United States Patent

Masuda

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[54] CONTROL DEVICE FOR AN ELECTRICALLY DRIVEN TOY

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[51] **Int. Cl.**.....**H01h 35/32,** A63h 30/00

[58] **Field of Search**.....46/206, 210, 244 A; 200/81 HO, 200/83 Z, 156

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[57] **ABSTRACT**

A control device for an electrically driven toy so improved as to facilitate its remote control by an operator wherein the steering and switching mechanisms for controlling the advance, retreat and stop of said toy can be effected by a single control device using air pressure.

5 Claims, 5 Drawing Figures

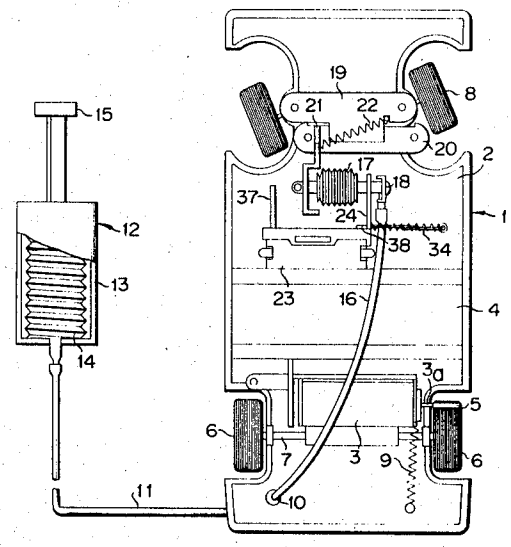


FIG. 1

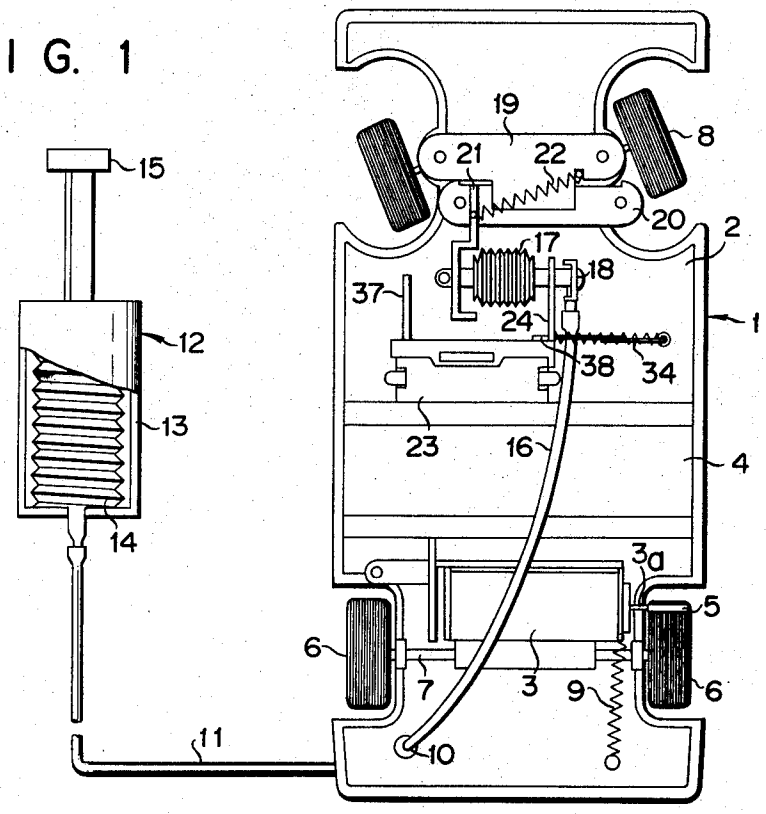
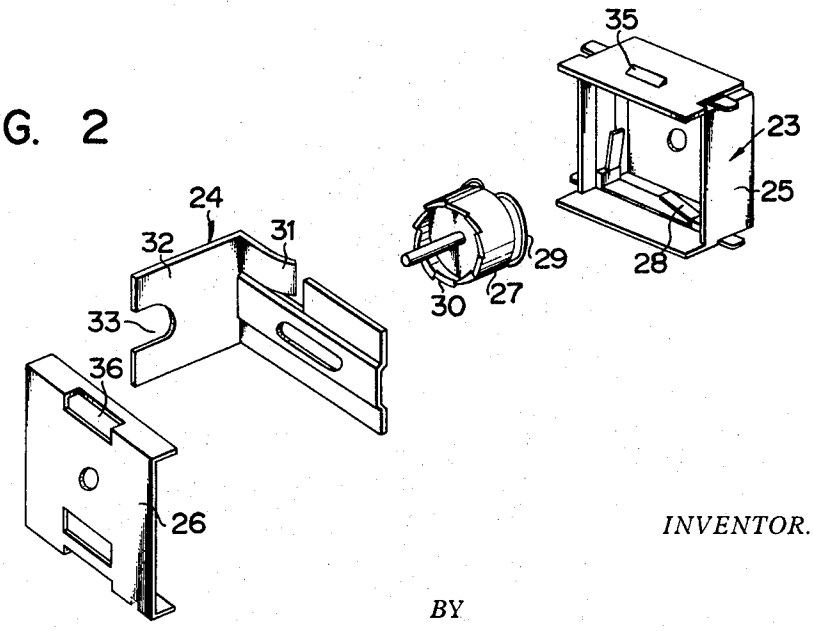


FIG. 2



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FIG. 3

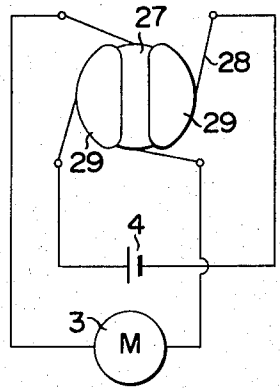


FIG. 4A

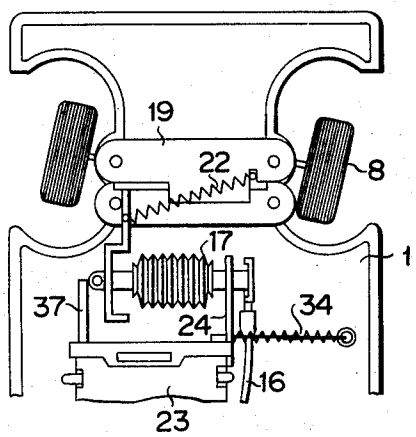
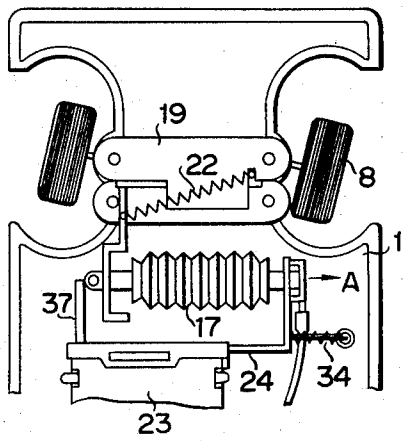


FIG. 4B



CONTROL DEVICE FOR AN ELECTRICALLY DRIVEN TOY

SUMMARY OF THE INVENTION

The present invention relates to a control device for an electrically driven toy and more particularly to a control device for an electrically driven toy which is made to travel by the rotation of a built-in electric motor.

There have heretofore been proposed various remote control devices intended for arbitrary control of the advance, retreat, rightward or leftward steering or stop of such toy. According to most of these devices, there is used a lead line connecting an electrically driven toy with a control device and the toy is made to advance, retreat or stop by switching and changing the polarity of an electric motor built therein. However, to control the steering as well as linear movement of the toy, there is further required a source of motive power such as an electromagnet which electrically actuates a steering mechanism. Accordingly, the prior mechanism is of complicated construction and operated by an on-off switching device with the resulting sudden start and stop of steering. Proper steering of the toy, therefore, requires constant adjustment of the toy rudder and in consequence advanced operating skill. As a result, the prior art remote control apparatus fails to permit the smooth travel of the toy.

Accordingly, the primary object of the present invention is to provide a novel control device for an electrically driven toy which has resolved the drawbacks of the known control devices by utilizing air pressure permitting the easy smooth movement of said toy by remote control.

Another object of the invention is to provide a control device for said toy wherein it is connected to the control device only by a light, flexible air tube and allowed to make a free movement substantially independently of the control device.

Still another object of the invention is to provide a control device for an electrically driven toy wherein its steering, linear travel (advance and retreat) and stop can be effected by single control means.

SUMMARY OF THE INVENTION

According to the present invention a control device for an electrically driven toy comprises a hollow member free to expand and contract under air pressure, one end of which is fitted to a steering mechanism, and the other end of the which is connected to the switching mechanism of a motor built in the toy for its drive, a stop plate disposed apart from that end of the hollow member connected to the steering mechanism, and a holding means for applying a resilient force to compress that end of the hollow member connected to the switching mechanism. Application of air pressure first causes displacement of said one end until it engages the stop plate, and then causes displacement of said other end to control the switching mechanism.

BRIEF EXPLANATION OF THE DRAWINGS

FIG. 1 is a plan view of an entire control device according to an embodiment of the present invention;

FIG. 2 perspectively presents the dismembered parts of a switching mechanism included in the control device of FIG. 1;

FIG. 3 shows an electrical circuit of the control device of FIG. 1; and

FIGS. 4A and 4B illustrate the operation of said control device.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, numeral 1 generally indicates an electrically driven toy automobile using a control device according to an embodiment of the present invention. 2 is an automobile body, and 3 a motor positioned at the rear part of the body 2 and operated by a dry cell 4 mounted at the center of the body 2. The rotary shaft 3*a* of the motor 3 projects from

the side of the body 2. A friction tube 5 fitted to the outer end of the shaft 3*a* contacts one of the rear wheels 6. The rear wheels 6 are fixed to both ends of a shaft 7 crossing the body 2 and are so supported as to co-operate with the later described front wheels 8 for the free travel of the body 2. The motor 3 is always pressed against the rear wheels 6 by the action of a tension spring 9, causing the projecting motor shaft 3*a* to contact the peripheral surface of one of the rear wheels 6. Numeral 10 is an air intake into which there is fitted a connection member (not shown) projecting from the bottom of the body 2. To said connection member is attached one end of an air pipe 11 having an arbitrary length, the other end of which is connected to a control device 12. This control device 12 consists of a bellow-like air cylinder 14 received in a casing 13. The combination air inlet and outlet port of the air cylinder 14 is connected to the air pipe 11. The air cylinder 14 itself can be suitably compressed by an actuating plate or rod 15 mounted on the casing 13, enabling the air in the cylinder 14 to be conducted under pressure through the air pipe 11 to the body 2. The air thus supplied from the control device 12 is introduced through a conduit 16 connected to the air inlet 10 into a bellow-like air cylinder 17 fixed to the end of the conduit 16. The air cylinder 17 has a connection member 18 provided at one end so as to engage the conduit 16 and is connected to the other end to part of a steering mechanism 19 for the front wheels 8. The steering mechanism 19 consists of a series of link systems. One end of the air cylinder 17 is fixed to an actuating plate 21 projecting from a movable link 20. Since the movable link 20 is always deflected in one direction by a tension coil spring 22, the front wheels 8 are in a state steered to the left. However, the expansion and contraction of the bellow-like air cylinder 17 operates the movable link 20 so as freely to steer the front wheels 8 through a neutral position to the right. That side of the air cylinder 17 which is connected to the conduit 16 is engaged with one end of the actuating plate 24 of a switching mechanism 23.

The switching mechanism 23 is positioned at the substantially central part of the body 2 and assumes a box shape. The switching mechanism 23 comprises, as illustrated in FIG. 2, a box member 25 open at the front, a cover 26 to close said opening, the actuating plate 24 introduced into the box member 25 in a manner to cross it from its side wall and a rotor 27 rotated in one direction by the actuating plate 24. To the four inner walls of the box member 25 are fitted inwardly projecting contact plates 28. The end of these contact plates 28 slidably contacts the peripheral surface of the rotor 27 rotatably supported within the switching mechanism 23. To the rear end of the rotor 27 are spatially fixed a pair of contact plates 29 assuming a substantially semicircular shape, whose circumferential edge slightly projects from that of the rotor 27. The projecting edges of the contact plates 29 selectively contact the aforesaid contact plate 28 provided in the box member 25 thereby to control the rotation of the motor. The front peripheral edge of the rotor 27 is all formed of a succession of ratchet-like teeth 30. The rotor 27 whose ratchet-like teeth 30 engage a pawl 31 projecting from the actuating plate 24 is rotated through a desired angle by the linear movement of the actuating plate 24. The end of that side of the actuating plate 24 which projects from the box member is bent toward the front part of the body 2, thus the actuating plate 24 as a whole assuming an L-shape. At the end of the bent portion 32 is cut out a U-shaped notch 33, into which there is fitted the connection member 18 of the air cylinder 17. Accordingly, the actuating plate 24 is urged by a compression coil spring 34 disposed between the actuating plate 24 and the body 2 so as to compress the air cylinder 17. An engaging projection 35 formed on the top surface of the box member 25 is fitted into an engaging hole 36 bored in the edge of the cover 26, thereby to fix it to the box member 25. The box member 25 is secured to the body 2 by engagement with a guide plate 38 projecting from the upper surface of the body 2. Numeral 37 denotes a stop plate which supports the box member 25 and also limits the movable range of the actuating plate 21 by abutting

thereon when the steering mechanism **19** is in operation. The electrical circuit of the control device of the present invention is schematically indicated in FIG. **3**.

There will now be described by reference to FIGS. **4A** and **4B** the operation of the present control device. When the actuating plate **15** of the control device **12** is depressed, the air in the cylinder **14** is conducted under pressure through the air pipe **11** into the air cylinder **17** of the body **2**. As a result, one end of the air cylinder **17** continues to expand until it reaches the stop plate **37**, while the other end thereof at which there is provided the coil spring **34** remains substantially fixed (FIG. **4A**). When the air cylinder **17** stops expansion at the arrival of said one end at the stop plate **37**, then the air cylinder **17** expands in the opposite direction against the force of the coil spring **34**. As a result, the actuating plate **24** of the switching mechanism **23** is urged in the direction of the arrow A (FIG. **4B**). Next when the actuating plate **15** of the control device **12** is pulled backward to stop its depression, then there is supplied no air to the air cylinder **17**, which consequently contracts itself by the force of the coil spring **34**. At this time, the pawl **31** of the actuating plate **24** causes the rotor **27** to rotate through an angle of **45°**. As a result, the contact plates **29** of the rotor **27** contact the contact plates **28** provided within the box member **25**, thereby to close the electrical circuit of FIG. **3**, rotate the motor **3** and in consequence start the travel of the body **2**. The steering of the body **2** is effected by the arbitrary push and pull of the actuating plate **15** of the control device **12**. To stop the motor **3**, it is only required strongly to push the actuating plate **15** and immediately afterward pull it backward. This causes the actuating plate **24** of the switching mechanism to rotate the rotor **27** and in consequence open the electrical circuit. Next when the circuit is closed in the aforementioned manner, the motor **3** is converted to the opposite polarity to make a reverse rotation with the resulting retreat of the body **2**.

What is claimed is:

1. A remote control device for an electrically motor driven toy comprising:

a hollow member free to expand and contract under air pressure;

manually operable means coupled to said hollow member by means of a flexible tube for conducting air pressure to said hollow member, to selectively expand and contract said hollow member;

stop means spaced from one end of said hollow member for limiting the expansion of said hollow member to a predetermined range;

resilient holding means for maintaining the other end of said hollow member at a substantially fixed position, during expansion of said hollow member up to the limit of said predetermined expansion range defined by said stop means, said resilient holding means maintaining said other end of said hollow member such that said other end of said hollow member is displaced during further expansion of said hollow member beyond said predetermined expansion range upon application of further air pressure by said manually operable means;

a steering mechanism coupled to said hollow member and controlled by the expansion and contraction of said hollow member within said predetermined expansion range; and

a switching mechanism coupled to said hollow member and controlled by the expansion and contraction of said hollow member beyond said predetermined expansion range, said switching mechanism being further coupled to and controlling said motor.

2. The control device according to claim **1**, wherein the holding means is a compression coil spring disposed between the other end of the hollow member and the toy body and exhibiting a predetermined compressive force.

3. The control device according to claim **1** further comprising means biasing said one end of said hollow member in a direction to contract said hollow member.

4. The control device according to claim **3** wherein said switching mechanism comprises a rotor provided with a pair of contact members and a plurality of ratchet teeth formed on the peripheral edge of said rotor; four fixed contact members which are selectively engaged with or detached from the movable contact members according to the rotation of the rotor and which, thereby selectively change the direction of rotation of the motor and stop its rotation; and an actuating plate operated in interlocking relationship with said other end of said hollow member so as to rotate the rotor in one direction by means of said ratchet teeth during each reciprocation of said actuating plate during displacement of said other end of said hollow member.

5. The control device according to claim **1** wherein said hollow member is an elongated bellows-like air cylinder.

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