TOY VEHICLES PASSING ON SAME ROADBED BY REMOTE CONTROL

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This invention relates to apparatus for simulating realistically in a toy, and through mainly invisible channels of remote control, characteristics of the travel performance of actual road vehicles represented by miniature traveling replicas of such vehicles.

For realism in toys that simulate highway traffic, as differing from toys in the art of toy or modeling railroadings, it is desirable that the miniature road vehicles be free to be steered arbitrarily without confinement to guidance by upstanding track rails or by grooves sunk in the roadbed to be trailed by the vehicle. Also for realism the toy road vehicles should be steerable in a manner to turn out and pass another at any point along the road or crossing over from one traffic lane to another at the will of the operator while continuously propelled by current derived from a roadbed whose entire width of tread surface is flat throughout.

An object of the present invention is to effect the steering control of toy vehicles in crossing over from one traffic lane to another for turn out and passing performance by means of an electrical system wherein one vehicle is motivated by only alternating current while another vehicle is motivated by only unidirectional current, both vehicles being propelled by current derived from the same pair or different pairs of side-by-side conductive road lanes, two of which pairs may have a single such lane in common.

A further object is to effect the above mentioned remote controlled steering by independently varying the potential of each of the aforesaid different kinds of current by which the different vehicles are motivated.

A still further object is by remote control to cause any chosen one of a plurality of vehicles on the same roadbed to travel backward as well as forward whereby a chosen vehicle may be backed into a parking space or backed up to a loading platform, all by selective remote control and without interrupting or disturbing the travel of another vehicle.

These and related objects of the invention will appear in greater particular from the following description of a toy embodying the improvements and having reference to the appended drawings wherein:

FIG. 1 is a perspective view of a three-lane, all-over flat roadbed with electric remote control means suitable for use in practicing the present invention.

FIG. 2 is a fragmentary section taken through the roadbed on the plane 2—2 in FIG. 1 looking in the direction of the arrows, and is drawn on an enlarged scale.

FIG. 3 is a plan view of a toy vehicle adapted for traveling on the roadbed of FIG. 1 when energized by alternating current drawn approximately twice the preferred size.

FIG. 4 is a bottom plan view of the vehicle of FIG. 3.

FIG. 5 is an elevation of the vehicle taken partially in section on the plane 5—5 in FIG. 3.

FIG. 6 is a plan view of a vehicle of a different kind adapted to travel on the same roadbed simultaneously with the vehicle of FIGS. 3—5 when propelled by unidirectional current.

FIG. 7 is a bottom plan view of the vehicle of FIG. 6.

FIG. 8 is a view in elevation showing the hollow body of the vehicle in section on the plane 8—8 in FIG. 6 with certain parts broken away better to expose the construction.

FIG. 9 is a perspective view of the toy showing a police car trailing a speeding truck.

FIG. 10 shows the police car turning out to draw alongside or pass the truck.

FIG. 11 is a complete diagram illustrative of electric circuits that may be involved in the remote control system.

The roadbed for vehicles 1 and 2 may be built on a plain wooden planking 12 on the upper surface of which in laterally spaced relation are 3 flat lanes 13, 14 and 15 of electrically conductive material having mutually flush tread surfaces. The inner lane 13 is bordered by an upstanding curb 16 and the outer lane 15 is bordered by a similar curb 17. Lanes 13, 14 and 15 are completely insulated from one another and are fed with current through separate lead wires 18, 19 and 20, respectively.

Insulation fills the spaces between lanes.

The supply of current to the lanes through wires 18, 19, 26 and 28 is determined by a remote controller 21 whose details of construction are not of importance to this invention except that the controller shall preferably incorporate at least those electrical components which are represented in the wiring diagram of FIG. 11. Such components include a transformer secondary 22 with current take-off sliders 23 and 24, one or more condensers 25, and preferably a double-throw, polarity reversing switch 27.

The vehicle of FIGS. 3, 4 and 5 is designated 30 as a whole and is herein sometimes referred to as the A.C. vehicle. It comprises a chassis 31 which may be mainly of insulative material topped by a driver's cab 32 and by a truck body 33 suitable for transporting toy lumber 34.

The two rear driving wheels 38 have insulative treads and a common drive axle journaled in bearings 40 depending fixedly from the chassis and driven through a worm wheel 41 that is in mesh with a worm 42 on the shaft of an alternating current motor 43 carried by the chassis. Motor 43 is of the commutator type having brushes 44 pressed against its commutator by a common spring 45.

Two front wheels 48 with insulative treads are carried by steering arms 49 that are individually swingable on king pins 50 whereby to steer the vehicle by cantiing in unison under control of the usual pivotally connected tie bar 51 which has a rearward extending tongue 52 containing an elongated slot 53. Tongue 52 extends through a gap separating stationary stops 54 against which the tongue abuts in its respectively opposite directions of steering movement. Such movement is caused by a reciprocative angle plate extension 55 that is fixed on and travels with the end of the core plunger 56 of the electrically energized solenoid 57 carried by chassis 31.

Normally plunger 56 is yieldably urged by a spring 58 toward the right side of the vehicle, when the latter is right side up as in FIG. 3, so that an actuating pin 59 carried on and below angle plate 55 in engagement with slot 53 yieldingly maintains the tie rod 51 urged to cant the wheels 48 clockwise about the king pins 50 in FIG. 4, or counterclockwise in the plan view of FIG. 3 to position 48a.
This causes the vehicle normally to veer toward the left from its direction of advancing travel until one of the front wheels meets one of the curbs 16 or 17 whereupon the vehicle will proceed to travel parallel with such curb as long as solenoid 57 remains unenergized.

Vehicle 30 further carries a condenser 65 whose location and function between collector 66 and both the A.C. motor 43 and the steering solenoid 57 in the electrical circuits here concerned are shown in FIG. 11. Electrical circuits are completed from the lanes of the roadbed to vehicle 30 by current collecting rod-like brushes 66 of conductive material. These brushes are vertically slidable in bearings 67 fixed on the insulated chassis 31 of the vehicle 30 at respectively opposite sides thereof. Each of brushes 66 is yieldingly thrust downward by a spring leaf conductor 68 bearing on a shoulder of the brush so that its bottom end constantly wipes on one or another of the conductive road lanes 13, 14 or 15 and current is conducted through a flexible lead wire attached to the top end of each brush.

The lateral spacing of the collector brushes 66, 69 or 99, 101 is the same on all vehicles and a preferred relationship of such spacing to the equal widths of the lanes 13 or 15 is shown in FIG. 5. The vertical current of the brushes may be the same distance apart as the centers of the two non-conductive spaces between the lanes while the width of each brush that contacts the lanes may be equal respectively to the width of the like spaces between the lanes. This prevents each vehicle from ever being cut off from current derived from any energized lane and if there should occur a very momentary contacting of two lanes by one brush in the passing across of a vehicle from one pair of lanes to the other it will do no damage in the relatively low voltage of the circuit concerned which may be up to ten volts for most speeds of the vehicle travel and, say, eighteen volts during extra energization of the steering solenoid for turn out and passing. The position of the collector brushes of both vehicles relative to the lanes 14 and 15, as the vehicles are related in FIG. 9, is shown in full lines in FIG. 2 while the position of the brushes 90, 101 of the police car when passing the truck is as shown in broken lines in FIG. 2 looking head-on at the vehicles.

The car of different construction in FIGS. 6, 7 and 8 is designated 74 as a whole and comprises a metallic chassis 75 topped by a hollow body 73 fashioned to represent a police car. A unidirectional or D.C. current motor 76 of the commutator type is carried by chassis 75. Motor 76 has brushes 83 pressed against its commutator by a common spring 84. Affixed to its permanent magnet stator are bearings 79 for the drive axle 77 which are attached to the rear driving wheels 80 having insulating treads. Axle 79 is driven through its carried worm gear 81 which is in mesh with a worm 82 on the armature shaft of motor 76.

The front wheels 86 are carried by separate steering arms 87 that are free to swing about king pins 88 respectively. Steering arms 87 are coupled to swing in unison by the pivotally connected tie bar 89 on which is fixedly carried an upstanding actuated pin 90. Pin 90 engages an elongated slot 91 in a reciprocative angle plate 92 that is fixed on the core plunger 93 of a solenoid 94 carried by chassis 75. A spring 95 yieldably urges pin 90 toward tie bar 89 and thus the vehicle in the advancing direction of travel when the vehicle is right side up as in FIG. 6. This serves to cant the front wheels 86 counterclockwise to positions 86a in FIG. 6 which tends to steer the vehicle toward the left in its direction of advancing travel in FIG. 6 until one of the front wheels meets one of the curbs 16 or 17 depending on the direction of advancing travel whereupon vehicle 74 will proceed to travel parallel with such curb as long as solenoid 94 remains unenergized.

Chassis 75 further carries in insulated relation thereon a reactance coil 100 which is located and functions as a choke between the collector 99 and both the motor 76 and the steering solenoid 94 in the electrical system as represented in FIG. 11. The electrical components carried by chassis 75 derive their current supply from two rod-like current collector brushes 99 and 101 located at respectively opposite sides of the vehicle. Collectively brush 101 is slidable vertically in a bearing 102 and insulated from the chassis 75 by an insulative pad 103 on which is mounted a conductive leaf spring 104. Spring 104 constantly presses downward on a shoulder of collector brush 101 and current is conducted through a flexible lead wire to the collector brushes 99. Collector brush 99 is vertically slidable in a bearing fixedly mounted directly on the metallic chassis 75 and is yieldably pressed downward by a leaf spring 106 that is anchored directly and conductively to the chassis 75 and presses downward on a shoulder of the brush. Thus the brush 99 is grounded to the chassis of the vehicle which conducts current in the electrical system utilizing vehicle 74.

In their operation the mechanical and electrical components of the improved system, inclusive of roadbed and vehicles as herein proposed, may be combined in various relationships to simulate such patterns of traffic performance as are shown in FIGS. 12, 13, 14 and 15. The vertical steerable light beam 57 of three lanes of traffic 13, 14 and 15. The steering solenoid 57 or 94 on either car may be so linked to the front wheels steerable thereby that normally such wheels are canted toward either the left or the right side of the vehicle whereby the vehicle can be made to normally bear against and follow along either the inner curb 16 or the outer curb 17 in its advancing travel. Manual switch 107 normally remains closed.

An example of one of many possible patterns of traffic performance is as follows with particular reference to FIGS. 6, 10, 11, 12, 13, 14 and 15. The electrical system of the lumber truck 30 will be altered as in FIG. 6 so that both vehicles 30 and 74 normally will veer to the right and follow the outer curb 17 while both are deriving their current from lanes 14 and 15, the truck operating on alternating current derived from said lanes and the police car operating on unidirectional current derived from the same two lanes. The police car 74 hence can be made to trail the truck 30 on the right side of the roadbed. Since the motor 76 and the steering solenoid 94 of the police car are responsive to only unidirectional current the speed can be increased by shifting the D.C. slider 23 on transformer secondary 22 relative to the base end 28 of the secondary. This will not increase the speed of the truck which is propelled by alternating current only and whose potential is varied only by shifting the A.C. slider 24. Thus the police car will appear to chase and catch up with the truck which is assumed to have been speeding or in violation of traffic regulations. Upon its close approach to the truck the police car will be caused to swerve to the left away from curb 17 into current pick up relation to inner roadbed lanes 13 and 14 and simultaneously gain enough speed to travel along side of the truck. This results from shifting the D.C. slider sufficiently to energize the police car with extra strong unidirectional current only that enables the solenoid 94 to overcome the spring 95 and steer only the police car and not the lumber car to the left. After passing the truck the police car is slowed by the simple two sliders 23 and 24 by retarding the slider 23 so that the pull of solenoid 94 is weakened and overcome by spring 95 thus restoring the front wheels of the police car to their normal position, canted toward the right. Thus both the speed and the course of each vehicle are individually under separate remote control of the officer depending on the circumstances.

If the truck has its steering linkage related to the solenoid 57 in such manner so that the truck normally veers to the right instead of the left, it will travel normally in wiping contact with whichever curb 16 or 17 is at its right side with respect to its direction of travel along
the roadbed. Thus the truck would follow outer curb 17 while the police car is following inner curb 16 if the vehicles are placed on the roadbed to advance in opposite directions whereby they are free to pass each other as in normal traffic performance. However, under these conditions and for the excitement of spectators it becomes apparent that either vehicle can then be steered toward the other for side swiping or to cause a head-on collision. When more than two vehicles are employed on the same roadbed and particularly if the roadbed is equipped with more than three lanes the diversification of traffic control and resulting complications are practically unlimited.

Further explaining the action pictured in FIGS. 9 and 10, it is recalled that the A.C. motor 43 is not responsive to unidirectional current because of the truck carried condenser 65 and the D.C. motor 56 of the police car is not sensitive to alternating current because of its carried choke coil 100. Thus if either of the sliders 23 or 24 is shifted in the proper direction relative to the base end 28 of the power secondary 22, its particular controlled vehicle will speed up without corresponding speeding of the other vehicle. This enables the police car to catch up with the truck 30 being pursued thereby and if the D.C. slider 23 is shifted sufficiently the increase in voltage which accompanies increased speed of the police car will energize the steering solenoid 94 sufficiently to cant the police car wheels 86 to the left. When this happens the police car will swerve from lanes 14, 15 across the lanes 13, 14 and will continue onward in the same direction until it pulls alongside the truck. The police car can thus be made to pass the truck, after which D.C. slider 23 can be shifted to reduce the unidirectional current potential whereup the steering solenoid 94 will yield to the spring 95 which will cant the wheels back to position 866. Thereupon the police car returns to its lanes 14 and 15 and can be stopped in front of the truck if desired, as if the police had signaled the truck driver to stop for check-up.

The ability of the police car to continue traveling on lanes 13 and 14 in the same direction it has been traveling on lanes 14 and 15 under unidirectional current is clear from the circuitry diagrammed in FIG. 11. Polarity of lane 14 can be either plus or minus, whereas the polarities of lanes 13 and 15 are respectively plus and minus in the condition of reversing switch 27 shown in FIG. 11. As polarity of lanes 13 and 15 can be reversed by throwing switch 27 to its opposite or downward position because switch 27 determines which of oppositely directed rectifier 26 shall be effective in circuit. In general it may be said that the unidirectional and alternating circuits involved in the present system with respect to any signal pair of the lanes work on the same principle as disclosed in our co-pending application, Ser. No. 739,838, filed June 4, 1958, now U.S. Patent No. 3,024,739. This gives the ability to reverse the direction of travel of either vehicle for making it run backward. The direction of travel of a D.C. vehicle can be reversed by throwing switch 27 just as it can be reversed by throwing switching switch 39 in our said co-pending application. Also as in the co-pending application the direction of an A.C. vehicle as used in the present system can be reversed by means of a sequence switch 69 which is stepped by consecutive forward strokes of a pawl-operating one-toothed ratchet wheel that is fixed to a circuit switching commutator drum. The direction of running of the A.C. motor 43 will be reversed each time that driving pawl is attracted by its relay solenoid 70. Such stepping is caused by shifting the alternating current slider 24 to an even further secondary base 28 than is necessary to affect the steering solenoid 57. It is found that a rise in potential from the 18 volts, to which steering solenoid 57 is responsive, to 20 volts can be made to cause the sequence switch 69 to step and perform its reversing function followed by a back dropping of the driving pawl when the voltage is next decreased to thus be ready to again step the sequence switch when the voltage to the lanes of the roadbed is next increased.

What is claimed is:

1. A toy traffic system comprising, miniature vehicles individually remotely controlled in a manner to turn out and pass one another at the will of the operator, a roadbed traveled by said vehicles having at least three separate side-by-side current conductive lanes with substantially flush tread surfaces permitting said vehicles to transfer from one pair of said lanes to a different pair of said lanes, a curb bordering the outer edges of each of the outermost lanes each of said vehicles having road wheels cantilever to steer the vehicles in directions along or crosswise of said lanes, means on each of said vehicles normally operative to cant said wheels to one side of the vehicle toward one of said curbs, electrically operable means on each of said vehicles connected to cant said road wheels to the opposite side of said vehicles in response only to voltage of extra high potential, current collectors at each side of each of said vehicles laterally spaced apart to travel in conductive contact with either of said two different pairs of said lanes, a propulsion motor on one of said vehicles operably responsive only to unidirectional current derived through its collectors and at and below said extra high potential, a propulsion motor on another of said vehicles operably responsive only to alternating current derived through its said collectors and at or below said extra high potential, and a source of combined alternating and unidirectional currents connected to three of said lanes including a voltage controller connected to govern said alternating current and a separate voltage controller connected to govern said unidirectional current.

2. A toy traffic system as defined in claim 1, in which the said source of combined currents includes the secondary of an alternating current transformer and two condensers interposed respectively between said secondary and lanes of said different pairs of lanes, and said voltage controllers comprise said current take-off sliders separately movable in conductive contact with the same secondary of said transformer.

3. A toy traffic system as defined in claim 2, together with two rectifiers oppositely polarized and interposed between one of the said take-off sliders and lanes of said different pairs of lanes, and a double-throw switch connected in electrical series with both of said rectifiers for reversing the polarity of unidirectional current delivered to said lanes of said different pairs.

4. A toy traffic system comprising, miniature vehicles individually remotely controlled in a manner to turn out and pass one another at the will of the operator, a roadbed traveled by said vehicles having at least three separate side-by-side current conductive lanes insulated from one another with substantially flush tread surfaces permitting said vehicles to transfer from one pair of said lanes to a different pair of lanes, both of said vehicles having roadwheels cantilever to steer the vehicles in a direction crosswise of said lanes, lane bordering curbs on the outer edges of the outermost lanes, means on both of said vehicles normally operative to cant said wheels to one side of said vehicle toward one of said curbs, electrically operable means on one of said vehicles connected to cant said road wheels to the opposite side of said vehicle in response only to voltage of extra high potential, current collectors mounted at each side of each of said vehicles constantly in conductive contact with either pair of said two different pairs of lanes, a propulsion motor on each of said vehicles, each of said motors being operably responsive to one only of two contrasting kinds of current and deriving said current through said collectors and at and below said extra high potential, and a source of said contrasting kinds of current connected to three of said lanes including a voltage controller con-
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ected to govern one of said kinds of current and a separate voltage controller connected to govern the other of said kinds of current.

5. A toy traffic system as defined in claim 4, in which the said current collectors are spaced apart laterally of the said one of the said vehicles a sufficient distance to contact both the middle lane and one of the other two of the said three lanes simultaneously in every position of the said one of said vehicles laterally of said lanes, and in which the width of each of the said three lanes is approximately the same as the said distance apart of the said current collectors, and in which the said current collectors are spaced apart laterally of the vehicle a distance substantially no greater than the lateral distance between the said road wheels.

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