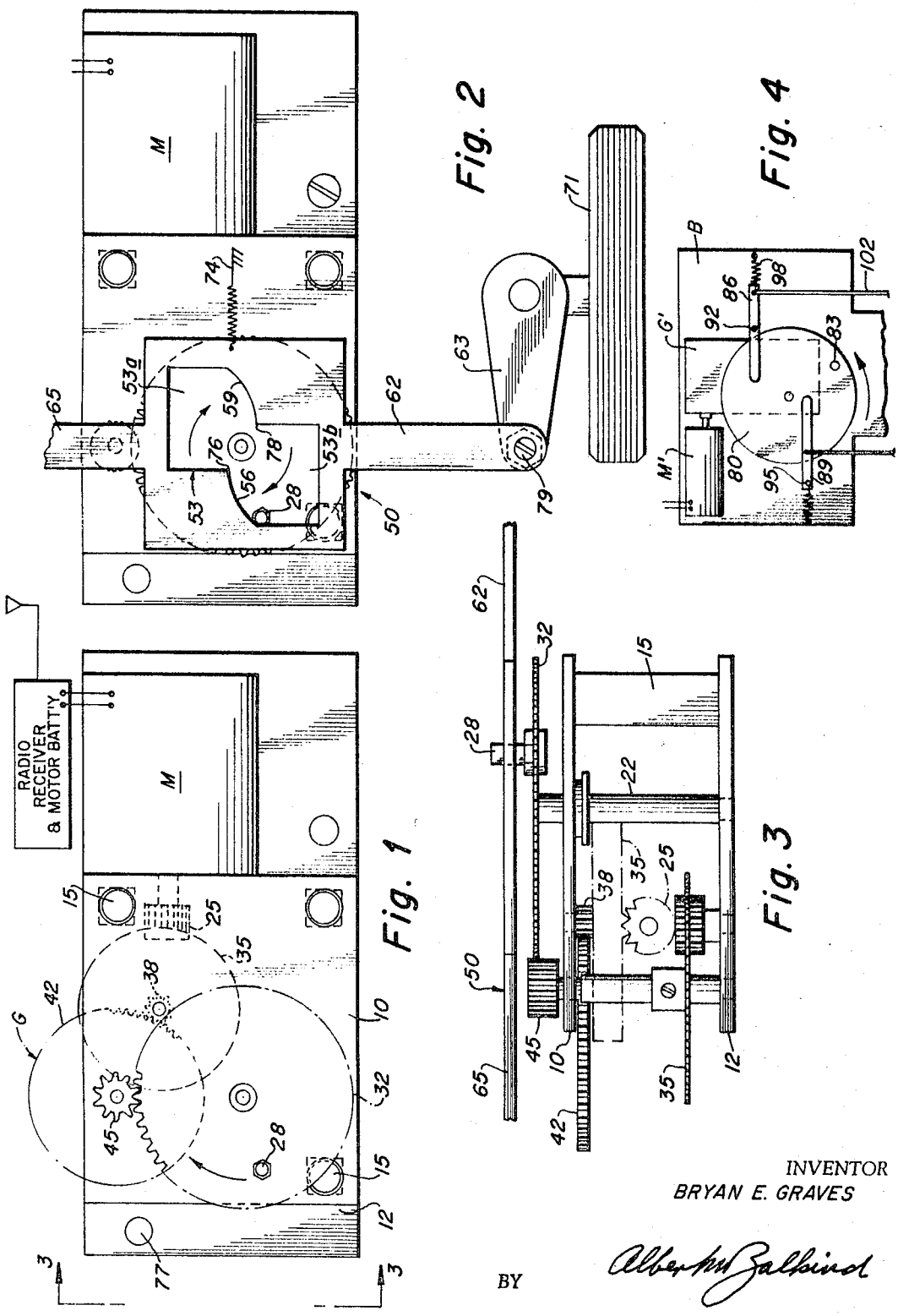
July 22, 1969 B. E. GRAVES 3,456,753

STEERING CONTROL FOR REMOTE CONTROL TOYS

Filed Jan. 18, 1967



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United States Patent Office 3,456,753 Patented July 22, 1969

3,456,753

STEERING CONTROL FOR REMOTE CONTROL TOYS

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Filed Jan. 18, 1967, Ser. No. 610,076
Int. Cl. B62d 1/24; A63h 17/36
U.S. Cl. 180—98 14 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to steering control mechanisms for remotely controlled toy vehicles, such as boats, cars, planes and the like. More particularly, the invention relates to a unitary steering control assembly which can be quickly attached to or detached from a toy for steering the toy responsive to radio signals.

FIELD OF THE INVENTION

The invention resides in the toy field, especially in the toy vehicle field.

DESCRIPTION OF THE PRIOR ART

The prior art known to the inventor comprises fairly complex and expensive mechanisms utilizing motors, escapements and/or solenoids for effecting directional remote control or wherein complicated coding systems or resonant tones, or differing transmission frequencies are utilized for controlling left and right steering.

SUMMARY OF THE INVENTION

The present invention overcomes the drawbacks of complexity, expense and functional unreliability of the prior art by providing a relatively simple mechanical unit which can be attached to toys and wherein said unit comprises a small electric motor, which, when energized under control of a radio signal receiver carried by the toy, effects left or right steering with use of a single transmitted frequency. Control of the direction in which the toy is desired to proceed is effected by energization of the motor upon signal transmission to the toy and by de-energization when it is observed that the toy is proceeding in the desired direction. Thus, a revolving cam member is actuated by the motor and arranged to engage sequentially with a pair of cam followers. Engagement with one follower effects steering in one direction by shifting of that follower and engagement with the other follower effects steering in another direction. The cam member revolves in a single direction, and is biased to a central position with respect to the cam followers when the vehicle is proceeding straight ahead. However, when the motor is energized responsive to signal, the revolving of the cam member first causes steering in one direction by engagement with a respective cam follower and, if that is the direction desired as determined by visual observation of the toy, then the signal is cut off at the transmitter by the operator, the toy continuing to steer in the aforementioned direction. If, however, the aforementioned direction is not the desired direction, then the operator continues to transmit the signal until the cam member moves past the engaged cam follower and abuts the other cam follower causing steering in another direction. Inasmuch as the movement of the cam member requires only about a half a second from beginning to end of engagement with any cam follower, it will be apparent that an initially undesired direction of steering will be of very brief duration and compensation therefor begun in less than two seconds by permitting the cam member to continue revolving until it engages and actuates the cam follower corresponding to the desired direction of steering, at which time the motor is de-energized by cessation of the signal when the operator observes that the toy is moving in the desired direction.

When the toy has steered to a desired degree the operator again energizes the motor for a brief period of a second or so in order to disengage the cam from the follower whereupon the cam follower is moved under bias to a neutral or straight ahead steering position.

It will thus be noted from the above that the invention accomplishes its objects of simplicity of structure, simplicity of operation, economy of manufacture, and reliability in functioning.

Other objects and features of the invention will be apparent from the disclosure to follow, including the construction of all parts of the mechanism so as to be readily secured to a toy.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of the mechanism of the invention showing the motor driving a gear reduction arrangement for effecting revolving of a cam member, the cam follower plate being removed for clarity;

FIG. 2 is likewise a plan view showing the mechanism with the cam follower plate in place over the mechanism as it would be in the course of operation;

FIG. 3 is an elevation view looking in the direction 3—3 of FIG. 1; and

FIG. 4 is a plan view of a modification of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment is as shown in FIGS. 1–3 and comprises a pair of spaced support plates **10** and **12**, an upper and lower plate, respectively, which are maintained spaced by column members **15** suitably secured to the plates. An electric motor M is carried on the bottom plate, being suitably secured thereto in any known manner.

The motor is controlled by radio signals which effect energization by transmission, current being from batteries, all as symbolized in FIG. 1. Extending between the plates is a shaft **22** which is part of the reduction gear train G that couples the motor pinion **25** to a revolving cam member, such as a cam finger or pin **28**. Any suitable reduction gearing may be utilized for the purpose, but, in the present instance, the pin **28** is conveniently carried by a gear **32**, the final driven gear in the train, on shaft **22**.

Gear **32** rotates at uniform angular velocity continually when the motor is energized at a contemplated rate of 30 r.p.m., or, one rotation in two seconds. The motor is geared down via the train consisting of pinion **25**, crown gear **35** and coaxial pinion **38**, gear **42** and pinion **45**, and gear **32**, in a completely conventional and well understood manner, the several gears and pinions being supported on shafts journaled in the plates as shown. It will, of course, be understood that any suitable reduction gearing may be utilized, for example, worm gearing or a belt and pulley system of positive drive type. A cam follower plate **50** is provided with a cut-out **53** comprising cut-out areas **53***a* and **53***b*, each of which provides a clearance for 90° rotation of the cam pin. The cut-out provides a pair of cam follower edges **56** and **59** engageable sequentially by cam pin **28** as it revolves clockwise in the direction indicated.

The cam plate has a pair of integral extending arms **62** and **65** which are pivotally supported on steering links, such as **63**, of a toy vehicle; for example, a toy automobile wherein the wheel **71** is shown as exemplary. Thus, the cam plate is supported independently of the unitary steering control mechanism on steering links, such

as **63**, and is maintained in a neutral or straight ahead steering position by biasing means, such as the spring **74**, which is fastened to the plate at one end and will be understood to be suitably fastened at its other end to the vehicle, as indicated by the ground symbol.

From the above, it will be apparent that the unitary mechanism may be suitably fastened to the vehicle as by screws or bolts through holes such as **77** through the bottom plate and in such position that the pin **28** will protrude through the cut-out either in area **53***a* or **53***b* so that when it starts to revolve it will engage the ensuing cam follower edge **56** or **59**. In FIG. 2 the cam pin is about to engage cam follower edge **56**.

The follower edges **56** and **59** will be engaged by the revolving cam pin each for a distance of 90° of rotation of the pin. When the pin escapes past a corner such as **76**, the cam plate will snap to the neutral position shown by virtue of the spring bias. However, by engagement with follower edge **56** the cam pin will shift the cam plate to the right (upward on FIG. 2) thereby causing the vehicle to steer in that direction for a period of half a second. If the operator desires right-hand steering, he merely cuts off the signal to the radio receiver when he observes that the vehicle is steering to the right. This leaves the cam pin somewhere in its traverse on cam follower edge **56** and holds the cam plate in shifted position. The vehicle will then continuously steer to the right going in a circle, if that maneuver is desired. On the other hand, if the operator wishes left-hand steering, he maintains the motor energized until the half second period of right-hand steering is over and continues to keep the motor energized when the vehicle straightens out for the next half second, during the course of which the pin traverses the empty space **53***a* of the cut-out. After such half second, the pin engages the cam follower edge **59** shifting the cam plate to the left (downward on FIG. 2) and the operator visibly observes that the vehicle is now steering to the left whereupon he cuts off radio transmission for as long as he wishes the vehicle to maintain leftward steering. In the event that the radio transmission is not cut off, the motor remains energized and pin **28** escapes past corner **78** and into the clearance area **53***b*. Cam plate **50** is then automatically shifted back to neutral or straight ahead position by the bias spring **74**.

While the cut-out areas **76** and **78** have been shown as square or rectangular, it will be appreciated, of course, that they may be of any shape just so long as they provide suitable escape clearance for the cam pin.

It will be apparent from the above description that the steering control is rugged, simple, and economical and, further, it is not limited to left or right steering but could, in fact, be used for altitude control of airplanes by coupling the cam plate to ailerons and elevator flaps. It will further be apparent that the cam plate may be shiftably secured in any manner as a matter of choice and design in any type of toy vehicle. Inasmuch as the degree of shifting, that is, reciprocation, is quite small, suitable looseness may be designed in the support so that there will be no binding due to the rocking connection that the cam plate has with links and levers. For example, the pivot screw **79** may be supplanted by other connection means. However, in the arrangement shown in FIG. 2, the plate can be permitted to shift bodily in a transverse direction, toward or away from the motor in order to compensate for the varying pivotal position of steering links **63**. Such transverse shifting is exceedingly small and of negligible consequence. The significant factor is that the unitary mechanism, as represented in FIGS. 1–3, may be applied to the vehicle or readily removed therefrom without having to remove the cam plate.

It will further be appreciated that the principle of the invention may be utilized to effect directional control for more than two directions by simply providing a cut-out having several cam edges disposed to be sequentially engaged by a revolving cam pin.

A modified arrangement is shown in the plan view of FIG. 4 wherein the motor M′ will be understood to be radio receiver controlled and operated through a reduction gearing of any suitable kind, as indicated by G′, to rotate a disk **80** which carries a cam pin **83** engageable sequentially with pivotal levers **86** and **89**. Thus, the levers and other elements as well as the disk **80** may be mounted on a baseboard B, the lever **86** being pivoted at **92** and the lever **89** being pivoted at **95**. Biasing springs, such as **98**, secured to the lever ends and to the baseboard in any suitable manner, maintain a neutral position of the respective levers. Each lever has secured thereto a push rod such as **102**, which may be a wire, and it will be understood that such rods are secured at their outer ends (not shown) to any steering linkages, etc., that are to be controlled.

The operation of the modification of FIG. 4 will be apparent, in that when motor M′ is energized pursuant to signal, cam pin **83** will rock lever **86** to effect a directional steering function and maintenance of energization of the motor will cause the cam pin to disengage lever **86** and, shortly thereafter, engage lever **89** to effect a different directional control function. The mode of control is by visual observation of the vehicle and the manner of controlling selected directions is precisely as heretofore explained in connection with FIGS. 1–3.

It will, of course, be understood that the lever lengths and positioning is such as to permit engagement with either lever for about a 90° traverse of pin **83**.

Although the form shown in FIG. 4 requires a bias means to return the levers from a rocked position, it will be appreciated that in the form shown in FIGS. 1–3, the cam pin itself is capable of performing that function in event of failure of the bias means. Thus, the revolving cam pin will leave one cam follower edge and about one-half second later abut the other edge, shifting the cam plate in the opposite direction. The cam follower edges are made arcuate for smoothness of engagement contact and disposed to provide about a 25° turning of vehicle wheels or rudders of boats, etc., which will be understood to be a matter of choice and design. In any event, it will be apparent that the control unit may readily be removed from, say, a toy car and secured in a toy boat, and vice versa, each toy being provided with a cam follower plate that stays in place in the respective toy.

What is claimed is:

1. A steering control mechanism comprising:

(a) a motor and motor control means for maintaining said motor uninterruptedly and continuously operable in a single direction for a selectively determined length of time dependent upon desired direction of steering;

(b) a steering control drive member operatively connected so as to be actuatable by said motor in single direction;

(c) a driven means disposed to be driven by said steering control drive member in sequentially differing directions when said steering control drive member is actuated in a single direction;

(d) and steering connection means actuatable by said driven means to effect steering sequentially in differing directions while said steering control drive member is being actuated in a single direction whereby a selected direction is effected without interruption of motor operation, including means for moving said driven means to predetermined initial position when not being affected by said drive member.

2. A steering mechanism as set forth in claim **1**,

(a) said steering control drive member comprising a revolving abutment member,

(b) said driven means comprising elements sequentially abuttable by said abutment member as said abutment member revolves.

3. A mechanism as set forth in claim 2,
(a) said revolving abutment member effecting a continuous unidirectional 360° traverse in a predetermined time at uniform angular speed,
(b) and said elements each being disposed to effect a respective actuation of said steering connection means during substantially 90° of travel of said steering control member.

4. A mechanism as set forth in claim 3,
(a) said revolving abutment member comprising a cam pin,
(b) said elements comprising pivotally mounted levers disposed to be sequentially rocked by said cam pin,
(c) and bias means for biasing said cam levers to an initial position in the path of said cam pin.

5. A steering mechanism as set forth in claim 1,
(a) said steering control drive member comprising a revolving abutment member,
(b) said driven means comprising a cam plate having cam followers disposed in the path of revolution of said revolving abutment member so as to be engaged thereby to effect shifting thereof in sequentially differing directions.

6. A steering mechanism as set forth in claim 5,
(a) said cam plate having a cut-out area and said cam followers being camming edges thereof,
(b) said revolving abutment member being disposed to revolve unidirectionally within said cut-out area and engaging said camming edges in continuous sequence,
(c) wherein said camming edges are oriented for reversible shifting of said camming plate.

7. In a steering mechanism as set forth in claim 6,
(a) said steering connection means comprising arm means extending from said cam plate, and
(b) means for effecting pivotal connection of said arm means with supporting linkage means for supporting said cam plate independently of said motor and said rotating abutment element.

8. A steering mechanism as set forth in claim 5,
(a) and means for securing said cam plate to a vehicle whereby said cam plate is supported by said vehicle independently of said motor and said revolving abutment member.

9. A steering mechanism as set forth in claim 5,
(a) said steering connection means comprising arm means extending from said cam plate, and
(b) means for effecting pivotal connection of said arm means with steering linkage means for supporting said cam plate independently of said motor and said rotating abutment element.

10. A steering control as set forth in claim 1,
(a) means for securing said motor and said steering control drive member as an integral unit for unitary attachment to a vehicle,
(b) said steering control drive member comprising a cam pin unidirectionally revolved by said motor,

(c) said driven means comprising a cam plate having cam followers sequentially engageable by said cam pin and being oriented so as to effect shifting of said cam plate in respective differing directions upon being engaged by said cam pin,
(d) and means for securing said cam plate to a vehicle independently of said unit and in position whereby said cam pin is engageable with said cam followers when said unit is secured to said vehicle.

11. A steering control mechanism as set forth in claim 1, wherein said initial position corresponds to a straight ahead steering position, including means whereby the motor control means functions at the will of an operator.

12. A steering control mechanism as set forth in claim 11, said drive member comprising a cam rotated by said motor, and said driven means comprising a member having a pair of cam followers spaced to be sequentially engaged by said cam to effect steering in respective directions; and position return means for moving said driven means to said initial position when said cam is not in engagement with one of said cam followers.

13. A steering control mechanism as set forth in claim 1, including means whereby the motor control means functions at the will of an operator.

14. A remotely controlled steering mechanism for the steering device of a vehicle, comprising a signal transmitter remote from said vehicle for transmitting signal wave impulses, a receiver on said vehicle for receiving said impulses, a motor having a drive element for rotating about a fixed motor axis and controlled by said receiver, said receiver upon receiving the transmitted impulses energizing said motor, said drive element rotating continuously and unobstructed in one direction as long as said motor remains energized, a steering control drive member driven in a given direction by said drive element, means driven by said steering control drive member in sequentially opposite directions when said steering control drive member is driven in said given direction, other means connecting said last mentioned means with the vehicle steering device whereby said steering device is steered sequentially in opposite directions while said steering control drive member is being actuated in said given direction to effectuate a selected direction of steering without interruption of the operation of said motor.

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