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REMOTELY-CONTROLLABLE TOY VEHICLE

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2 Sheets-Sheet 1

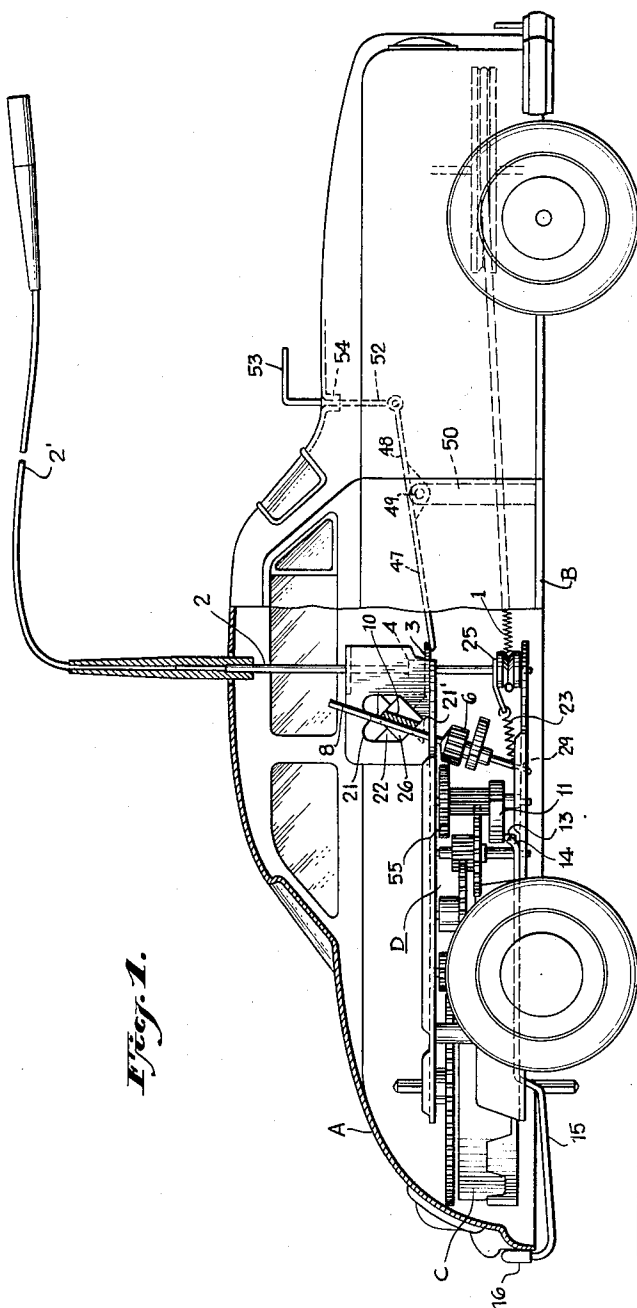


Fig. 1.

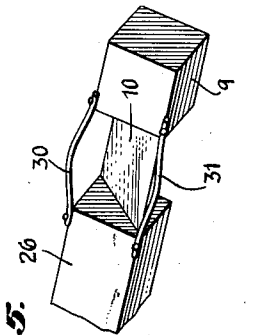


Fig. 5.

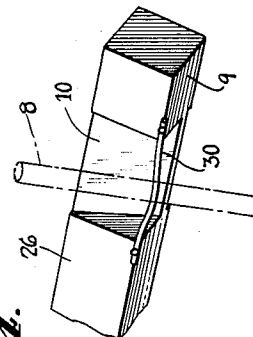


Fig. 4.

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REMOTELY-CONTROLLABLE TOY VEHICLE

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12 Claims. (Cl. 46—206)

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My invention relates to mechanically or electrically driven toy vehicles which can be selectively controlled to perform different operations, for instance in a desired sequence. In one of its more particular aspects, the invention relates to wheeled toy vehicles that are steerable by means of a flexible control cable.

Toy vehicles with a control member for setting them to perform different functions are known as such. There are, for instance, toy vehicles in which the pulling of a control cable or the depressing of a control lever serve to control the speed of the vehicle drive. Known also is a toy vehicle with a speed regulator controlled by an oscillating lever whose amount of angular travel may be changed by a pulling action to thereby vary the speed of the propulsion drive.

It is generally an object of my invention to provide a simple, small and versatile control mechanism for driven toy vehicles, which controls a number or sequence of different functions by a repetitive actuation of an exteriorly accessible or remotely-operable control member. These various functions may consist, for instance, in: switching to different propulsion speeds, reversing the travel direction, stopping the vehicle, making and breaking the electric circuit of the vehicle illumination or of a blink light, signal, or the like. The available control possibilities are to be controlled in such a manner that each individual actuation of the control mechanism effects or controls the adjustment of a corresponding functioning of the toy vehicle depending upon the immediately preceding setting of the mechanism.

Another object of the invention is to make such a control mechanism suitable not only for producing the available operations in a given sequence, but also for selecting them out of turn simply by a rapid succession of actuations of the control member, thus making it readily possible to set the toy from one to any other operation that may be desired, such as switching from one speed to another without letting an intermediate speed step or stoppage of the vehicle become effective.

According to a feature of my invention, the control mechanism for selectively setting the drive of a toy vehicle or the like to a different functioning by repetitive actuation of a control member, comprises a stepping device which has a ratchet wheel with four or more lobes or teeth joined with a coaxial stepping member or core of polygonal or poly-cornered shape whose number of corners or edges corresponds to the num-

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ber of ratchet lobes; and this stepping member is revolvable within a recess or opening of a frame structure and is normally resting against an angular portion of the recess contour to be thus held in one of its selective rotational positions. A control member or pin, displaceable in a generally tangential relation to the ratchet wheel, serves to unrest the stepping member and to turn it one step for each individual actuation of the control member. The actuation of the control member may be effected in various ways, such as by pulling a flexible and revolvable steering cable, by exerting pressure with a finger or a stick, by imposing air pressure or shooting upon a movable element such as a lever, plate or the like; and the revolution of the stepping member is utilized to effect and/or release the selected functioning of the drive.

The above-mentioned and other objects and features of my invention will be apparent from the following description of the embodiments exemplified by the drawing, in which—

Fig. 1 shows a complete side view of a toy automobile according to the invention, part of the vehicle body being removed to reveal the interior;

Fig. 2 shows separately and on a larger scale the control mechanism of the same toy, except that some of the mechanism parts are somewhat modified over the corresponding parts shown in Fig. 1;

Fig. 3 is a perspective view of a portion of the same mechanism as shown in Fig. 2, but illustrates a pertaining speed regulator in inactive position while in Fig. 2 the same regulator is shown in active engagement with the drive;

Fig. 4 shows perspectively a stepping member of the control mechanism;

Fig. 5 is a similar perspective view of a modification of the stepping member; and

Fig. 6 shows another modification of the invention by a partial rear view of the control mechanism which, in this embodiment, is designed to permit reversing the travelling direction of the toy vehicle.

According to Figs. 1 to 3, the illustrated toy has a vehicle body A mounted on a wheeled chassis B which carries a drive C here shown as a spring motor although an electric or other type of drive may also be used. The drive C is geared to the rear wheels and also to a gear train D for speed regulation. The front wheels are steerable about a king-pin (not shown) by means of a link or endless-string transmission I which is joined with a vertical control spindle 2 accessible from the outside. When spindle 2 is turned, the ye-

hicle changes its travelling direction accordingly. A flexible cable 2' is shown attached to the top end of spindle 2 to permit a remote control of the steering device. The control spindle 2 is axially displaceable in the upward direction against a spring bias and, as will be described, cooperates also with a control mechanism which, acting together with above-mentioned gear train D, selectively controls the operation of the vehicle drive so that each individual pull on spindle 2, and hence on cable 2', sets the toy for a different functioning of the drive.

The control mechanism for translating the repetitive axial displacement of the spindle 2 into respectively different settings of the drive performance comprises a stepping switch device which has a lobed ratchet wheel 22 firmly joined with a coaxial stepping member 26. The revolvable structure, comprising the wheel 22 and the member 26, has at one end a bearing pin 33 (Figs. 3, 6) with which this structure is revolvably journaled in a circular bearing hole 34 of a frame structure 32 mounted on the chassis B. At the other end of the structure, the stepping member 26 is supported within a heart-shaped recess 21 of the frame structure 32. The heart-shaped recess has a downwardly directed tip point 21' (Fig. 2), and the shape of the recess contour adjacent to this point matches the polygonal cross-sectional shape of the stepping member 26, so that this member normally rests against the tip contour of the recess and is thus held in the proper rotational position.

Firmly attached to the control spindle 2 is a sleeve 4 with a disc-shaped flange 3. When the spindle 2 is being pulled upwardly, for instance by means of the flexible steering cable 2', the edge of flange 3 engages one of the lobes of the ratchet wheel 22 and moves it upwardly, thus lifting the stepping member 26 out of its seat and away from the tip point 21' of the heart-shaped recess 21. As a result, the stepping member 26, in the illustrated example, is turned one quarter of one revolution and thereafter drops with its next adjacent edge into resting engagement with the tip portion of the recess. By repeating this remote control operation, the stepping member is turned in the same manner, each time one quarter of one revolution. According to the respective positions of rotation to which the stepping mechanism is thus adjusted, the various functions to be performed by the toy vehicle are selectively effected or released.

For example, and as illustrated, a speed-regulating device may thus be switched into and out of operation for the purpose of setting the propulsion speed of the vehicle to two different values. To this end, the stepping member 26 in the illustrated embodiment has a flattened cam portion 10 so that the shaft 8 of a revolvable regulator member abuts either against one of the two long sides of portion 10 (Figs. 1, 3, 4) or against one of the two short sides of portion 10 (Fig. 2), depending upon the rotational position of the stepping member 26. The regulator shaft 8 has its lower end journaled at 29 in a round hole of the frame structure, while an intermediate shaft portion is journaled within an oblong hole 23 of the frame structure (Figs. 1, 2), so that the shaft 8 may swing about the journal point 29. When the regulator shaft 8 is in the position shown in Fig. 1, a pinion 6 of the shaft is disengaged from a spur gear 55 of the gear train D driven by the vehicle drive C so that then the regulator is inactive and the

driving speed comparatively high. When the regulator shaft 8 is in the position shown in Fig. 2, the pertaining pinion 6 meshes with the spur gear 55 so that the regulator shaft is revolving when the vehicle drive is in operation, thus reducing the vehicle speed.

A spring 23 is preferably provided for returning the control spindle 2 from the raised position (Fig. 2) to the normal, lowered position (Fig. 1) after each individual control action. The spring 23 has one end secured to the frame structure or chassis at point 24, while the other end of spring 23 is secured to an eyelet 25 revolvably seated on the control spindle 2.

For improving the engagement of stepping member 26 with the edge of recess 21 at the tip point 21' of the heart-shaped contour, a biasing spring acting between the stepping member and the chassis or frame structure may be provided. However, a simplified design is obtained by applying a gravity bias. To this end, the revolvable structure of wheel 22 and member 26 may simply be given sufficient weight. In the illustrated embodiment, this weight is obtained by extending the member 26 beyond its flat cam portion 10 into a weight formed by an extension 9.

As shown in Fig. 6, a leaf spring 27 may be provided for biasing the regulator shaft 8 toward the stepping member 26, so that the shaft will always safely rest against the long sides and short sides of the flat cam portion 10, depending upon the rotational position of the stepping member.

For providing additional speed steps, one or two wire springs 30, 31 (Figs. 4, 5) are mounted on the stepping member 26. In given positions of the member 26, the wire spring not only places the pinion into meshing engagement with the spur gear 55, but also exerts an elastic and frictional braking force upon the regulator shaft 8. The wire springs, depending upon the desired purpose, are either relatively soft to permit a revolution of the regulator shaft at a reduced speed, or they are sufficiently stiff to stop the drive.

Instead of controlling the vehicle drive by pulling the control spindle 2 in the above-described manner, the illustrated toy vehicle also permits a remote control by the exertion of pressure or impact. For instance, according to Fig. 1, a lever with two arms 47 and 48 is fulcrumed at point 49 in a support 50. Linked with arm 48 is a pressure-transmitting member 52 which is guided at 54 in an opening of the vehicle body and whose upper end has a pressure plate 53. When plate 53 is subjected to downward pressure, arm 48 moves downwardly and arm 47, moving upwardly, engages the under side of flange 3, thus shifting the control spindle 2 upwardly. In this manner, the switching operation is performed in the same manner as when pulling the spindle 2.

A modified design of the just-described pressure-responsive control means is illustrated in Fig. 2. This modification permits applying the controlling pressure not from above but from the front side of the vehicle, i. e. in the direction of the arrow E. The pressure-responsive control element consists again of a lever with two arms 47' and 48' fulcrumed at 49' on a support 50'. The lever arm 48' is bent downwardly. This modification permits a remote control, for instance by shooting or throwing a projectile onto the lever arm or plate 48', thus effecting a switch-

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ing of the stepping mechanism, for instance, for stopping the travelling toy vehicle, for reversing its direction of travel, or for changing its functioning in any other available manner.

A switching from forward to reverse travel or vice versa with the aid of the remotely-controlled stepping mechanism may be effected by the following means. As shown in Fig. 6, the journal pin 33 of ratchet wheel 22 and stepping member 26 carries an extension sleeve 35 with a cam 36 consisting, for instance, of a tumbling disc. The cam partakes in the incremental revolutions of the stepping member 26. The edge of the cam disc 36 is straddled by the forked end 37 of a lever 38 pivoted at 39. The lever 38, therefore, performs oscillating movements about the pivot point 39, depending upon the rotation of cam disc 36. A connecting rod 41, linked at 40 to lever 38 and at 42 to a lever 15, imparts the rotational oscillations of lever 38 to the lever 15. Lever 15 is pivoted at 15' and carries a revolvable pinion 45. Pinion 45 is selectively engageable with one or the other of two coaxial crown gears 43 and 44 joined with the axle of the vehicle wheel to be driven. Pinion 45 pertains to the transmission gearing between the drive motor proper and the vehicle wheel. Consequently, the direction of wheel rotation or vehicle travel depends upon which of the two crown gears at a time is in meshing engagement with the driving pinion 45. Hence, the travel direction depends upon the angular position of lever 15 and thus upon the rotary position of cam disc 36. Consequently, the toy vehicle is switched from forward to reverse travel or vice versa when the setting of the control mechanism is changed accordingly.

Instead of remotely controlling the reversal of travel, the gear shift may also be effected manually with the aid of a handle 16 after first removing the connecting rod 41.

The lever 15 has an upward extension with a laterally bent lug 14. During the remotely-controlled or manual reversing operation, the lug 14 comes into engagement with a pin 13 when the lever 15 reaches a position intermediate the active forward and reverse positions. The pin 13 is mounted on an eccentric weight 11 firmly secured to one of the revolving shafts of the transmission gearing. In this manner, the eccentric weight 13 is temporarily arrested during the reversing operation for a short interval of time, so that the spring drive remains stopped during that interval and is thus prevented from idling at racing speed.

By suitably designing the control cam 36, the reversing of the drive by remote control of the stepping mechanism may occur, for instance, in such a manner that a given remote control action will directly shift the gear from forward to reverse travel or vice versa, so that the stopping action in the intermediate position of the pinion 45 between the crown wheels 43 and 44 cannot persist for an appreciable length of time.

However, the cam disc 36 may also be given such a cam shape that a remote control action at first causes the gear shift to be set to the intermediate stop position so that another remote control action is needed for setting it to the other travelling direction. If in this case a stopping of the vehicle is to be prevented, two rapidly successive control actuations are needed.

The remotely controllable reversing from forward to reverse travel and vice versa, with or without an intermediate stopping adjustment,

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may be combined with means for setting the drive to selectively different speed steps by placing a regulator device into and out of operation and, if desired, by switching an elastic friction member into and out of operation. As a matter of fact, the embodiment of Fig. 1, if designed in accordance with the features described with reference to Figs. 4 and 6, involves a combination of these possibilities. As a result, this toy vehicle according to the invention can be selectively set to operate at two different forward speeds, to stop, or to reverse simply by repeating the remote actuation. A ratchet wheel and a stepping member with only four positions are needed for securing this versatile functioning. A larger variety of control possibilities, of course, may be secured if more than four positions are provided. Although the control mechanism comprising the invention has been described and illustrated herein as remote control means for changing the speed and direction of travel of the toy vehicle, it will readily be understood that it could also be adapted to other purposes, such as to switch vehicle lamps on and off, or, in the case of a vehicle carrying a gun, to fire projectiles therefrom.

It will be obvious to those skilled in the art that modifications other than those specifically set forth can be made without departure from the essential features of my invention and within the scope of the claims annexed hereto.

I claim:

1. In a toy vehicle having a drive and selective control means connected with said drive for controlling its operations, said control means comprising a stepping switch mechanism having a frame structure with a recess of a cornered contour and having a revolvable poly-cornered stepping member disposed in said recess and normally in resting engagement with the corner of said recess, a ratchet wheel coaxially joined with said member and having a plurality of lobes corresponding to the respective corners of said member, and an axially displaceable control structure having an element engageable with said respective lobes, whereby said member is released from said engagement and turned one step by said element when said control structure is axially displaced.

2. In a toy vehicle having a drive and selective control means connected with said drive for controlling its operations, said control means comprising a stepping switch mechanism having a frame structure with a recess and having a revolvable stepping member in said recess, said recess having a generally heart-shaped contour and having an angular corner at one side of said contour, said member being generally polygonal and having one of its edges normally in biased engagement with said angular corner to be thereby arrested in a selected position of revolution, a ratchet wheel coaxially joined with said member and having a plurality of lobes corresponding to the respective corners of said member, an axially displaceable control spindle mounted on said frame structure and having an element engageable with said respective lobes, whereby said member is released from said engagement and turned one step by said element when said spindle is axially displaced.

3. In a toy vehicle having a chassis with steering means, a propulsion drive on said chassis, and control means connected with said drive for controlling its operation, said control means comprising a stepping switch mechanism having a

frame structure with a recess of a cornered contour and having a revolvable poly-cornered stepping member disposed in said recess and normally in resting engagement with the corner of said recess, a ratchet wheel coaxially joined with said member and having a plurality of lobes corresponding to the respective corners of said member, a revolvable and axially displaceable control spindle, transmission means connecting said spindle with said steering means for operating said steering means by revolution of said spindle, said spindle having an element engageable with said respective lobes for releasing and stepping said member by axial displacement of said spindle.

4. In a toy vehicle having a drive and selective control means connected with said drive for controlling its operations, said control means comprising a stepping switch mechanism having a frame structure with a recess of a cornered contour and having a revolvable poly-cornered stepping member disposed in said recess and normally in resting engagement with the corner of said recess, a ratchet wheel coaxially joined with said member and having a plurality of lobes corresponding to the respective corners of said member, and an axially displaceable control structure having an element engageable with said respective lobes, whereby said member is released from said engagement and turned one step by said element when said control structure is axially displaced, said control means comprising further a speed regulator for adjusting said drive to a plurality of speeds, and a gear in geared connection with said drive, said speed regulator being movable between two positions and being in meshing engagement with said gear in only one of said positions, and said regulator being in engagement with said stepping switch mechanism to occupy said respective positions in dependence upon the rotary position of said stepping member.

5. In a toy vehicle according to claim 4, said stepping switch mechanism having spring means mounted on said stepping member and in frictional engagement with said regulator when said member is in a given rotary position in which said regulator is in meshing engagement with said gear, whereby an additional speed step is selectively adjustable.

6. In a toy vehicle according to claim 4, said stepping mechanism having spring means mounted on said stepping member and in frictional engagement with said regulator in a given rotary position of said member in which said regulator is in meshing engagement with said gear, said

frictional engagement being so strong that said drive is arrested.

7. In a toy vehicle according to claim 1, said control means comprising a device for reversing the driving direction, said device being connected with said stepping member to be actuated in a given rotary position of said member.

8. In a toy vehicle according to claim 1, a reversing gear having a pinion connected with said drive and having two coaxial crown gears selectively engageable with said pinion, a gear-shift lever for shifting said pinion into engagement with either one of said crown-type gears, a cam element coaxially joined with said revolvable stepping member, a cam follower cooperative with said cam element, and link means interconnecting said cam follower and said lever for shifting said lever in dependence upon the rotary position of said stepping member.

9. A toy vehicle according to claim 3, comprising a flexible steering control cable attached to said control spindle for steering the vehicle by turning said cable, a biasing spring connected with said control spindle and having relative to said spindle a biasing force directed axially away from said cable, whereby said stepping switch is controllable by repetitively pulling said cable.

10. A toy vehicle according to claim 3, comprising a pressure element linked to the vehicle and accessible from the outside, said pressure element being connected with said control spindle for axially displacing said spindle in response to pressure exerted upon said pressure element, whereby said element permits controlling said stepping switch mechanism by touch, air pressure, projectiles and the like.

11. In a toy vehicle according to claim 1, said stepping member and said ratchet wheel having at one axial end an axial pin journaled in stationary relation to said frame structure and being at the other axial end supported only by said resting engagement of said stepping member in said corner of said recess.

12. In a toy vehicle according to claim 1, said stepping member having a square cross section and said ratchet wheel having four lobes.

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