdown gears 46 and 48. Gear 46 has a large portion 46a and an integral small portion 46b. gear 48 has a large portion 48a and a small portion 48b. Gear portion 48b is in mesh with a wheel gear 50. Gear 46 has the rear axle 38 passing therethrough and is rotatably mounted with respect to the axle. Gear 48 is rotatably mounted on the shaft 52 which is secured between two mounting plates 54 and 56. Gear 50 is fixedly secured to the rear axle 38 for rotation therewith.

Drive gear 44 is in meshing engagement with the large portion 46a of gear 46. The small portion 46b of gear 46 is in meshing engagement with the large portion 48a of gear 48. The small portion 48b of gear 48 is in meshing engagement with gear 50. Thus, the motor through its drive gear 44 causes gear 46 to rotate which causes gear 48 to rotate which causes gear 50 to rotate which ultimately turns axle 38 and the wheels mounted thereon to propel the vehicle over the ground, floor, or the like.

The steering means 18 which is housed in the front compartment 28 generally comprises the electrical control circuit of FIGS. 7 and 12 (not shown in FIGS. 1 and 2), a uni-directional electric motor 60 run by said circuit, a stepdown gear train, generally designated 62, operably connected to a generally heart-shaped steering cam 64 which is operably connected to a steering linkage, generally designated 66.

The control circuit is such that electricity will be fed to the electric motor 60 for a given period of time in response to an outside command signal. While the motor 60 is thus running, the front wheels 14 will be in the process of turning to a desired direction. When the motor 60 is not running the vehicle will have a fixed steering direction.

Motor 60 is secured and mounted within the front compartment 28 by means of a motor support bracket 68. A drive shaft 70 (FIG. 1) has a drive gear 72 fixedly secured thereto for rotation at the end of said shaft when the motor is running.

The stepdown gear train 62 generally includes three stepdown gears 74, 76 and 78, each having a large portion (designated a) and a small portion (designated b), and a cam gear 80. Gears 74 and 78 are rotatably mounted on a vertical fixed shaft 82. Gear 76 is rotatably mounted on another shaft 84 which is spaced from an parallel to shaft 82. Cam gear 80 is fixedly secured to shaft 84 for rotation therewith.

Drive gear 72 is in meshing engagement with the larger portion 74a of gear 74 so that gear 72 drives gear 74. The small portion 74b of gear 74 is in meshing engagement with the larger portion 76a of gear 76 so that gear 74 drives gear 76. The small portion 76b of gear 76 is in meshing engagement with the large portion 78a of gear 78 so that gear 76 drives gear 78. The small portion 78b of stepdown gear 78 is in meshing engagement with cam gear 80 so that gear 78 drives gear 80. Thus, by rotating drive gear 72, cam gear 80 is caused to rotate.

The steering cam 64 is fixedly secured to both the cam gear 80 and shaft 84 for rotation therewith. Thus, cam 64 is made to rotate in response to the running of motor 60.

The steering linkage 66 is shown best in FIGS. 3 and 4 and is seen to generally include two generally L-shaped wheel mountings 86L and 86R mounted beneath the body 10 and interconnected by a connecting plate member 88. The two wheel mountings 86L and 86R are spaced apart and are identical, each having a lever leg, 90L and 90R and a wheel leg, 92L and 92R, respectively.

The wheel leg, 92L or 92R, of each wheel mounting has one of the front wheels 14 rotatably mounted thereon. Each wheel mounting is rotatably mounted on a vertical shaft 94 which is fixedly secured to the bottom 96 (FIG. 2) of the body 10. Each lever leg, 90L and 90R, has a slot 98 formed therein for purposes which will become more apparent hereinafter.

The connecting member 88 is a relatively flat rectangular bar that is slidably mounted on the bottom 96 of the body 10 and is supported by two elongated transverse ridges 100 and 102 formed on the body bottom 96. The member 88 is captured between the ridges 100 and 102 by the overlying steering cam 64. The member 88 is allowed to slide, as guided by ridges 100 and 102, in either transverse direction relative to the vehicle body 10.

The connecting member 88 has a pair of upwardly extending cam pins 104R and 104L and a pair of upwardly extending lever pins 108R and 108L. Cam pins 104R and 104L are formed on the surface of the connecting member 88 so that they abut the sides of the overlying cam gear 64. In response to forces exerted by the cam 64 against either of the pins 104R or 104L, connecting member 88 is made to slide in one transverse direction or the other. Lever pins 108L and 108R are captured within slots 98L and 98R, respectively. The pins are freely slidable within said slots. Because of this parallelogram type linkage, each of the wheel mountings 86L and 86R will rotate about its respective shaft 94 the same amount in response to the sliding movement of the connecting member 88. In this manner the vehicle is effectively steered according to the rotation of cam 64.

Because of the configuration of the cam 64 and the interconnection of the steering linkage 66, the wheels 14L and 14R are movable between a left position wherein the wheels are turned to the left (not shown) and a right position wherein the wheels are turned to the right (see FIG. 3). The wheels 14L and 14R will be turned between these positions in a given sequence in response to rotation of the cam 64 in a singular direction. That is, is not necessary that there be a reverse rotation to bring the wheels back to a previous position.

The cam 64 is generally heart shaped and has a lobe portion 64a and a recessed portion 64b which is 180° opposite the lobe portion. Thus, as the cam rotates the edge of the lobe portion 64a abut against either of the pins 104L, 104R to move the connecting bar member 88 while the opposite pin rides into the recess 64b.

Depending on the time period during which the control circuit allows the motor 60 to run to rotate cam 64, an operator will be able to steer the vehicle through certain given predetermined steering positions. For example, looking at FIGS. 2 and 4 wherein the wheels 14 are in a "center" position (wherein the cam lobe 64a and recess 64b are 90° out of phase relative to pins 104L, 104R), it can be seen that, assuming the cam 64 is rotated in the direction of arrow A, connecting member 88 will be forced to move in the direction of arrow

B which will turn the wheels 14 toward the right in the direction of arrows C as seen in FIG. 3, due to the cam lobe portion 64a biasing against pin 104L. Upon further rotation of the cam 64, the wheels 14R and 14L will not continue to move in the direction of arrows C after they have reached the right position (FIG. 3), but will be turned back to the left in a direction opposite that of arrows C until the wheels reach a left position effected by engagement of the cam lobe 64a with the pin 104R, where the cam stops at a central position with the wheels straight. Upon further rotation of the cam 64, the wheels will move back to the central position and then to the right position, etc. This eliminates all need for a complicated structure which changes the rotation of the motor, or employs complicated reversing linkages to effect equivalent movement.

In the present embodiment, the control circuit, which will be discussed in greater detail hereinafter, is such that the cycles of operation of the vehicle allow the following sequence of steering maneuvers to occur:

1. during the first energized time period, the wheels 14R and 14L will go from a center to a right position
2. During the next sequentially energized time period, the wheels 14R and 14L will be turned from the right position back to the center position;
3. During the next sequentially energized time period, the wheels 14R and 14L will be turned from the center position to the left position;
4. During the next sequentially energized time period, the wheels 14R and 14L will be turned from the left position back to the center position; and
5. The four position cycle as set forth in steps (1) through (4) will repeat itself during each full rotation of cam 64.

Again, it should be noted that the steering need not be limited to four positions per cycle. Depending on the length of the time period, there can be any number of positions during each cycle.

A steering position indicator 110 (FIGS. 1 and 6) is fixedly secured to the top of shaft 84 for rotation therewith and is exposed on top of body 10. The indicator 110 is a flat disc having arrow type indicia 112 printed thereon. The indicator 110 will rotate the same amount as cam 64. Depending on the relative position of the arrow type indicia 112, the operator can tell in which direction the wheels 14R and 14L are steered.

Two embodiments of control circuits 114 and 115 comprising the command signal receiver for the vehicle are shown schematically in FIGS. 12 and 7, respectively, and include the batteries 22 and 24 and motors 34 and 60. Both circuits 114 and 115 operate substantially in the same manner electrically. The rear wheel drive motor 34 runs whenever the power on/off switch S1 is closed and has no connection with the control function of circuit 114, i.e., the running of steering motor 60. The switch S1 may be of any convention manually operable switch mounted on the vehicle and connected in the circuits described above. The remainder of the circuits 114 and 115 are seen to generally comprise a signal detector 116, a resistor R1, a transistor (complementary silicone controlled rectifier) TR1, and a cycle interrupter switch S2 (for use in circuit 114) or S3 (for use in circuit 115). The difference between circuit 114 and circuit 115 is that interrupter switch S2 is connected in series with TR1 in circuit 114 whereas interrupter switch S3 is connected in parallel with TR1 in circuit 115.

The signal detector 116 detects a command signal and converts that signal into an electrical impulse. TR1 acts as a nonfrequency discriminating electronic switch which determines when electricity is to flow through the circuit 114 and is changeable between a normally off or non-conducting" state preventing the flow of electricity thereby and an on or "conducting" state wherein electricity is allowed to flow through the circuit. Resistor R1 serves to initially bias TR1 so that it is almost at a conducting or on state. The initial state is characterized by the potential TR1 anode current below the value of the specified "holding current" which is the minimum anode current required to maintain TR1 in an on state. TR1 changes from its off to its on state in response to an electrical impulse through its gate electrode caused by the reception of a command signal by detector 116. By using a silicone controlled rectifier in this circuit as an electronic switch, the rectifier renders the control circuit sensitive to a broad band of frequencies in which the command signal is generated, unlike the prior art devices.

It is the nature of a complementary silicon controlled rectifier that once it is turned on, it will remain on. The only manner in which TR1 can be turned off is by reducing its anode current to a level below the value of its specified "holding current." To this end there is provided the interrupter switches S2 and S3. Series interrupter switch S2 opens the circuit momentarily and parallel interrupter switch S3 shunts the current away from TR1.

The series cycle interrupter switch S2 is movable between a normally on or closed position and an off or open position. TR1 goes from an on state to an off state whenever interrupter switch S2 goes from an on position to an off position thereby opening up circuit 114.

In association with circuit 114, a switch cam 118 (see FIG. 11 — not shown in FIG. 12) is operably associated with the gear train 62 and is mounted for movement against the series interrupter switch S2 for moving the interrupter switch S2 between its on and off positions. The switch cam 118 determines the length of time circuit 114 is to conduct electricity after TR1 is turned on.

More particularly, the series interrupter switch S2 (FIG. 11) is seen to include a stationary contact 120 and a movable contact 122, the latter being normally biased against the stationary contact. The movable contact is quite flexible and springy and the end thereof rides along the periphery of cam 118. Also, a mass 124, is disposed near the end of movable contact 122 for purposes that will become more apparent hereinafter.

Formed on the periphery of cam member 118 is an outwardly extending protrusion 126. The protrusion will contact the end of contact 122 as the cam member 118 is rotated, with gear 78, in the direction of arrow D. When protrusion 126 engages the movable contact 122, the contact is flexed against the stationary contact 120. The end of the movable contact 122 will then give way allowing the protrusion to pass the switch S2. When this occurs the end of movable contact is sprung in the direction indicated by arrow E in response to the release thereof by the protrusion 126. Mass 124 adds to this springing motion. This action momentarily spaces contacts 120 and 122 opening switch S2. The open or off position of switch S2 lasts only a very short period of time because movable contact 122 will spring back to its initial closed or on position.

Initially circuit 114 is not conducting electricity. Thus, TR1 is off, series interrupter switch S2 is on because movable contact 122 is biased against stationary contact 120, and the motor 60 is not running.

When a command signal is received by signal detector 116, an electrical impulse is directed to the gate electrode of TR1. The additional electrical impulse causes TR1 to shift from its off to its on state thereby allowing electricity to flow through circuit 114. This causes motor 60 to be initially actuated. At this time when TR1 initially is fired, series interrupter switch S2 is still in an on position. However, motor 60 is turning switch cam 118 in the direction of arrow D (FIG. 11) so that protrusion 126 is moved into engagement with the movable contact 122. When protrusion 126 release movable contact 122 as described above, series interrupter switch is momentarily in an off or open position thereby cutting off all of the electricity flowing through circuit 114. This turns TR1 to its off state. Because TR1 is in an off state, circuit 114 cannot conduct electricity and steering motor 60 is shut off. Circuit 114 will not conduct again until the next command signal is received by detector 116.

With respect to circuit 115, the cycle interrupter switch S3, which is connected across or in parallel to TR1, is capable of by-passing TR1 and thus changing TR1 from an on to an off state after TR1 has been turned on by the initially received electrical impulse. The parallel interrupter switch S3 is movable between a normally off or open position and an on or closed position. The parallel interrupter switch S3 is in its off position whenever TR1 is in an on state. TR1 goes from an on state to an off state whenever the interrupter switch S3 goes from an off position to an on position thereby short-circuiting TR1.

A switch cam 118a (see FIG. 5 — not shown in FIG. 7) is operably associated with the gear train 62 and is mounted for movement against the interrupter switch S3 for moving the interrupter switch between its on and off positions. The switch cam 118a determines the length of time circuit 115 is to conduct electricity after TR1 initially is turned on.

More particularly, the interrupter switch S3 (FIG. 5) is seen to include a stationary contact 120a and a movable contact 122a normally biased away from the stationary contact. The movable contact 122a rides on the top of switch cam 118a so that the switch cam can move the movable contact 122a away from or toward the stationary contact 120a.

The switch cam 118a (FIG. 5) is an upstanding generally annular rib 126a formed on the face of gear 78 and, thus, is rotatable therewith. The movable contact 122a is biased against the top edge of the rib 126a. The rib has an on portion 128 which biases the movable contact 122a into engagement with stationary contact 120a, and a recessed off portion 130, lower in height than the on portion 128 which permits the movable contact 122a to move away from the stationary contact 120a thereby causing the interrupter switch S3 to assume an off or open position.

Initially circuit 115 is not conducting electricity. Thus, TR1 is off, parallel interrupter switch S3 is off because movable contact 122a is disposed in the off portion 130 of the switch cam 118a, and motor 60 therefore is not running.

When a command signal is received by the signal detector 116, an electrical impulse is directed to the gate

electrode of TR1. The additional electrical impulse causes TR1 to go from its off to its on state thereby allowing electricity to flow through the circuit 115. This causes motor 60 to be initially actuated. At this time, when TR1 initially is fired, parallel interrupter switch S3 is still in an off position. However, the motor 60 is turning switch cam 118a in the direction of arrow F (FIG. 5) so that the movable contact 122a rides upwardly onto the on portion 128 of switch cam 118a and touches stationary 120a. When this occurs, parallel interrupter switch S3 is closed and short-circuits TR1 turning the same off. At this point in time, the circuit 115 is still conducting through switch S3.

After the circuit 115 has been conducting for a length of time depending on the speed of rotation of switch cam 118a, the switch cam 118a will be rotated through one revolution whereby movable contact 122a will drop back into the off portion 130 of the cam rib 126a thus opening the interrupter switch S3. Because both TR1 and parallel interrupter switch S3 now are in their off states, circuit 115 cannot conduct electricity and steering motor 60 is shut off. circuit 115 will not conduct again until the next command signal is received by detector 116.

The length of time that the motor 60 is running determines how far wheels 14R and 14L will be steered in one direction or the other. This time period is dependent upon the ratio of the on portion 128 to the off portion 130 of the switch cam 118a in the case of circuit 115 and the relative speed at which the switch cams 118 and 118a are rotated in both circuits 114 and 115. All of these variables can be altered to achieve the desired time periods or cycle of operation when designing a remotely controlled vehicle such as the embodiment described herein.

The remotely controlled vehicle shown herein is geared so that the time period during which the motor is running is such that one turn of switch cam 118 or 118a will turn the steering cam 64 90°. The 90° incremental or sequential rotation of the steering cam 64 will effect the four position cycle as described above.

The form of the signal detector 116 depends upon the form of the command signal. In the present embodiment, an electromagnetic wave generating transmitter generally designated 132 (FIGS. 8-10), is used. Accordingly, the signal detector 116 on the vehicle is in the form of an antenna 134 (FIG. 1).

Turning to FIGS. 8, 9 and 10 in greater detail, the transmitter 132 of the present embodiment is seen to generally comprise a housing 136 having a buzzer, generally designated 138, connected to two batteries 140 mounted in the housing. The buzzer 138 is a conventional electromagnetic buzzer that is energized by the batteries whenever a depressible on-off switch button 142 is pressed downwardly. When button 142 is pressed downwardly, a two-pronged contact 144 is caused to touch two conductive battery carriages 146 and 148 which hold batteries 140. The batteries are connected by wiring (not shown) to a coil 150 of the buzzer. The batteries energize the coil 150 of buzzer 138 when button 142 is depressed causing, not only a buzzing sound, but an electromagnetic wave disturbance. This electromagnetic disturbance (or "spark") can be transmitted over short distances, especially with the aid of an antenna 152 secured to the transmitter housing 136, and with the disturbance picked up by antenna 134 on the vehicle.

In use, the vehicle of the present embodiment can be remotely controlled by merely pressing the transmitter switch button 142 down. Assuming that wheels 14R and 14L of the vehicle are in a center position, depression of the transmitter button 142 will cause the buzzer to "buzz", sending out a command signal described above. The command signal then is received by the vehicle antenna 134 thereby activating the control circuit 114 or 115. When the electricity is flowing through circuit 114 or 115, motor 60 runs the steering means and causes the wheels 14R and 14L to move to the first steering position described above. After the first steering position is reached, a successive depression of transmitter button 142 will cause wheels 14R and 14L to turn to the next steering position, and so on.

The drive motor 34 is activated by merely closing the switch S1. As can be seen in FIG. 7, the steering must be effected while switch S1 is closed, i.e., while the vehicle is moving. However, it would be a simple matter to change circuits 114 or 115 of FIG. 7 so that the steering could be effected while the car is standing still.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art.

We claim:

1. In a remote controlled toy combination including a responsive toy structure, means separate from said toy structure for generating a command signal, electrical receiver control means carried by said toy structure for receiving said command signal and generating an electrical control current in response thereto, and means for translating said control current into a desired response, the improvement in said electrical receiver control means comprising:

means defining a normally nonconducting electrical circuit operably connected to said translating means for operating said translating means whenever said circuit is conducting the control current, said electrical circuit including in electrical connection

an electrical power source;

a nonfrequency discriminating signal detector to detect a momentary command signal over a broad band of frequencies and convert said command signal into a supplemental electrical signal;

electronic switch means for determining when the control current is to initially flow through said circuit, said electronic switch means being changeable in response to said supplemental electrical signal from a normally off nonconducting state wherein electricity does not flow through the electronic switch means and an on conducting state wherein electricity flows through said electronic switch means and the circuit; and

an interrupter switch for changing said electronic switch means to its off state and for stopping the control current a predetermined time after the circuit commences to conduct electricity, said predetermined time defining the period during which said control current actuates said translating means.

2. The toy combination of claim 1 including a switch cam mounted for movement against said interrupter switch for moving said interrupter switch between an off or open position and an on or closed position in response to the control current, said switch cam deter-

mining the length of time said circuit is to conduct electricity after the circuit commences to conduct electricity.

3. The toy combination of claim 2 wherein said translating means includes an electric motor connected in said circuit, said motor providing mechanical moving means for the translating means whenever the circuit is conducting.

4. The toy combination of claim 3 wherein said switch cam forms a part of the translating means and said motor moves said switch cam whenever the circuit is conducting.

5. The toy combination of claim 1 wherein said electronic switch means includes a transistor having its gate electrode connected to said signal detector and responsive to said supplemental electrical signal.

6. The toy combination of claim 1 wherein said command signal is in the form of an electromagnetic disturbance and said signal detector is an antenna.

7. The toy combination of claim 2 wherein said interrupter switch is normally in an off position and is connected in parallel with said electronic switch means whereby said electronic switch means, after being turned on, changes from its "on" state to its off state whenever said interrupter switch is moved from its off position to its on position.

8. The toy combination of claim 7 wherein said interrupter switch includes a stationary contact and a movable contact, the latter being normally biased away from said stationary contact, said movable contact abutting said switch cam, whereby the switch cam moves the movable contact away from or toward the stationary contact.

9. The toy combination of claim 8 wherein said switch cam is a rotatably mounted circular disc having an upstanding generally annular rib on the face thereof, said movable contact being biased against said rib, said rib having an on portion wherein the movable is contact is touching the stationary contact and an off portion lower in height than said on portion so that the movable contact is spaced from said stationary contact.

10. The toy combination of claim 2 wherein said interrupter switch is normally in an on position and is connected in series with said electronic switch means, whereby said electronic switch means, after being turned on, changes from its on state to its off state whenever said interrupter switch is moved from its on position to its off position.

11. The toy combination of claim 10 wherein said interrupter switch includes a stationary contact and a movable contact, the latter being normally biased against said stationary contact, said movable contact abutting said switch cam, whereby the switch cam moves the movable contact away from or toward the stationary contact.

12. The toy combination of claim 11 wherein said switch cam is a rotatably mounted circular disc having a lateral peripheral surface, said movable contact being in contact with said surface, said surface having an outwardly extending protrusion for engagement with the movable contact so that said protrusion biases the movable against the stationary contact when said protrusion is rotated into engaging relationship with said movable contact, whereby said movable contact is sprung away from said stationary contact upon further rotation of the switch cam after the protrusion contacts the

movable contact causing a momentary opening of the circuit.

13. In a remote controlled toy combination including a responsive toy structure, means separate from said toy structure for generating a command signal, electrical receiver control means carried by said toy structure for receiving said command signal and generating an electrical control current in response thereto, and means for translating said control current into a desired response, the improvement in said electrical receiver control means comprising:

means defining a normally nonconducting electrical circuit operably connected to said translating means for operating said translating means whenever said circuit is conducting the control current, said electrical circuit including in electrical connection

an electrical power source;

a nonfrequency discriminating signal detector to detect a momentary command signal over a broad band of frequencies and convert said command signal into a supplemental electrical signal;

electronic switch means for determining when the control current is to initially flow through said circuit, said electronic switch means being changeable in response to said supplemental electrical signal from a normally off nonconducting state wherein electricity does not flow through the electronic switch means and an on conducting state wherein electricity flows through said electronic switch means and the circuit;

an interrupter switch in parallel with said electronic switch means for stopping the flow of electricity through the circuit a predetermined time after the circuit commences to conduct electricity, said interrupter switch being movable between a normally off position and an on position, said predetermined time defining a period during which said control current actuates said translating means, whereby said electronic switch means, after being turned on, changes from its on state to its off state whenever said interrupter switch is moved from its off position to its on position; and

a switch cam mounted for movement against said interrupter switch for moving said interrupter switch between its off and on positions in response to the control current, said switch cam forming a part of the translating means so that the motor moves the switch cam whenever the circuit is conducting determining the length of time said circuit is to conduct electricity after the circuit commences to conduct electricity.

14. The toy combination of claim 13 wherein said electronic switch means includes a transistor having its gate electrode connected to said signal detector and responsive to said supplemental electrical signal.

15. The toy combination of claim 13 wherein said interrupter switch includes a stationary contact and a movable contact the latter being normally biased away from said stationary contact, said movable contact abutting said switch cam, whereby the switch cam moves the movable contact away from or toward the stationary contact.

16. The toy combination of claim 13 wherein said switch cam is a rotatably mounted circular disc having an upstanding generally annular rib on the face thereof, said movable contact being biased against said rib, said

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rib having an on portion wherein the movable contact is touching the stationary contact and an off portion lower in height than said on portion so that the movable contact is spaced from said stationary contact.

17. The toy combination of claim 13 wherein said command signal is in the form of an electromagnetic disturbance and said signal detector is an antenna.

18. In a remote controlled toy combination including a responsive toy structure, means separate from said toy structure for generating a command signal, electrical receiver control means carried by said toy structure for receiving said command signal and generating an electrical control current in response thereto, and means for translating said control current into a desired response, the improvement in said electrical receiver control means comprising:

means defining a normally nonconducting electrical circuit operably connected to said translating means for operating said translating means whenever said circuit is conducting the control current, said electrical circuit including in electrical connection.

an electrical power source;

a nonfrequency discriminating signal detector to detect a momentary command signal over a broad band of frequencies and convert said command signal into a supplemental electrical signal;

electronic switch means for determining when the control current is to initially flow through said circuit, said electronic switch means being changeable in response to said supplemental electrical signal from a normally off nonconducting state wherein electricity does not flow through the electronic switch means and an on conducting state wherein electricity flow through said electronic switch means and the circuit

an interrupter switch in series with said electronic switch means for turning said electronic switch means to its off state and for stopping the flow of electricity through the circuit a predetermined time after the circuit commences to conduct electricity, said interrupter switch being movable between a normally on position and an off position,

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said predetermined time defining a period during which said control current actuates said translating means, whereby said electronic switch means after being turned on, changes from its on state to its off state whenever said interrupter switch is moved from its on position to its off position; and

a switch cam mounted for movement against said interrupter switch for moving said interrupter switch between its off and on positions in response to the control current, said switch cam forming a part of the translating means so that the motor moves the switch cam whenever the circuit is conducting determining the length of time said circuit is to conduct electricity after the circuit commence to conduct electricity.

19. The toy combination of claim 18 wherein said electronic switch means includes a transistor having its gate electrode connected to said signal detector and responsive to said supplemental electrical signal.

20. The toy combination of claim 18 wherein said interrupter switch includes a stationary contact and a movable contact, the latter being normally biased against said stationary contact, said movable contact abutting said switch cam, whereby the switch cam moves the movable contact away from or toward the stationary contact.

21. The toy combination of claim 18 wherein said switch cam is a rotatably mounted circular disc having a lateral peripheral surface, said movable contact being in contact with said surface, said surface having an outwardly extending protrusion for engagement with the movable contact so that said protrusion biases the movable contact against the stationary contact when said protrusion is rotated into engaging relationship with said movable contact, whereby said movable contact is sprung away from said stationary contact upon further rotation of the switch cam after the protrusion contacts the movable contact causing a momentary opening of the circuit.

22. The toy combination of claim 18 wherein said command signal is in the form of an electromagnetic disturbance and said signal detector is an antenna.

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