

Feb. 23, 1971

L. T. STORMON ET AL  
POWERED TOY VEHICLE HAVING MOTOR MEANS  
SELECTIVELY, DRIVINGLY, CONNECTABLE  
TO A STEERING MECHANISM  
AND A DRIVING MECHANISM

3,564,765

Filed Nov. 20, 1968

2 Sheets-Sheet 1

FIG. 1

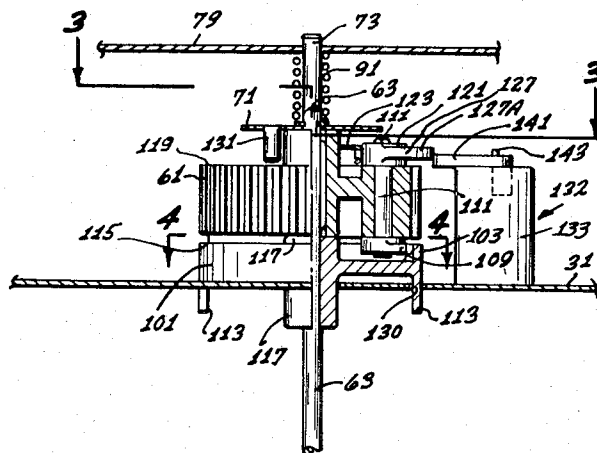
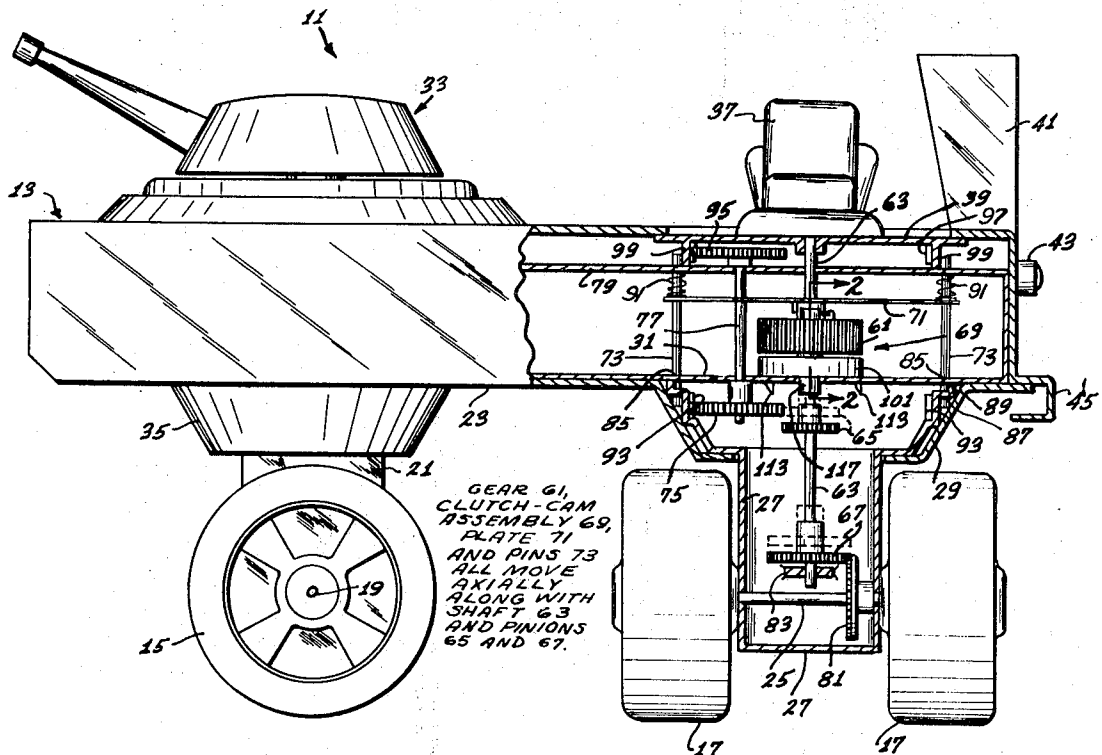


FIG. 2

INVENTORS  
LESTER T. STORMON  
OLDRICH FRYE

BY *Max E. Shirk*  
ATTORNEY

Feb. 23, 1971

L. T. STORMON ET AL  
POWERED TOY VEHICLE HAVING MOTOR MEANS  
SELECTIVELY, DRIVINGLY, CONNECTABLE  
TO A STEERING MECHANISM  
AND A DRIVING MECHANISM

3,564,765

Filed Nov. 20, 1968

2 Sheets-Sheet 2

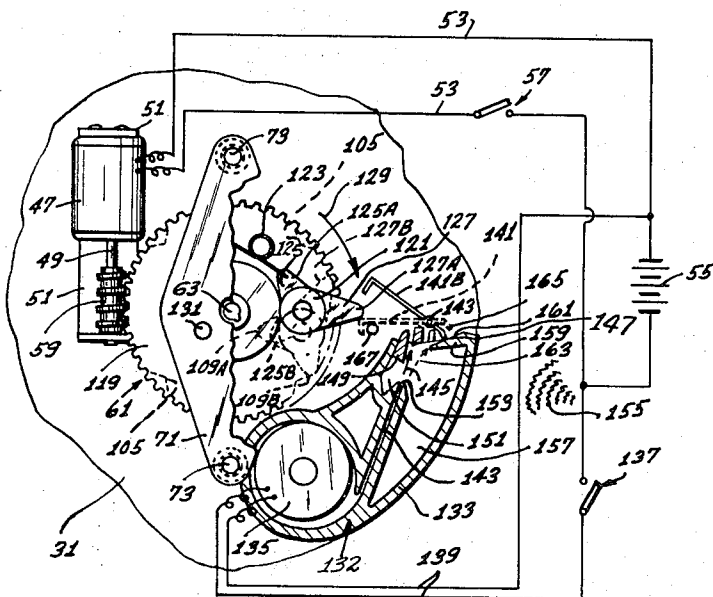


Fig. 3

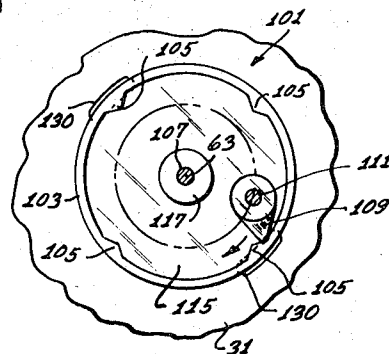


Fig. 4

Fig. 5

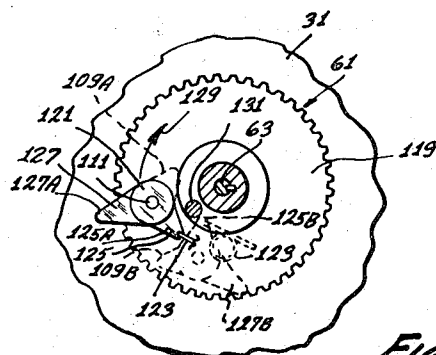
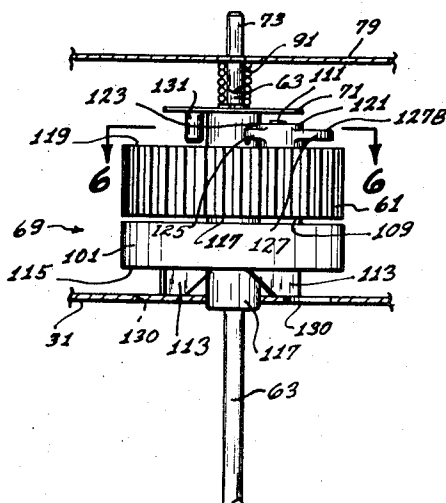


Fig. 6

INVENTORS  
LESTER T. STORMON  
OLDRICH FRYC

BY *Max E. Shirk*  
ATTORNEY

1

2

3,564,765

## POWERED TOY VEHICLE HAVING MOTOR MEANS SELECTIVELY, DRIVINGLY, CONNECTABLE TO A STEERING MECHANISM AND A DRIVING MECHANISM

Lester T. Stormon, Manhattan Beach, and Oldrich Fryc, Redondo Beach, Calif., assignors to Mattel, Inc., Hawthorne, Calif., a corporation of Delaware  
Filed Nov. 20, 1968, Ser. No. 777,282  
Int. Cl. A63h 17/00

U.S. Cl. 46—206

14 Claims

### ABSTRACT OF THE DISCLOSURE

This is a toy vehicle incorporating a self-contained motor for providing rotational power, a steering mechanism continuously changing its direction only as long as receiving rotational power, a drive mechanism for propelling the vehicle in the direction of the steering mechanism only as long as receiving rotational power, and a remotely controlled transmission mechanism continuously operatively coupled to the motor for alternately shifting, upon command, the rotational power from the motor to either the steering mechanism or to the drive mechanism.

### BACKGROUND OF THE INVENTION

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

#### Field of the invention

The present invention pertains generally to the field of toy vehicles and more particularly to a novel remotely controlled toy vehicle capable of being self propelled in any direction remotely selected by an operator.

#### Description of the prior art

Toy vehicles capable of changing their direction of movement across a running surface may be classed in one of two general classes. The first class includes toy vehicles that change their direction either on a predetermined timed sequence or upon the meeting of an obstruction. The second class includes toy vehicles that are either controlled in direction by a remotely positioned control mechanism coupled to the vehicle by a control cable or by a remotely positioned control mechanism electronically or acoustically coupled through a receiving mechanism in the toy. In toys of the former class, there is the disadvantage that no control is provided to an operator and no skill can be developed in connection with their operation.

As to the second classification in the case of cable operation, these toy vehicles have the disadvantage of requiring a control cable that may become entangled in surrounding obstructions, of not allowing vehicle operation through tunnels and the like, and of requiring that the operator move along with the toy due to the limited length of the cable.

In the case of prior art devices allowing the remote control without the objectionable cable, these toys are generally very complex, intricate and delicate and, accordingly, are not very rugged or reliable and very costly and therefore limited in market appeal.

A toy vehicle that can be controlled remotely without the use of a control cable and which is relatively simple to construct with no delicate or intricate parts and that has no expensive electronic circuitry would be a significant advancement in the toy industry.

### SUMMARY OF THE INVENTION

In view of the foregoing disadvantageous characteristic of the prior art, it is a primary object of the present invention to provide a new and improved remotely controlled vehicle not subject to these disadvantages and having a unique rotational power distribution transmission coupling this power either to a steering mechanism or to a drive wheel mechanism depending upon the remote commands of an operator.

Another object of the present invention is to provide a remotely controlled toy vehicle that upon command will stop its progress across a running surface and commence continuously changing its steering mechanism until positioned in a desired direction.

Still another object of the present invention is to provide a remotely controlled toy vehicle that responds to acoustic commands of an operator.

According to the present invention, motor means and directional means including a steering mechanism are supported by a toy vehicle body that has at least one driving wheel. The motor means provides rotational power for the vehicle and the directional means allows the continuous changing of the direction of the steering mechanism only as long as it is receiving rotational power. The vehicle also includes drive means coupled to the drive wheel for continuously rotating the wheel only as long as the drive means is receiving the rotational power from the motor means. Continuously coupled to the motor means are transmission means having a first mode of operation for coupling the rotational power only to the drive means and also has a second mode of operation for coupling the rotational power only to the directional means. Further included, are remote control means coupled to the transmission means for alternately shifting the transmission means from one of its modes of operation to the other upon command from a position remote from the vehicle.

The directional means may include a rotatable steering yoke assembly carrying a drive wheel axle to which the drive wheel is attached. Also, the transmission means may include a vertical rotating shaft that is geared to a motor shaft so as to receive the rotational power from the motor. The shaft in turn may be elevated and lowered to alternately couple, through appropriate gearing, the rotational power either to the drive wheel or to the steering yoke assembly.

As to the remote control means, this may be an acoustically actuated fluid dynamic control device of the type described in U.S. Pat. No. 3,282,051, assigned to the assignee of the present application.

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

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view, partially broken away and with parts removed for clarity, of an embodiment of the invention;

FIG. 2 is an enlarged partial cross-sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged top plan view of the driving and controlling mechanism portions of the invention;

FIG. 4 is an enlarged view of the clutch mechanism taken along line 4—4 of FIG. 2;

FIG. 5 illustrates by way of an enlargement the transmission clutch-cam assembly in its second operational mode; and

FIG. 6 is a plan view of the trip and reset mechanism of the clutch-cam assembly, taken along line 6—6 of FIG. 5.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring again to the drawings and particularly to FIGS. 1, 2 and 3, a remotely controlled toy vehicle generally designated 11 is shown having a body or frame 13. For support, the body 13 is provided with rear wheels 15 and front wheels 17. The rear wheels 15 are not driven and are mounted on a rear axle 19 held by a pair of rear vertical brackets 21 attached to the underside 23 of the body 13. Either one or both of the front wheels 17 may be driven by being keyed to and mounted on a front axle 25.

The axle 25 is supported by and passes through apertures in a steering yoke member 27 rotatably held in position by and between a lower body lip portion 29 and a lower body plate 31.

The toy vehicle may be fabricated in any desired form such as the toy artillery-carrying mobile platform shown in the figures. In this configuration, the body 13 includes a gun turret assembly 33, a conforming rear wheel skirt portion 35, and a simulated operator's seat 37, mounted on a rotatable platform 39 that rotates in the direction of travel as will be described later. Also provided for decorative purposes is a windscreen 41, a headlamp assembly 43, and a front bumper bracket 45, all attached to the front of the body 13. Although the outward appearance of the toy is important to its salability, the essential portions of the invention are generally contained within the vehicle body and need not be visible to the user.

Rotational power for propelling and steering is provided by a self-contained miniature electric motor 47 having a rotating output shaft 49 and mounted on a bracket 51 attached to the lower body plate 31 as seen more clearly in FIG. 3. The motor 47 is connected by means of wires 53 to a battery 55 contained in a compartment within the vehicle body. The motor 47 may be turned on and off by a conventional electric switch 57.

The rotational power from the motor 47 is transmitted by means of a worm gear 59, mounted on the end of the shaft 49, to a transmission mechanism including a relatively large first transmission gear 61. The gear 61 is carried by a rotatable transmission shaft 63 which also carries a steering pinion gear 65 and a drive wheel pinion gear 67.

The transmission mechanism has basically two modes of operation: a first mode as shown in solid lines for gears 65 and 67 in FIG. 1 and a second mode as indicated by the dashed lines for the same gears. Although not shown for the sake of clarity, the first transmission gear 61 along with a clutch-cam assembly 69, a horizontal lock pin retaining plate 71 and its associated lock pins or rods 73 are raised and lowered with the steering and drive wheel pinions 65 and 67.

In its first mode of operation, the steering pinion 65 is not engaged to an associated idler gear 75 that is rotatably mounted on the lower surface of the plate 31 by means of an idler shaft 77 passing through an aperture in the plate 31 and one in an intermediate horizontal plate 79. However, in this mode the lower positioned drive wheel pinion 67 is caused to engage a front axle drive gear 81 which is keyed thereto for the purpose of causing the axle 25 to rotate and the driven wheel or wheels along with it. The lower end of the shaft 63 is journaled in a bracket 83 in order to allow axial and rotational movement without allowing lateral motion.

Also in this first mode, the lock pin retaining plate 71 is in its lower position forcing the lock pins 73, which normally protrude through appropriate apertures 85 in the

lower body plate 31, to pass through a pair of a plurality of steering yoke locking apertures 87 in an upper lip portion 89 of the steering yoke 27. The lock pins 73 are provided with return springs 91, which in their lower position prevent the yoke 27 from rotating.

In the second mode of operation, the shaft is caused to be elevated by the clutch-cam assembly 69. This action causes the drive wheel pinion 67 to be disengaged from the drive gear 81, and the vehicle is then free wheeling. At the same time, the steering pinion 65 engages the steering idler gear 75 and the lock pins 73 are pulled by the plate 71 from the yoke apertures 87 to free the yoke 27 to rotate.

The steering idler gear 75 meshes with a steering mechanism crown gear 93 mounted adjacent the upper lip portion 89 on the inner surface of the yoke 27. The idler 75 is keyed to the idler shaft 77 as is a second idler gear 95 that engages a second crown gear 97 attached to an inner surface of a lower circular lip portion 99 extending below the rotatable platform 39.

It should be clear from the foregoing description of the two modes of operation of the transmission mechanism that the rotational power from the motor 47 is coupled to the shaft 63 through the large gear 61 which in turn causes the steering pinion 65 and the drive wheel pinion 67 to rotate. Thus, when the transmission is in its first mode, the drive gear 81 is engaged and the front wheels 17 are driven to propel the toy in the direction in which the steering mechanism is set at the time. However, when the transmission is shifted to its second mode by operation of clutch-cam assembly 69 as will be described, the front wheels 17 are allowed to free-wheel and the rotational power is coupled through the idler gears 75 and 95 to rotate the yoke 27 and the platform 39 on which the seat 37 is mounted. The seat 37 and steering yoke 27 will continue to rotate in a 360° circle until the clutch-cam assembly 69 again allows the shaft to be lowered into the transmission's first mode and thereby cause the front wheels 17 to again be driven, but now in possibly a different direction determined by the position of the yoke 27 when the mode was shifted.

The above-mentioned clutch-cam assembly 69 functions as the means for shifting the transmission mechanism between the two modes. This assembly is seen in more detail in FIGS. 3, 4, 5 and 6, where there is shown a lower circular housing 101 having an upward extending lip 103, four equally spaced clutch protrusions 105, an aperture 107 for the shaft 63, an internally mounted actuation lever 109 held by and pivoting with an actuating shaft 111, and a pair of cam members 113 extending below the bottom portion 115 of the housing 101.

Unlike the gear 61, the housing 101 is not keyed to the shaft 63 and has a relatively large bearing interface therewith in the form of a bearing extension 117 disposed about the shaft 63 above and below the bottom portion 115.

The other elements of the clutch-cam assembly 69 are mounted on an upper surface 119 or through the first transmission gear 61. For example, a tripping lever 121 is fixed to the actuating shaft 111 and is biased alternately in a first or second position by an overcenter spring 123 coupled to a first or reset lobe 125 thereof. The spring 123 is anchored to an appropriate post (not shown) extending upward from the upper gear surface 119.

The tripping lever 121 and the actuation lever 109 are fixed on the actuating shaft 111, in a particular relationship such that when a tripping lobe 127 of the tripping lever 121 is extending radially outwardly from the gear 61, as indicated by the configuration denoted as 127A, the actuation lever 109 is in the position denoted as 109A. Of course, in this particular position, the first lobe 125, being in fixed relationship to the tripping lever 127, is denoted as 125A. From viewing FIGS. 3 and 6, it can be seen that in a first position A, the tripping lobe 127 extends outward ready to be tripped, and the actuation lever 109

5

extends inward where it is not in a position to engage any other member of the clutch mechanism. Thus, as long as the mechanism is in the first position A, the first transmission gear 61 will be rotated in the direction indicated by an arrow 129 as will the shaft 63, but the clutch-cam housing 101 will remain stationary with its cam members 113 disposed in conforming slots 130 in the lower body plate 31 as illustrated in FIG. 1. Also, the lower pinion 67 will engage the drive wheel gear 81.

On the other hand, when the tripping lobe 127 is in position, B, the actuation lever 109 is also in its position B with its lobe adjacent the inner surface of the upward extending lip 103 of the housing 101. Here, as the gear 61 rotates with respect to the stationary housing 101, the actuation lever 109B will move with the gear 61 without engagement until it strikes the next adjacent clutch protrusion 105 as shown in FIGS. 3, 4 and 5. At this point, the housing 101 will be caused to rotate with the gear 61 and in consequence thereof the housing 101, along with the gear 61 and the shaft 63, will be elevated to the transmission's second mode by the action of the cam members 113 riding out of the slots 130 in the lower body plate 31.

The rotation of the housing 101 is only provided for a portion of a revolution, generally 90°, at which time the first or reset lobe 125B comes into contact with a stationary reset post 131 mounted on and extending downward from the lock pin retaining plate 71 (FIGS. 5 and 6). The movement of the reset lobe 125B relative to the post 131 forces the tripping lever 121 back to its A position with its tripping lobe shown in the figures as 127A. This action disengages the actuation lever 109 from the protrusion 105 and the housing 101 no longer rotates. As long as the tripping lever 121 remains in this position, the transmission will remain in its second mode of operation and the yoke 27, along with the rotatable platform 39 and its attached seat 37, will continue to rotate in a 360° circle.

When the tripping lever 121 is again forced into its B configuration (see tripping lobe 127B), the actuation lever 109 will again engage a clutch protrusion 105 and cause the housing 101 to rotate until the cam members 113 drop into the aforementioned slots 130 in the plate 31 to lower the shaft 63 and cause the front wheels 17 to be driven.

The mechanism will again be reset by the reset post 131 striking the reset lobe 125B where the transmission mechanism will be ready for another cycle of operation. In this manner, it should be understood that the toy vehicle will remain in either of its two modes of operation (either being propelled in the direction determined by its steering mechanism or continuously rotating its steering mechanism in a 360° circle) until the tripping lever 121 is tripped.

The toy vehicle 11 is further provided with means for remotely controlling its two modes of operation. This may comprise the acoustically actuated air switch 132 (FIGS. 2 and 3) previously mentioned (U.S. Pat. No. 3,282,051) including a blower (not shown) mounted in a switch housing 133 and powered by an electric motor 135 connected through second electric switch 137 and wires 139 to the battery 55. Also included may be a tripping vane 141 which is generally in one of two positions, pivoting about a pivot pin 143 extending upwardly from and attached at its lower end to the lower body plate 31. The unactuated or first position is that shown in FIG. 3 in solid lines while the actuated position is shown in dashed lines 141B.

A very detailed explanation of this type of fluid switch may be found in the referenced patent but in simplified terms it may be said that the blower powered by the motor 135 produces, in conjunction with a channel 143 in the housing 133, an air jet stream shown as arrow 145 that follows a path adjacent a first boundary wall 147 of a blocking member 149, due to the action of a separa-

6

tion chamber 151 disposed between the blocking member 149 and an exit 153 of the channel 143. However, when a sound 155 is introduced into a resonant chamber 157 disposed between the jet stream exit 153 and a nozzle block member 159, the jet stream is attached toward the resonant chamber 157 and caused to flow adjacent a second boundary surface 161 of the nozzle block member 159 as indicated by dashed arrow 163, where it will remain only for the duration of the actuating sound. Of course, the sound 155 must contain sound energy at the frequency to which the resonant cavity 157 is tuned in order to actuate the switch and divert the jet stream.

In the unactuated situation, the jet stream 145 impinges upon the tripping vane 141 to the left of the pivot pin 143 where it cannot be engaged by the extended lobe 127A of the tripping lever 121 and the transmission mechanism will remain in whichever mode of operation it happens to be in. Upon the introduction of an appropriate sound 155, however, the jet stream is diverted to the path indicated by the dashed arrow 163 and the stream now strikes a cupped arm portion 165 of the tripping vane 141 so as to force the vane into the position shown by the dashed lines 141B, resting against a stop post 167. Now, the lobe 127A will strike the vane and through the action of the over-center spring 123 will move to and remain at the position indicated by the outline 127B until reset by post 131 acting on reset lobe 125B.

In operation, the electric switches 57 and 137 are moved to their "on" position to energize the two electric motors 47 and 135, respectively. Assuming that the transmission mechanism is in its first mode, the front wheels will be driven and the toy vehicle 11 propelled in the direction set by the radial direction of the steering mechanism as locked by the locking rods 73. This direction can be readily determined by viewing the relative position of the front of the seat 37 with respect to the vehicle body 13. Upon an appropriate acoustical command such as a whistling sound, the fluid switch 132 will cause the tripping lever 121 to be rotated to its second or B position and the shaft 63 elevated to disengage the drive arrangement and engage the steering mechanism. The steering mechanism will now continue to rotate until the command is given, at which position this mechanism will be locked and the front wheels 17 again driven. In this manner, the operator may control the vehicle in both direction and motion from a position remote from the toy.

The materials used in the fabrication of this toy are not considered critical and any material generally known to be suitable for a particular use may be utilized. For example, the axles and shafts are generally formed from a suitable metal such as iron or steel and the gears may be of metallic or synthetic materials, for example.

From the foregoing, it will be evident that the invention provides a new and useful remotely controlled toy vehicle that is not subject to the disadvantages of the prior art and that has a unique rotational power distribution transmission for coupling the rotational power produced by a self-contained electric motor either to a steering mechanism or to a drive wheel mechanism, depending upon the commands of an operator not physically connected by any apparatus to the vehicle.

Although a specific embodiment of the invention has been described in detail, other organizations of the embodiment may be made within the spirit and scope of the invention.

Accordingly, it is intended that the foregoing disclosure and drawings shall be considered only as illustrations of the principles of this invention and are not to be construed in a limiting sense, and the scope of this invention is to be defined by the scope of the following claims.

What is claimed is:

1. A powered vehicle toy, comprising:
  - motor means for providing power;
  - a steering mechanism continuously changing the direc-

tion of travel of said vehicle when said steering mechanism is receiving power from said motor means; a drive mechanism for propelling said vehicle when receiving power from said motor means; connecting means for selectively drivingly connecting said motor means to only one of said steering and drive mechanisms; and remote control means coupled to said connecting means for controlling the operation thereof.

2. A vehicle toy according to claim 1 wherein said connecting means includes a tripping level swingable to a first position for connecting said motor means to said steering mechanism and to a second position for connecting said motor means to said drive mechanism.

3. A vehicle toy according to claim 1 wherein said remote control means is an acoustically-actuated fluid air switch.

4. A vehicle toy according to claim 3 wherein said air switch includes a tripping vane swingable to a first position for tripping said tripping lever, said vane being swung to said first position when said air switch receives a predetermined acoustic signal.

5. A remotely controlled toy vehicle, comprising:  
a toy vehicle body having at least one drive wheel mounted thereon;  
motor means supported by said body for providing rotational power for driving or steering said vehicle;  
directional means including a steering mechanism disposed in said body and including means for continuously changing the direction in which said steering mechanism steers only as long as said directional means is receiving said rotational power;  
drive means coupled to said drive wheel for continuously rotating said drive wheel only as long as said drive means is receiving said rotational power;  
transmission means continuously drivingly coupled to said motor means and having a first mode of operation coupling said rotational power only to said drive means, and having a second mode of operation coupling said rotational power only to said directional means; and  
remote control means coupled to said transmission means for alternately shifting said transmission means from one of said modes of operation to the other upon command from a position remote from said vehicle.

6. A remotely controlled toy vehicle according to claim 5, wherein said transmission means includes a gear carrying rotatable shaft that is axially movable to two opposite positions, the first of which causes the engagement of only a first gear to said drive means, and the second of which causes the engagement of only a second gear to said steering mechanism, said shaft further carrying in fixed relationship a motor driven gear.

7. A remotely controlled toy vehicle according to claim 6, wherein said transmission means also includes a clutch-cam mechanism that in a first configuration is not coupled to said shaft which is in said first position, and that in a second configuration is coupled to and rotates with said shaft for a predetermined portion of one revolution of

said shaft and in said second configuration axially moves and maintains said shaft to and in said second position only for the time said clutch-cam mechanism is in said second configuration.

8. A remotely controlled toy vehicle according to claim 7, wherein said clutch-cam mechanism includes a circular housing and at least one cam member extending therefrom, said cam member causing said circular housing to move axially from a first axial position to a second axial position as said housing is rotated for only a predetermined first portion of one revolution and to return to said first axial position when said housing is rotated for only a predetermined second portion of one revolution.

9. A remotely controlled toy vehicle according to claim 8, wherein said housing includes a raised lip portion with a plurality of spaced protrusions extending radially inwardly and also includes a pivoted actuation lever coupled to a tripping lever having an A position and a B position, said actuation lever engaging one of said protrusions when said tripping lever is in said B position.

10. A remotely controlled toy vehicle according to claim 9, wherein said remote control means is an acoustically-actuated fluid air switch having a tripping vane that engages said tripping lever only in said A position and only when said switch is actuated.

11. A remotely controlled toy vehicle according to claim 6, wherein said steering mechanism includes a rotatable yoke having two arms extending downwardly and whereat adjacent the lower extremities of said arms is horizontally disposed a drive axle upon which said drive wheel is attached.

12. A remotely controlled toy vehicle according to claim 11, wherein said yoke has mounted in the upper inner portion thereof a crown gear adapted to engage said second gear.

13. A remotely controlled toy vehicle according to claim 12, wherein said transmission means further includes yoke locking means for preventing rotation of said yoke when said transmission means is in said first mode of operation.

14. A remotely controlled toy vehicle according to claim 13, including a passenger seat mounted in said body and means connecting said seat to said yoke for rotation therewith, whereby said seat will face the direction of said steering mechanism.

#### References Cited

##### UNITED STATES PATENTS

|           |         |                    |         |
|-----------|---------|--------------------|---------|
| 1,796,157 | 3/1931  | Moore              | 46-210X |
| 1,808,015 | 6/1931  | Buchanan-Wollaston | 46-210  |
| 2,133,038 | 10/1938 | Muller et al.      | 46-210  |
| 3,386,406 | 6/1968  | Tsunoda            | 46-243X |
| 2,519,472 | 8/1950  | Howard             | 46-244  |
| 2,742,735 | 4/1956  | Sommerhoff         | 46-244  |

F. BARRY SHAY, Primary Examiner

U.S. Cl. X.R.

46-210, 244