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(54) **MODEL CAR RACING SIMULATOR**

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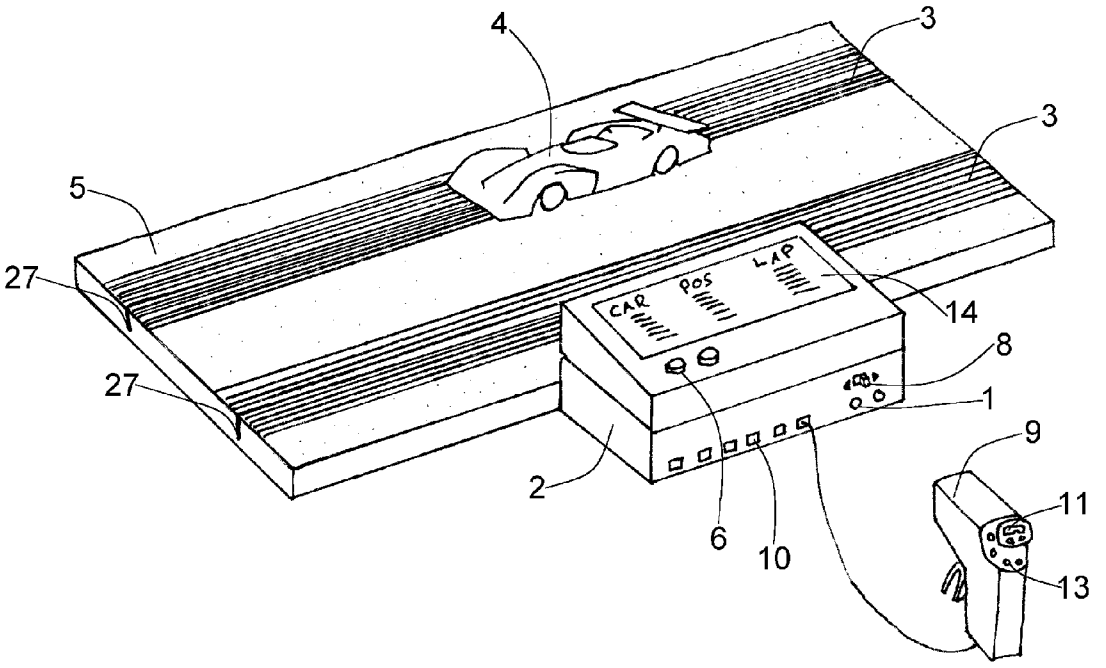
(52) **U.S. Cl.** **104/60**

(57) **ABSTRACT**

A model car racing simulator game which employs a unique, configurable guide blade and rails system which consist of a plurality of brush connections and rails to create a unique path for power and control data to individual toy vehicles so that they may change lanes and race in the same lane to more realistically emulate actual automotive racing. Modular power base units are described herein allowing a larger field of vehicles to race simultaneously. Such a field of vehicles ranges in size from 1 to 25 or more vehicles within this description and may include more depending upon rail and guide configuration implemented. The invention includes track segments as well as processing and display means which allow for lane changes, lap counting and timing, pit stops. The invention includes a control device which allows control of a subset of features including though not limited to vehicle steering, vehicle speed, braking, lights, brake lights.



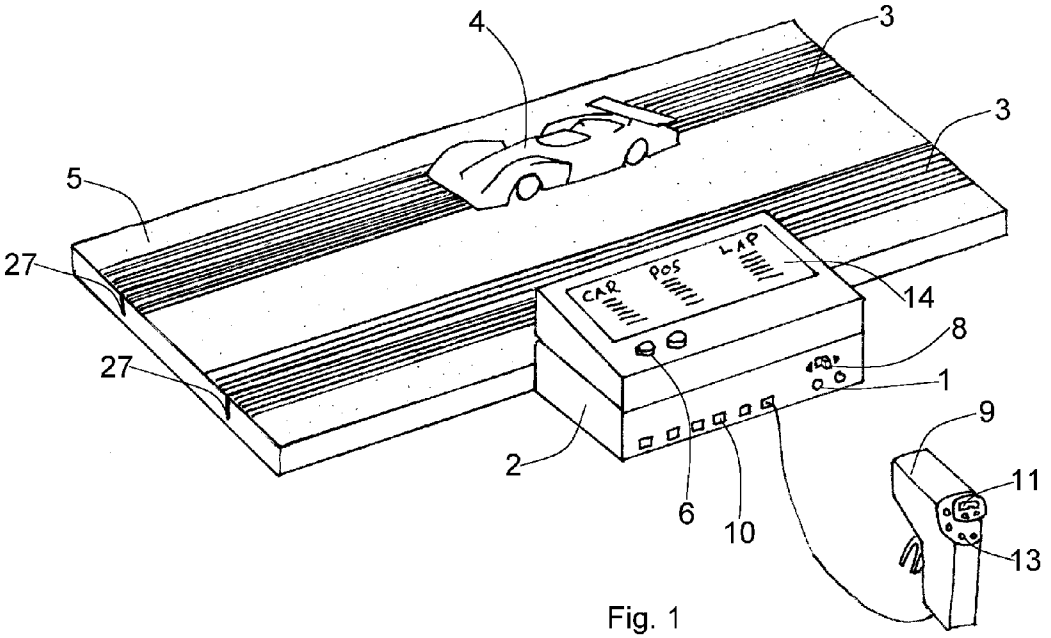


Fig. 1

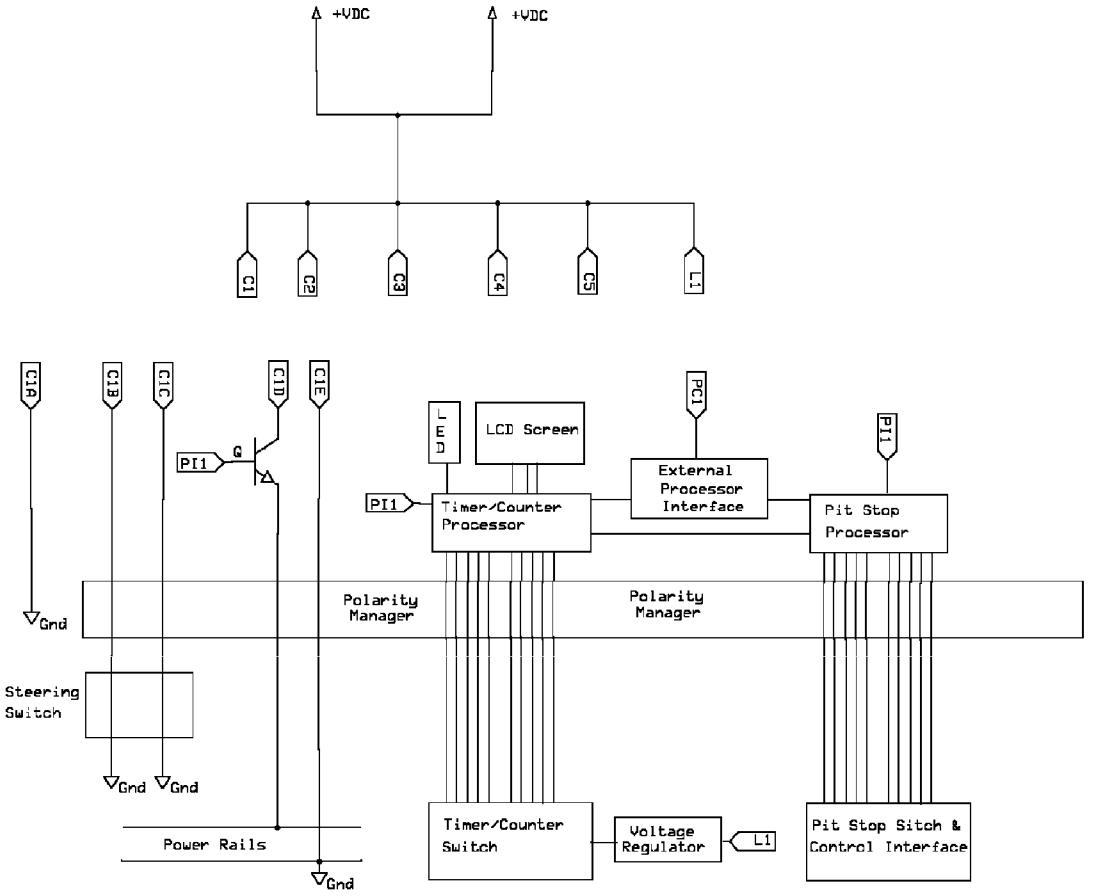

+VDC
+VDC
C1
C2
C3
C4
C5
L1
C1A
C1B
C1C
C1D
C1E
PI1
Q
LED
LCD Screen
PC1
PI1
PI1
Timer/Counter Processor
External Processor Interface
Pit Stop Processor
Gnd
Polarity Manager
Polarity Manager
Steering Switch
Gnd
Gnd
Power Rails
Gnd
Timer/Counter Switch
Voltage Regulator
L1
Pit Stop Sitch & Control Interface

Fig. 2

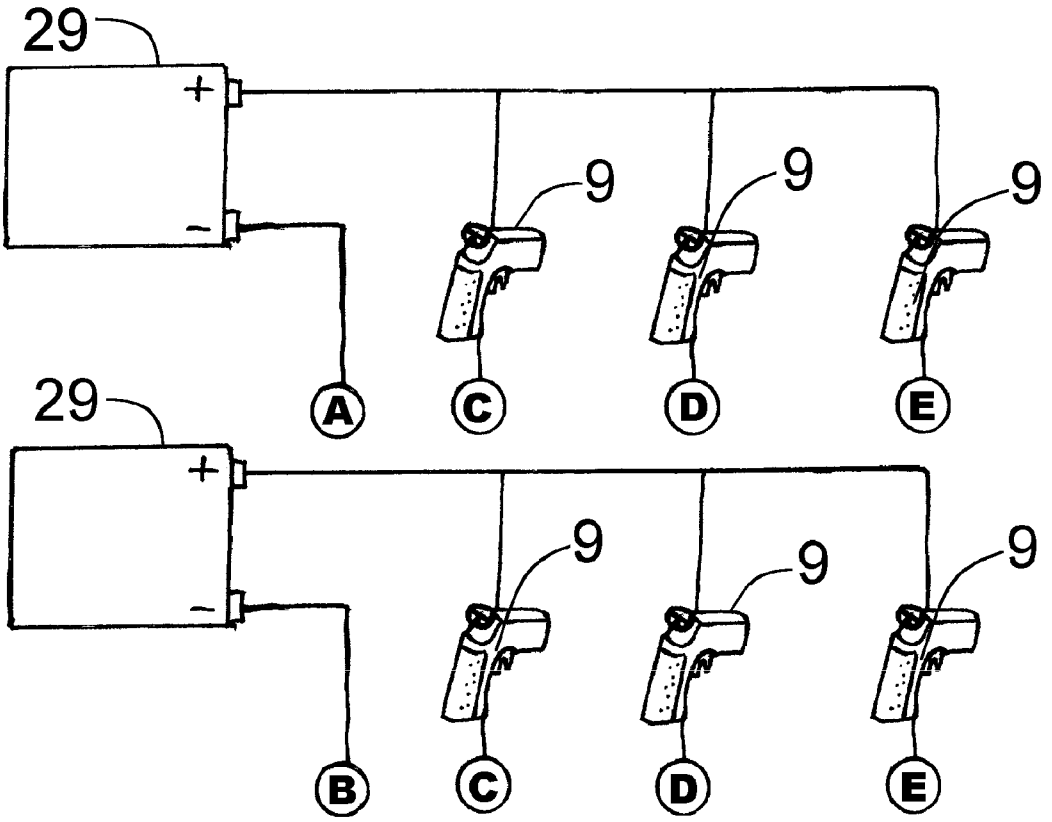


FIG. 3A

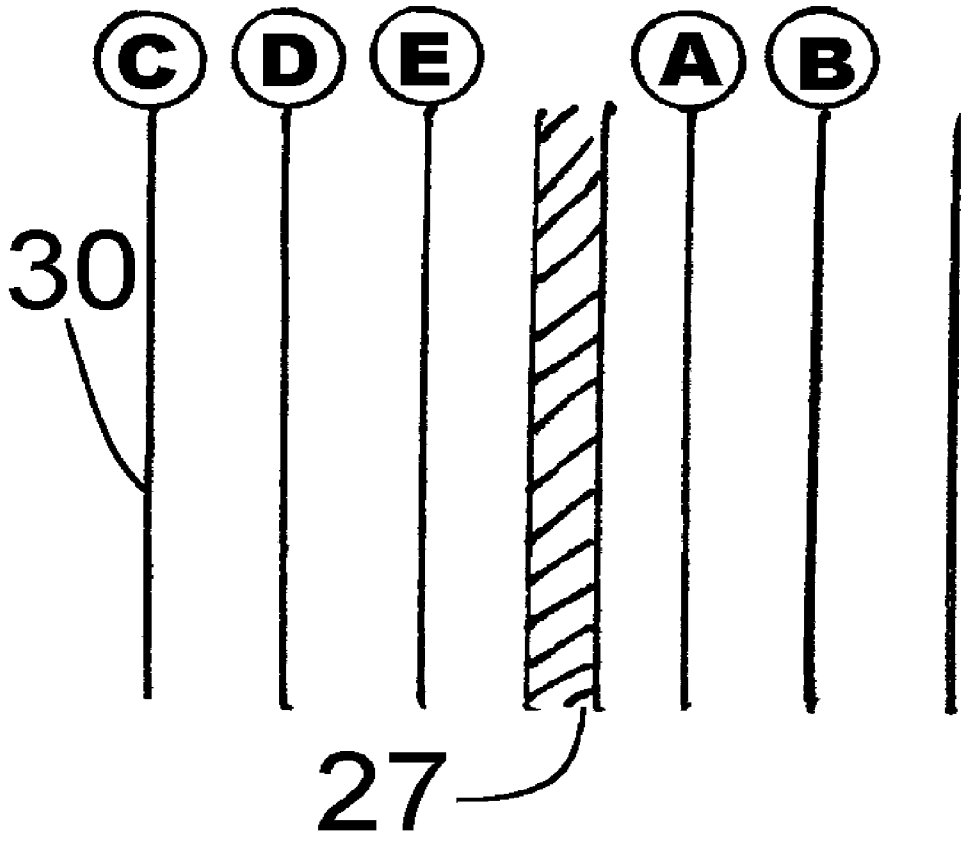


FIG. 3B

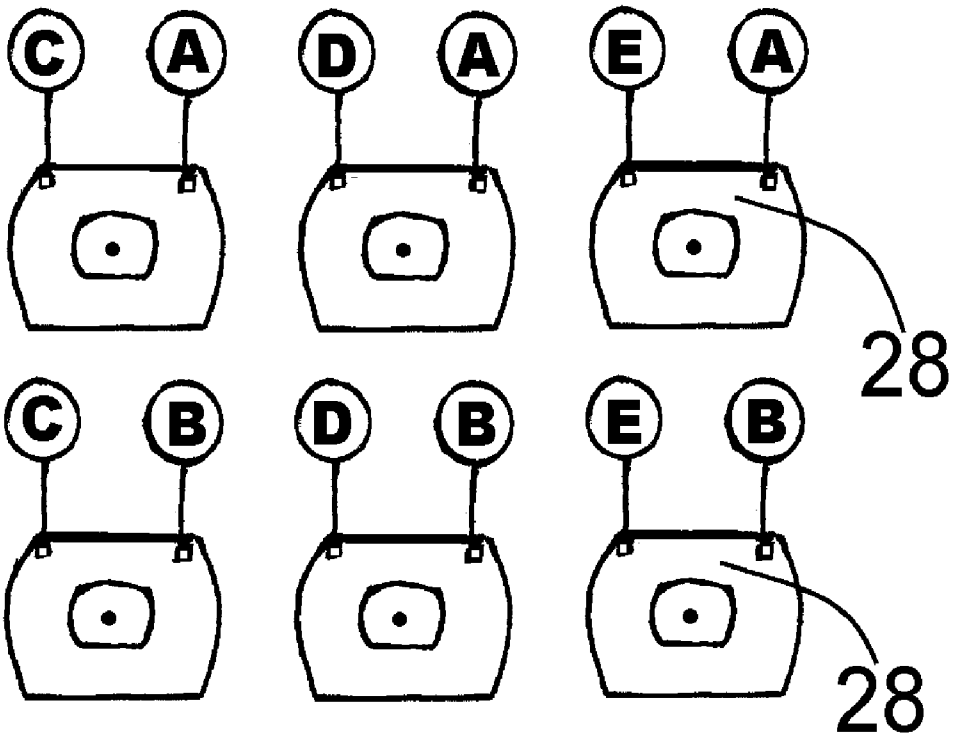


FIG. 3C

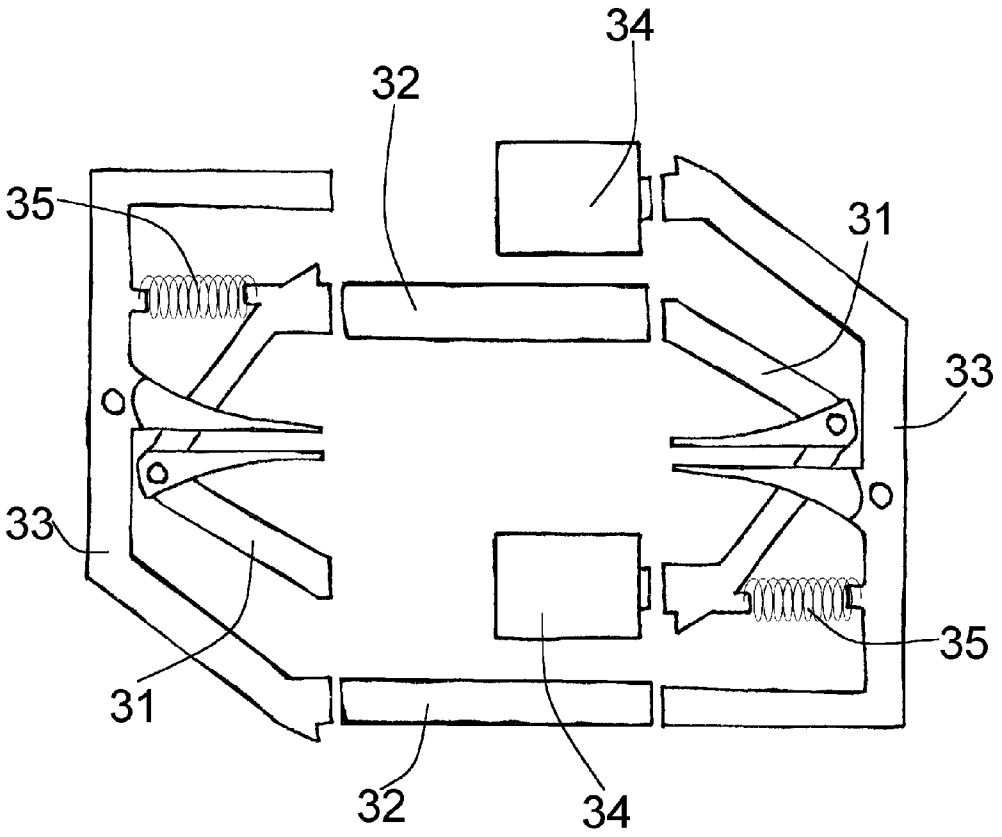


FIG. 4A

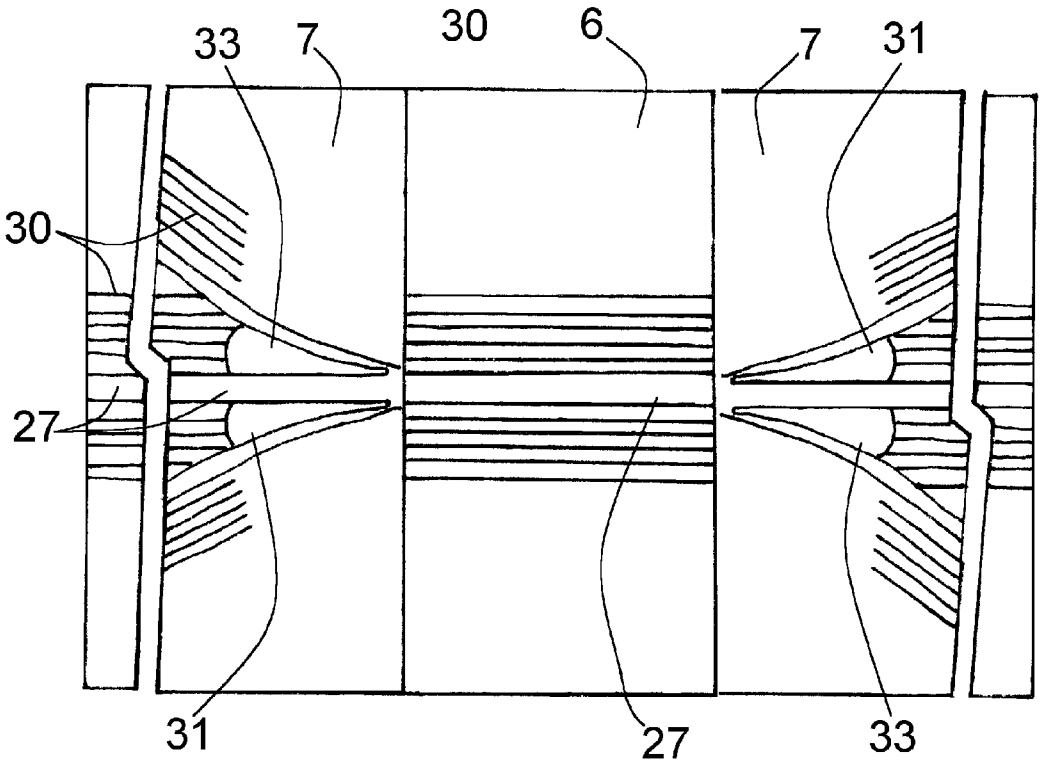


FIG. 4B

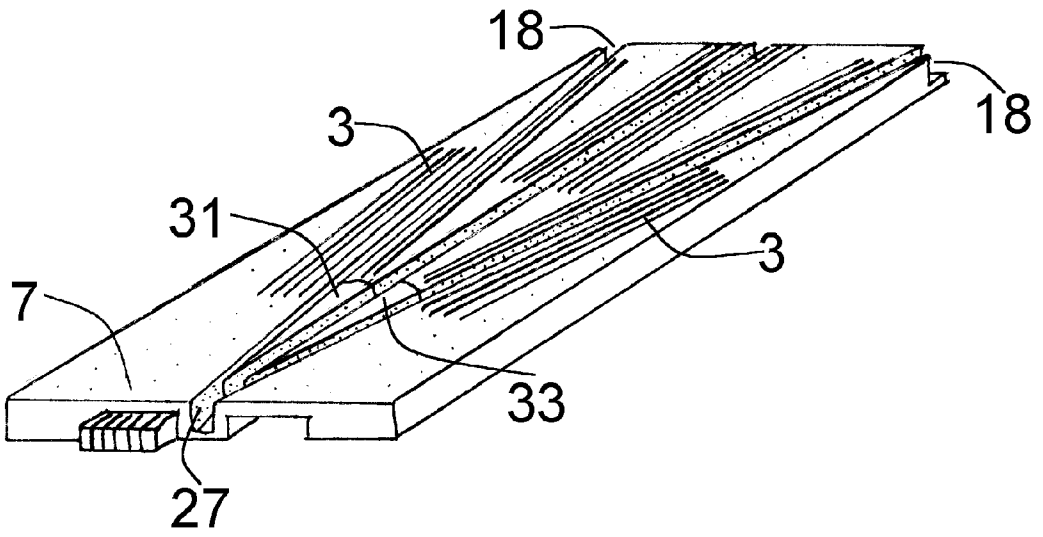


FIG. 4C

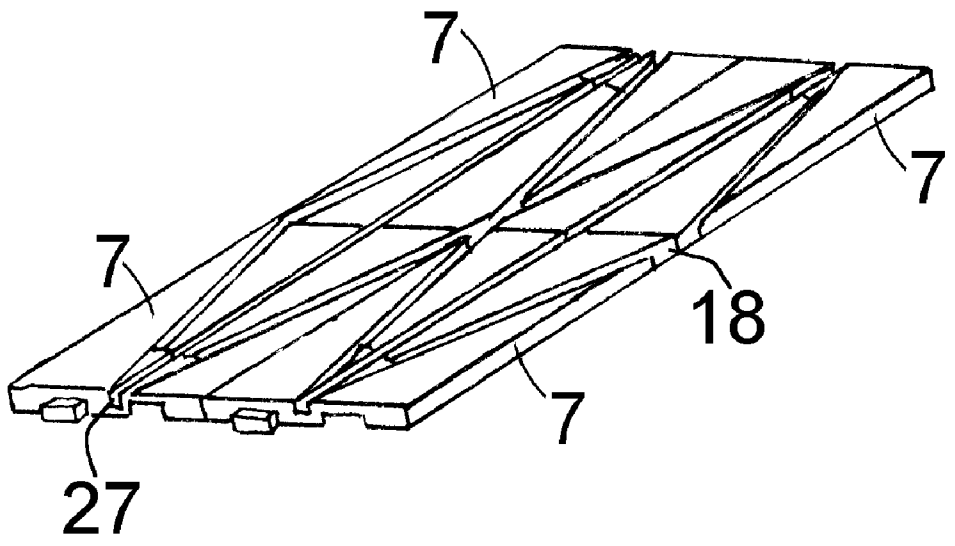


FIG. 4D

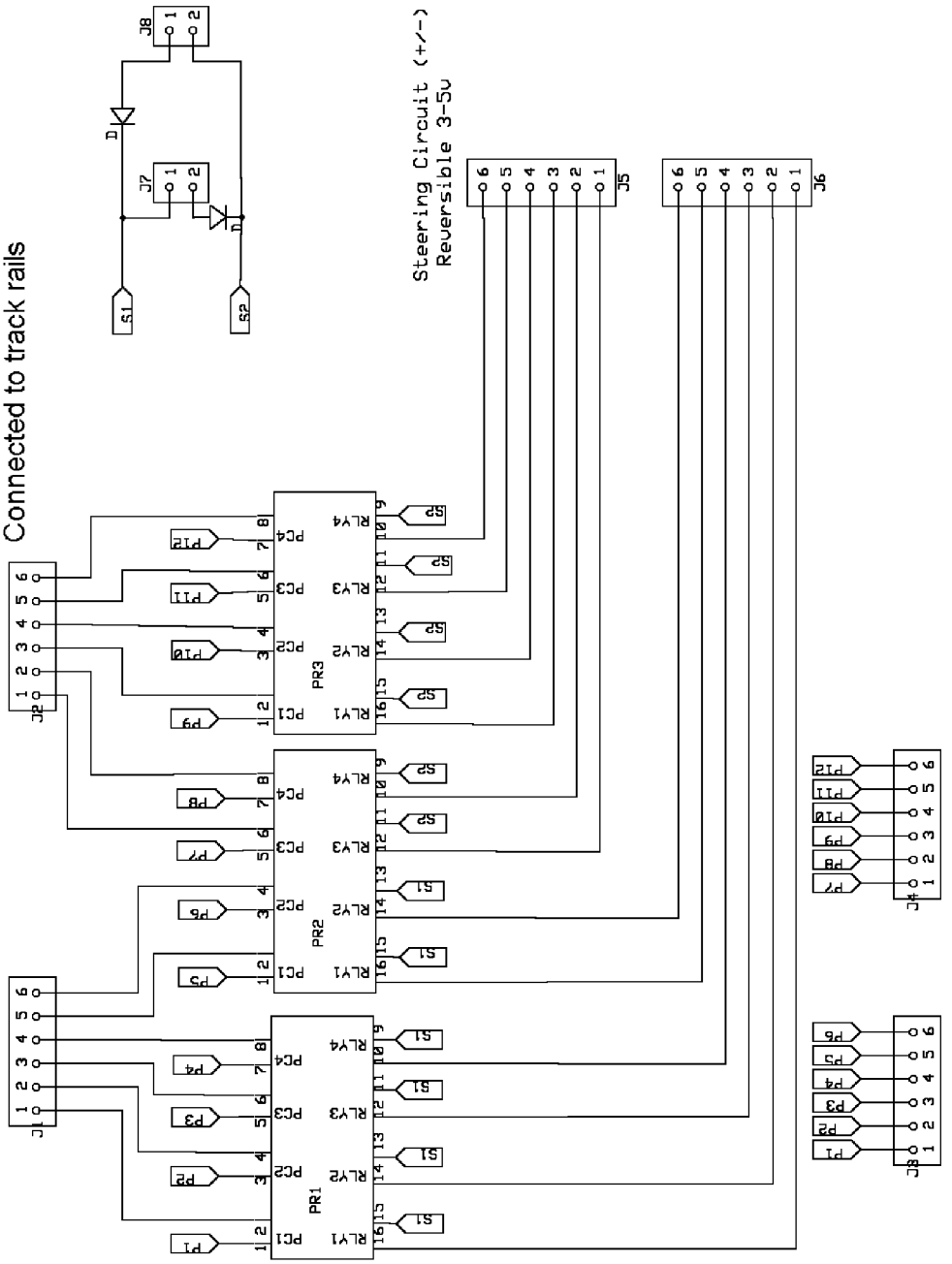

Connected to track rails
Steering Circuit (+/-)
Reversible 3-5v
J8
J7
J5
J6
J2
J1
J4
J3
D
n
S1
S2
PR3
PR2
PR1
PC1
PC2
PC3
PC4
RLY1
RLY2
RLY3
RLY4
P1
P2
P3
P4
P5
P7
P8
P9
P10
P11
P12

FIG. 5

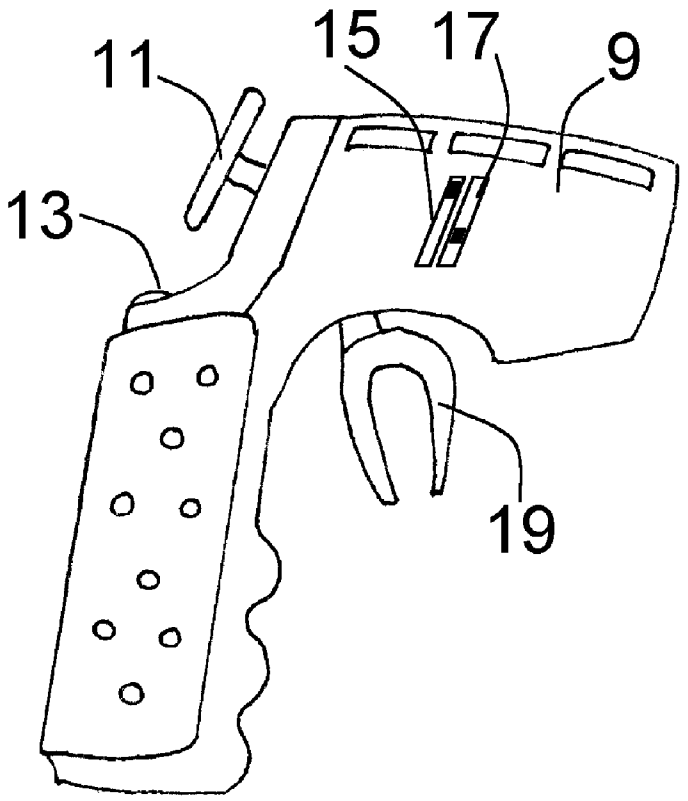


FIG. 6A

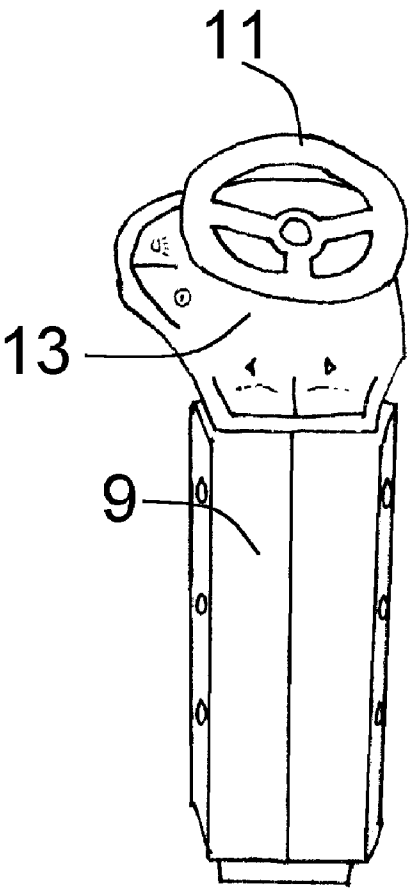


FIG. 6B

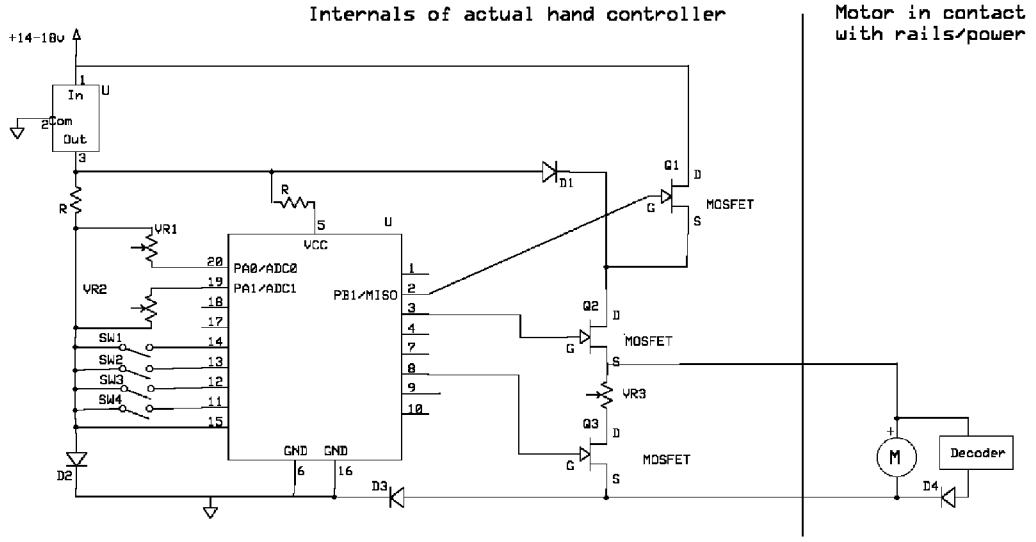

Internals of actual hand controller
Motor in contact with rails/power
+14-18v
In
Com
Out
R
VR1
VR2
SW1
SW2
SW3
SW4
D2
D1
Q1
MOSFET
VCC
PA0/ADC0
PA1/ADC1
PB1/MISO
GND
GND
Q2
MOSFET
VR3
Q3
MOSFET
D3
M
Decoder
D4

FIG. 7

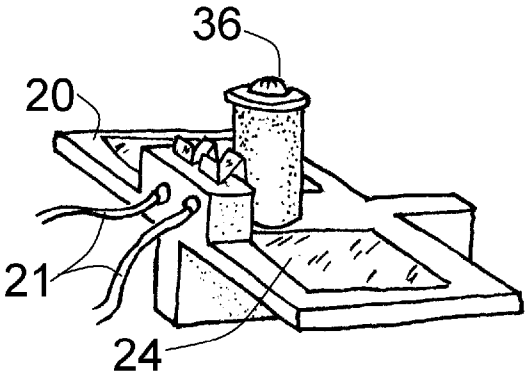


Fig. 8A

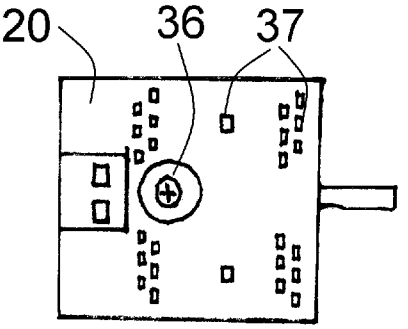


Fig. 8B

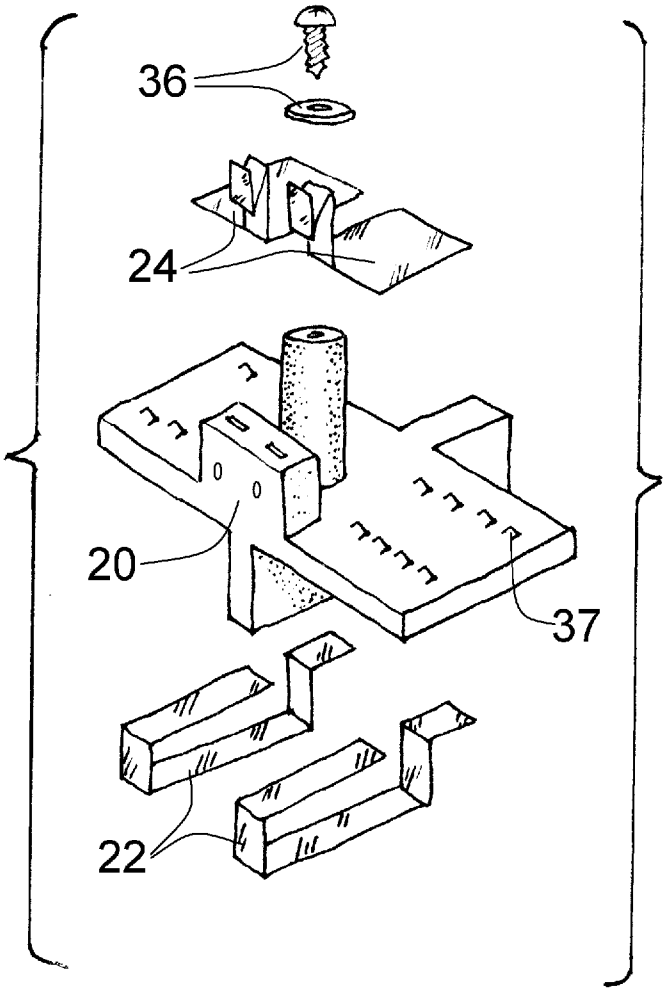


Fig. 8C

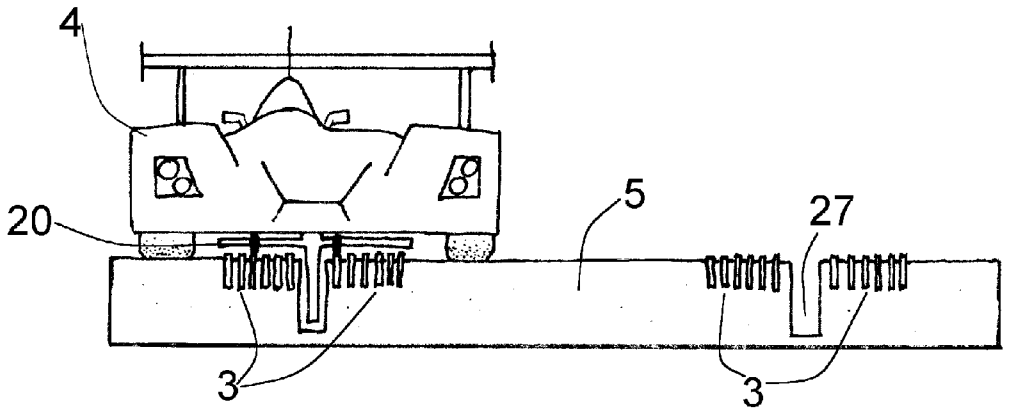


FIG. 9

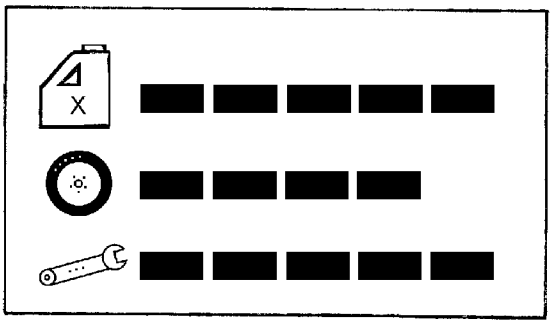


FIG. 10A

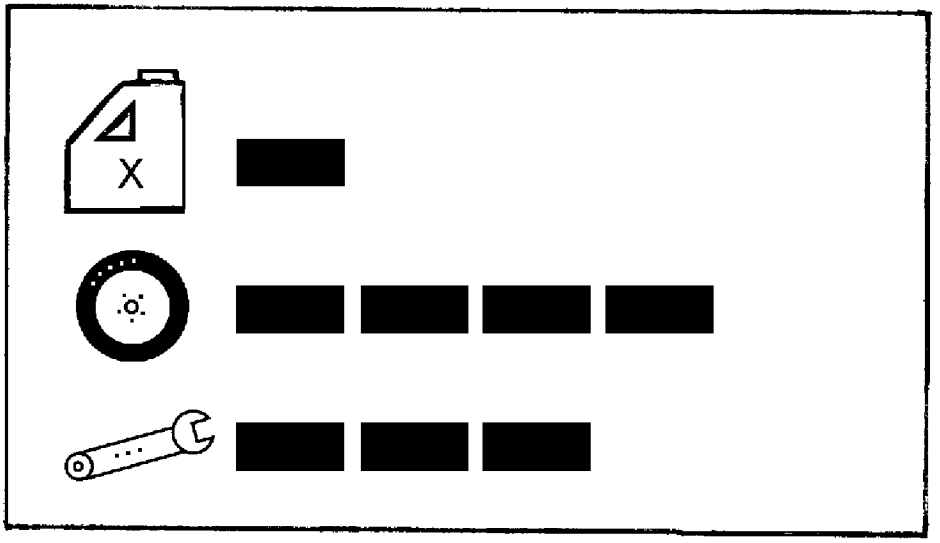


FIG. 10B

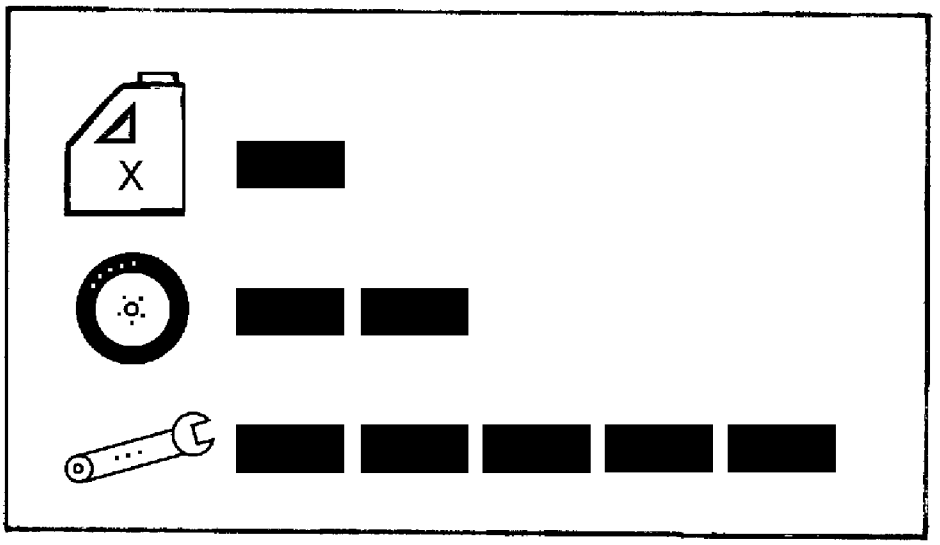


FIG. 10C

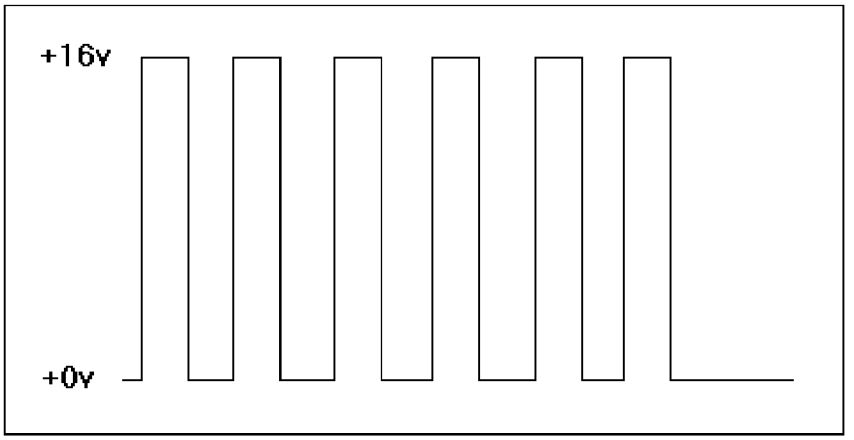


FIG. 11A

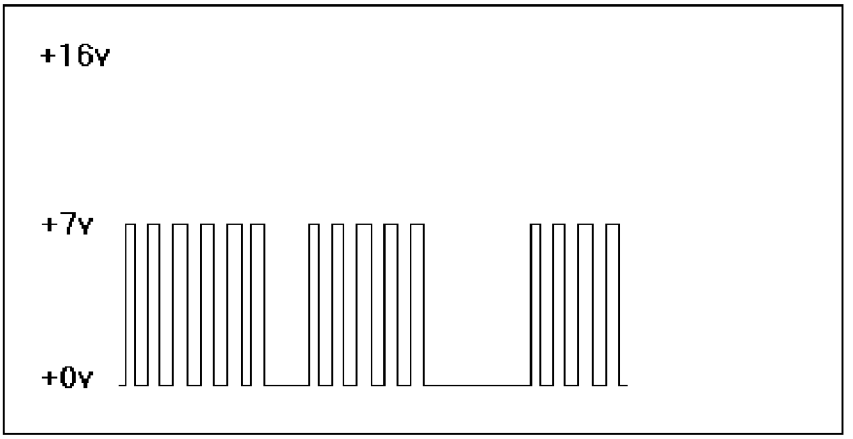


FIG. 11B

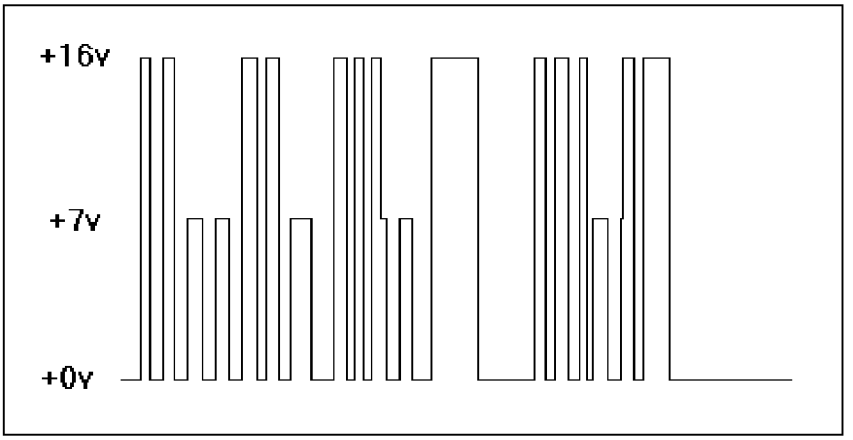


FIG. 11C

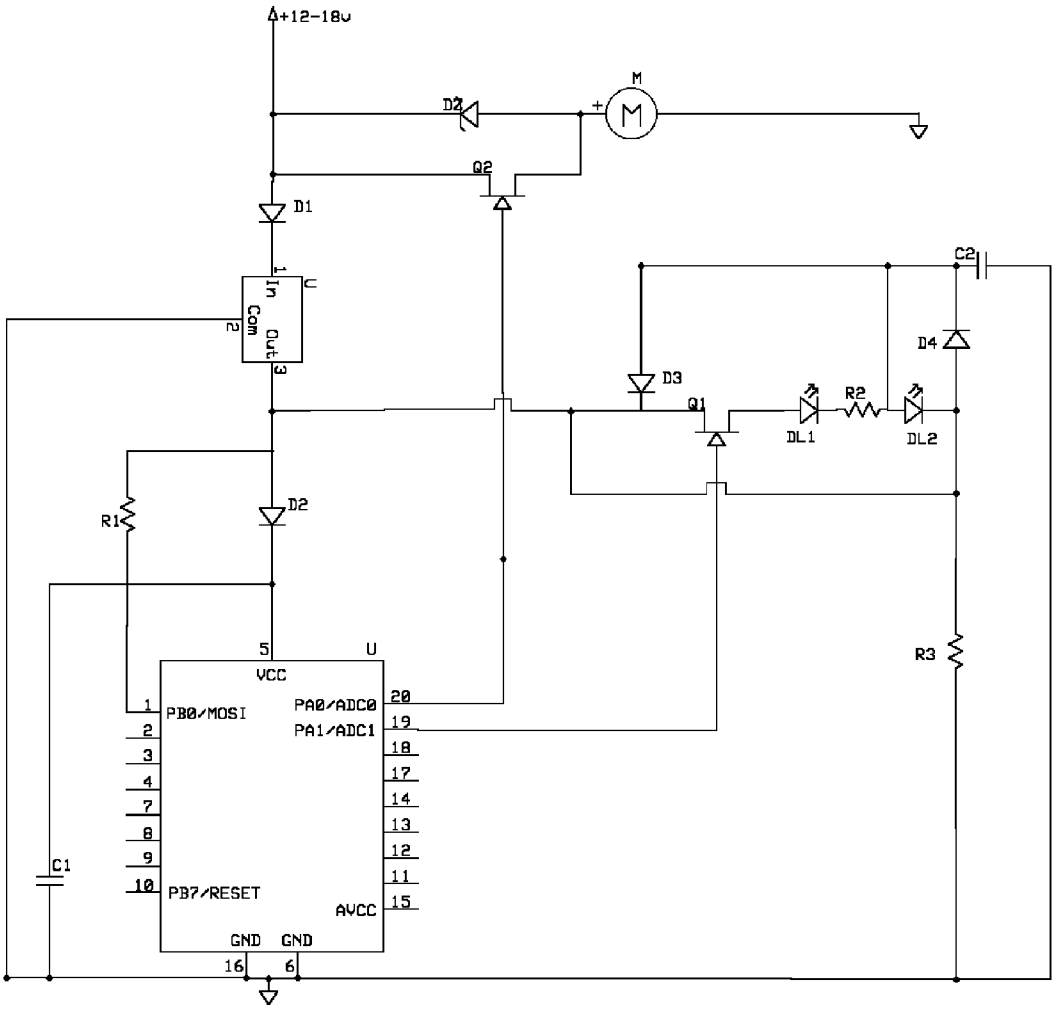

+12-18V
M
D2
Q2
D1
In
Com
Out
C
C2
D4
D3
Q1
R2
DL1
DL2
R1
D2
R3
U
VCC
PB0/MOSI
PA0/ADC0
PA1/ADC1
PB7/RESET
AVCC
GND
GND
C1

Fig. 12

MODEL CAR RACING SIMULATOR

FIELD OF INVENTION

[0001] The present invention is related to amusement devices generally depicting simulation of vehicle travel or racing. In particular this invention relates to vehicles which are electrically powered and guided by a slot or groove in a simulated raceway or path.

BACKGROUND OF INVENTION

[0002] The invention pertains to the activity or hobby of slot car or model car racing. For nearly 40 years this activity has utilized rubber or plastic roadway or track which is fitted with two electrical rails for each given lane. The electrical power, typically direct current (DC), passes through a means of varying voltage to the track and thus the electric motor inside the toy vehicle which would vary its speed on the track.

[0003] The challenge aspect of the hobby was increased by an introduction of modular track pieces to vary track layouts. In addition timing and lap counting were added and are generally accepted as common within the art. To improve the aspects of challenge and realism various types of slotless track systems, vehicle steering systems and racing elements have been invented or attempted.

[0004] In pursuit of a more accurate portrayal of automotive racing U.S. Pat. No. 6,109,186 issued to David Smith and David Brobst is a slot racing system which introduces a working vehicle race pit stop which includes tracking of fuel usage and refueling, tracking tire wear and replacement as well as random events which affect the performance of the electric toy vehicle on the slot track. However, that invention severely limits the number of active users and precludes the user of the system to interactively control pit stop functions. Nor does that system allow realistic vehicle control functions such controlling vehicle lights, brakes, and actually steering into or out of a desired lane or pit stop location. In addition the system only allows for a single vehicle per lane which forces entry to the pits from an outside lane by at least one toy vehicle which is unrealistic from the standpoint of a realistic race simulation.

[0005] U.S. Pat. No. 6,688,985 issued to Steven N. Weiss and Gerhart P. Huy, et al. proposes an interactive, electronically controlled racing game which provides aural and visual feedback via graphical LCD panel attached to a base unit. That system monitors fuel usage and tire wear and allows input from the user via a button to manipulate the events related to the pit stop. While that invention improves on the interactivity between the user and the toy, it too only allows a single vehicle per lane, thus forcing vehicles to "pit" in two lanes which, too is unrealistic from a racing simulation point of view. While the pit function indicates some sort of attention is needed, it does not allow the operator to either bypass or partially address a particular problem and accept the consequences of his actions in the interest of saving time. Lap counting and timing by design are limited to **100** laps and $1/100^{th}$ of a second which is not suitable for realistic racing simulation.

[0006] U.S. Pat. No. 5,218,909 embodies a slot track wherein the toy vehicles change lanes. The vehicles specified in that case are radio-controlled and thus not of the commonly conceived method within the slot racing hobby of having the track supply power to the toy vehicles.

[0007] U.S. Pat. No. 4,382,599 issued to Neil Tilbor introduced a method of racing slot cars which allowed the changing of lanes in a manner similar to realistic driving. With the touch of a button the user could make his or her vehicle change lanes. However, centrifugal force would change your lane on a curve while using this invention, taking control from the user. In addition, no realistic means for lap counting or timing is there identified.

[0008] Finally, within the art it is common that one vehicle is allowed per lane. This forces an individual to add numerous parallel lanes in order support a larger field of vehicles. This often has a negative impact on available space and the available designs of the resulting race course.

[0009] U.S. Pat. No. 6,883,720 issued to V. J. D'Angelo, Jr. et al. proposes locating guide slots in close parallel in order to simulate a chicane. That invention forces vehicles in closer proximity for a time in order to enhance the excitement of the racing experience. While innovative, this art continues to restrict the racing simulation to only two toy vehicles and includes no other unique, interactive functionality. It certainly does not provide for lane changing as does this invention.

[0010] In addition to creating a more realistic racing environment, the objective of this invention is to introduce a means for controlling multiple brands of toy slot vehicles which reduces heat and wear to their motors while protecting the investment of the individual in control devices. Unlike other control devices, the control means of this invention accommodates customization without opening the device or requiring technical skill. While it is best to match controller performance to vehicle performance, controllers available today are difficult or time-consuming to customize. Thus some purchase multiple, pre-configured controllers or endure an unsatisfying experience attempting to control a slot car for which their controller is not suitably matched. The control means introduced in this invention provides the operator with greater control over their environment, an experience which enhances enjoyment and offers a control device that proves to be a more sound and lasting investment.

BRIEF DESCRIPTION OF INVENTION

[0011] The invention comprises a system that allows for a more realistic racing simulation that previously provided on an electrically powered, continuous loop, slotted racing surface. Components of the invention include durable plastic, slotted track surfaces where each slot is flanked by pairs of rails which allow multiple vehicles to race in a single lane. The vehicles are also allowed to change lanes upon command at selected points on the track.

[0012] The size of the field of vehicles is determined by multiplying the number of rails on the left side of the slot by the number of rails on the right side. Operating multiple vehicles in a single slot is accomplished by selective sharing of the grounding wire for a group of positive leads on the opposite side of the slot. Vehicles have electrical pickup shoes which can be arranged in such a way that each uses a unique combination of rail pairs. That unique shoe-placement and rail positioning configuration also allows uncom-

plex vehicle recognition by mechanisms which provide or monitor lane changing, lap counting, timing, pit stops and vehicle functions such as lights and brakes.

[0013] A unique hand-held control mechanism is specified with which the toy vehicle can be steered into lanes chosen by the user. Toy vehicle lights can be activated by each individual user, pit stop functions can be controlled. Vehicle lighting system will recognize input from the user via a digital signal on the track system which is the subject of this invention or will operate in automatic mode on other analog track systems. Brake lights on the toy vehicle may be operated by issuing the braking command on the hand-held controller. Dynamic braking is achieved via back electromagnetic field which can be activated between speed power pulses, allowing braking and acceleration functions to operate simultaneously when the throttle is not at 100%. The hand-held device controls speed via pulse width modulation. The hand controller supports a mode allowing for control of analog vehicles as well as vehicles controlled via the microprocessor described herein. Hand held device will interpolate pulsed power signals with pulsed data signals to the microprocessor means within the vehicle on the positive side of the direct current wave. The power pulse goes over a zener voltage while the data signal is under the zener voltage. The hand held device can operate a vehicle using a variety of power and performance curves which are stored on the microprocessor.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWING

[0014] The foregoing summary, as well as the following detailed description of preferred embodiments of this invention, will be better understood when read in conjunction with the appended drawings. For the purpose of illustrating the invention, there is shown in the drawings embodiments which are presently preferred. It should be understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0015] In the drawings:

[0016] **FIG. 1** is a front perspective view of a hand held control unit, a base unit with lap counter/timer interface along with an attached track segment along with an electrically powered toy slot vehicle;

[0017] **FIG. 2** is a general schematic representing the interconnection of hand held control device, base unit, lap counter/timer device and pit stop control device;

[0018] **FIGS. 3A** to **3**C display the unique interconnectivity sharing an electrically conductive ground between multiple hand held control units, the electrically conductive rails and a plurality of motors inside the electrically powered toy vehicles;

[0019] **FIGS. 4A** to **4**C illustrate the unique, bidirectional lane change mechanics and implementation of such mechanics in its track segment as viewed topographically and from a perspective;

[0020] **FIG. 4D** illustrates how lane change track segments may be arranged so as to support a a track which is multiple segments wide. This is a single lane segment.

[0021] **FIG. 5** is a schematic representing the electronic circuit between the hand held control device and the lane change/Pit Stop track segment;

[0022] **FIGS. 6A** to **6**B show two perspectives of the external housing of the hand held control unit along with its controls and buttons which affect operation of the toy vehicle;

[0023] **FIG. 7** is a schematic showing the electronic circuit for the hand held control device;

[0024] **FIGS. 8A** to **8**B show a perspective and topographic view of a guide flag which attaches to the toy vehicle and makes electrical contact with both the conductive rails of the track and the motor and/or decoder of the toy vehicle;

[0025] **FIG. 8C** shows an exploded view of the guide flag for the toy vehicle;

[0026] **FIG. 9** shows an electrically powered toy vehicle on a track segment with the guide of the toy vehicle in contact with the conductive rails of the track segment via pickup shoes arranged in such a way as to uniquely identify the vehicle to its hand held control unit and system accessories;

[0027] **FIGS. 10A** to **10**C shows various possible states of the pit status for a specific toy vehicle as it would appear either as part of an external program or on a modular device utilizing a graphical LCD display;

[0028] **FIGS. 11A** to **11**C show wave form patterns for power signal, information signal and finally the information signal superimposed upon the power signal;

[0029] **FIG. 12** is a schematic representing a decoder device which controls lighting events for the toy vehicle either in response to commands sent by a native hand held control unit or automatically when such a control unit is not utilized.

[0030] It is hereby noted that the scope of this invention shall not be limited by the drawings as these merely attempt to represent the typical embodiments and implementations of the invention. A more detailed description of the invention is to follow and shall include numerals to represent common, significant components appearing in the above referenced figures.

DETAILED DESCRIPTION OF THE DRAWING

[0031] A base unit **2** as appearing in **FIG. 1** connects to at least one track segment **5** which uses a plurality of electrically conductive rails **3** and a slot **27** for the guide flag of an electrically powered toy vehicle **4**. The control unit allows vehicle travel and lap counting for vehicles traveling either in clockwise or counter-clockwise direction via a switch **8** mechanism. The base unit **2** supports a plurality of vehicles **4** and thus hand held control units **9** via connections **10** for hand held control units **9** or other accessories which may include lighting and otherwise. The base unit **2** is comprised of simple electrical components, allowing connection of analog hand controllers for select third parties. The base unit **2** also supports multiple DC power supply devices via power ports **1**. The track segments include an electrical and mechanical means for interconnection (not shown).

[0032] A combination of base units **2** may be configured to support their maximum number of vehicles simultaneously on the same track to which they are interconnected. Lap count and timing may be displayed on an optionally attached display **14**. That display allows operator to select modes of

racing such as though not limited to rally, Max Laps, Timed Endurance, qualifying, etc. via button control devices **6**. Lap Timing, counting, racing mode selection as well as pit functions are to be controlled via microcontroller device.

[**0033**] As seen in **FIG. 2**, voltage from multiple sources simultaneously is supported. Schematic tags C**1**A-C**1**E show the connection between the hand control unit **9** of **FIG. 1** and the base unit. The "Polarity Manager" controlled by the switch **8** in **FIG. 1** governs the flow of electricity to the conductive rails **3** and accessories such as lap counting/timing as well as pit stop control devices which may or may not be integrated into a base unit. The LED device allows connection to an external starting light system which is associated with the race start function. Flow of current to track segments may be affected either by timing or pit stop events via transistor "Q" through connection identified as tag PI**1**. Pit stop and timer/counter activator switches are integrated with certain track segments. A voltage regulator protects such segments from over voltage via the power line identified as "L1". "PC1" reflects UART communication timing and/or pit stop information to an external computing device such as a personal computer.

[**0034**] The schematic representation of **FIGS. 3A** to **3**C show the unique method here employed for the purpose of sharing an electrical ground wire. The diagram shows how multiple hand control units **9** use a uniquely controlled "powered" line **30** and a shared ground in order to achieve unique control and communication to a particular electrically powered toy vehicle (**4** as appears in **FIG. 1**). In this diagram "A" and "B" represent ground circuits for two unique DC power supplies or sources **29**. Multiple power and ground rails are situated on either side of the slot **27** in a track segment. A motor **28** and an optional decoder device (not shown, See **FIG. 12**) would be powered using this methodology providing unique control to an individual operator.

[**0035**] The device shown in **FIG. 4A** would be attached to the underside of a particular track segment. The device is comprised of at least one push type solenoid **34**, two pushrods **32**, a "left turn" diverter **31** and a "right turn" diverters **33** and springs which will return the diverters to their non-activated state. The activation of either "right turn" or "left turn" diverters will activate diverters on either entry or exit side of the lane change device of **FIG. 4B**. This allows the lane change device to work the same way in either direction without the need for additional solenoids. The diverters will enter the path of the slot at an angle of approximately **10** degrees, forcing the vehicle either left or right on the track. The flanged end of each diverter will make contact with a stop on an adjoining track segment preventing diverter from enter the path of the slot inadvertently. An attached microprocessor allows the unit to accept steering input from a driver, automatically divert a particular vehicle after identifying it via the pair of rails it uses, detect and avoid collision be deactivating lane change if a collision is imminent. This track section also allows the user to selectively bias the steering in a certain direction in a way that steering in the opposite direction will deactivate the bias for a particular driver or vehicle.

[**0036**] The lane change track segment **7** shown in **FIG. 4C** includes diverters **31**, **33**, electrically conductive rails **3** on either side of the slot **27**. The drawing also shows unique notches **18** which allow a vehicle to pass from one lane change track segment **7** to another adjoining segment so that more than two lanes are accommodated on a racing circuit. **FIG. 4D** shows the track segments **7** implemented as single lane segments and in a group of four segments though the detail of conductive rails is not shown.

[**0037**] The schematic of **FIG. 5** shows integrated circuits which contain relay devices. The current from the hand held controller flows into either J**3** or J**4** depending on the polarity which is determined as per the discussion of **FIG. 1**. The current would flow through the relay switches via power connections P**1**-P**12** of the integrated circuits PR**1**-PR**3** to the rails of the lane change or pit device J**1** and J**2**. The relays are only activated when a combination of rails in J**1**-J**2** are activated by being in contact with the vehicle guide as seen in **FIG. 9**, number **20**. A matching combination of relays RLY**1**-RLY**4** having current flowing through them indicates a request to change lanes by an operator via hand controller unit to connections J**5** and J**6**. The direction of the current indicates the requested direction of the lane change. Connections J**7** and J**8** will respond to only one current direction respectively. Control of current flow to these connections is managed by the diodes marked "D" in **FIG. 5**. Current would flow to either of the push-type solenoids of **FIG. 4A**, number **34** if this is a lane change track segment. However, current would active one of two control mechanisms controlling pit stop or other accessory functions should this track segment serve as a pit control or other accessory segment. The electronic circuit allows for control of an endless array of interactive track segments and thus a variety of racing, driving or chase "games" which could be played. Lap counting, timing and vehicle identification at pit stops will also use this method of identifying unique rail pairs use by a specific vehicle.

[**0038**] Referring to **FIG. 6**, the hand control device **9** there depicted is designed to provide the operator a device which is durable and customizable allowing the control device to accommodate a variety of vehicles and their unique performance characteristics. In addition, the device allow for a more realistic driving experience by implementing a steering device **11** whose functions can be mimicked in a one-hand operating using the steering control set of function buttons **13**. Other buttons **13** allow for control of lighting effects and an enhanced mode which would be required by certain accessories such as the pit stop accessory. The trigger may be configured to serve as a throttle when the trigger is pressed and an active brake when the trigger is pushed away. An active brake may also be implemented as a separate button control mechanism (not shown). Controls are provided to allow selection of a predetermined power and acceleration curve **15** as well as braking strength **17** to accommodate the weight and characteristics of different toy vehicles. This device, when wired properly should function in standard mode for any analog-controlled toy vehicle on any track system whose electrical characteristics match those of the native system of this hand held control device.

[**0039**] The electronics supporting the functions within the hand held control unit are shown in the schematic of **FIG. 7**. SW**1**-SW**4** are contact switches which affect enhanced functions such as pit stops. Other functions for those switches include turning head and tail lights off and on, sending a nominal voltage to the track surface when steering is activated so that one can coast and steer through track

segments simultaneously, other vehicle accessory function yet to be determined such as sound.

[0040] VR1 and VR2 are analog inputs to the pulse width modulation output which controls vehicle speed. VR3 regulates resistance during dynamic braking. Q1 MOSFET controls the power pulses controlling vehicle speed. The Q2 MOSFET is responsible for sending actual data signals to decoders and affecting the flow of power pulses to the motor. Q2 MOSFET takes precedent over Q1 MOSFET. Thus power pulses from Q1 will not reach vehicle/decoder during periods when Q2 is inactive. This is how the data signal is superimposed over power pulses. If no power pulse is active via the trigger then 6 volt data pulses will be sent over the conductive rails upon activation of Q2. 6 volts is under the 7 volt zener in the decoder. Pulses at that voltage are read as data packets by the decoder, but are not high enough to pass zener voltage and thus power the motor of the vehicle when enhanced control is activated via the hand control unit.

[0041] Q3 activates a short circuit between a specific pair of rails so that dynamic braking is activated for a spinning engine connected to those rails.

[0042] Programming logic will keep Q3 and Q2 from be active simultaneously as this would short out the system. When the braking function is activated, the brake Q3 will only be active during the period of time during the duty cycle when such cycle is less than 100 percent. This allows user to use accelerator and brake simultaneously if desired to fine tune acceleration and deceleration when their vehicle is turning or otherwise. Voltage regulars and protection diodes are used to protect the circuitry. **FIGS. 11A** to **11**C show the waveforms for speed/power pulses, signal pulses and a signal pulse superimposed on a power pulse. Notice the signal pulses coming in under the zener voltage for the decoder identified in **FIG. 12**.

[0043] **FIGS. 8A** to **8**C depict various views of the unique guide **20** mechanism of this invention. The guide may be attached to the toy vehicle using either a self-retaining method or a retaining screw **36** and washer. Since electrical pickup shoes **22** may be positioned by the operator on the guide **20** it is important the electrical contact is made between the pickup shoes **22** and the engine/decoder via the conductive wires **21**. Since the shoes can be placed in any position the conductive plates **24** are used to maintain that contact across a predetermined width.

[0044] To enhance the realism of the race experience, this invention introduces a pit stop function. This function would monitor the status of critical resources during a race. The display of the various statuses of these resources is depicted in **FIGS. 10A** to **10**C. Such a display may be part of an integrated accessory with an LCD display or part of an external computing program and display mechanism. In either case pit status would be associated with a particular vehicle and would reflect the usage of limited resources. Positioning the toy vehicle on a certain track segment and activating "left" or "right" control mechanism as discussed per **FIG. 6**, number **13** would allow selection of a resource to renew as well as a choice to replenish that resource. The need to "pit" may be communicated audibly or visually with flashing symbols such as fuel, tires and repair as appearing in **FIGS. 10A** to **10**C.

[0045] This invention proposes a means whereby the operator can communicate to his or her toy electric vehicle with the intent of activating or deactivating accessory functions such as lights. A decoder chip is proposed for this function as a receiver of requests from the operator. The schematic of **FIG. 12** shows the logic behind this decoding device. This device is not necessary to operate lane change functions, lap counting or lap timing. I would likely be necessary for pit stop function control. In **FIG. 12**, a voltage regulator is used to manage current going to integrated micro control device. Capacitor C1 should maintain current to VCC of the chip keeping its memory from resetting due to the use of pulsed power. D2 is a zener diode of approximately 7 volts for the motor M. Q2 is a normally closed transistor device which allows the vehicle with this decoder to operator in analog mode by default. Activating Q2 puts the vehicle in enhanced mode, separating data pulses from those above 7 volts which would power the motor. Port PB0 reads input data pulses. Capacitor C2 is to power the brake light DL2 with higher voltage to make it brighter when power is not present and dynamic braking may be in effect. The same capacitor C2 would also power the headlights DL1 during periods when headlights are desired and no current is flowing. Of course this power would be temporary. However, a miniature, rechargeable battery may be used in place of C1 or C2. R2 would reduce the voltage and thus brightness of the tail lights during periods of normal operation when current is flowing. Transistor or MOSFET device Q1 is normally closed just as Q2 is, making head and tail lights operate in analog mode by default. However, activating Q2 selectively in enhanced mode will turn lights off or on. The system also allows flexibility so that auxiliary functions may be activated and lighting configuration is customizable manually by the operator. The activation signal is retrieved from the hand held control device.

What is claimed is:

1. A system including at least one electrically powered toy vehicle and a continuous loop track for racing the electrically powered toy vehicle under control of an operator, a continuous or modular track having at least one lane and an a plurality of electrical paths extending along each lane for providing separate electrical power to at least one vehicle about the track, comprised of any or all of the following: at least one hand-held control unit operably connected with the electrical path, interlocking, modular track segments which allow for a straight path travel, curved path travel, interactive lane change and pit stop control, power connect segment, straight segment with left or right lane change, curved segments with left or right lane change, lane change segments which allow crossing over to a separate track segment off of either left of right edge, lap counting and timing segments, segments which detect and avoid collision, segments which respond to both human input for some vehicles while making automatic judgements for vehicles not controlled by human input during the same usage session, interactive segments which may be switchably biased by the user, at least one electrically operated base unit which allows for connection of at least one power supply thus serving as means for managing power distribution to control units and polarity management for direction of vehicle travel, as well as communication between control units and interactive track segments which includes adjustments in power distribution to individual toy vehicles based upon responses and events initiated by interactive devices of the system, a display and or aural feedback unit operably connected to or integral with at least one base unit and configured to display

lap timing, lap counting, vehicle position, simulated pit stop function in response to input from at least one control unit as well as communicating or aggregating such data for an external computing or display device.

2. A system according to claim 1 wherein control units contain a processing means which allows operation upon analog-controlled toy vehicles and digitally controlled toy vehicles outfitted for this system via modes which are selectable by manipulation of an integrated button control mechanism; and integrates a steering means supporting both types of vehicles allowing a left or right change in direction as well as operation of pit stop functions on respective track segments; and allows adjustments.

3. A system according to clam **1** wherein control units by default support analog toy vehicles by supplying pulse width modulated electrical current for speed control, variable back electromagnetic field within the control unit for brakes and allows a selection of predetermined acceleration curves.

4. A system according to claim 1 wherein control units supports digitally controlled vehicles outfitted for this system by supplying pulse width modulated electrical current over a zener voltage for speed and digital signals under a zener voltage for control of other vehicle functions including, but not limited to the following functions: head/tail light on/off, proportional brake function, brake lights.

5. A system wherein specific modular track segments having a plurality of electrical contacts on either side of the slot are able to respond to electrical contact by the guide of a toy vehicle traveling in either direction and/or manipulation of steering means as necessary for that track segment whereby a steering track segment would allow vehicle to travel to the left or right from the same lane even when the destination is another track segment, using a least one electrically actuated diverting means, a pit stop segment would allow control of generally known pit stop functions and a lap counter/timing segment would signal a lap counting/timing means, each after identifying at least one vehicle via a unique pair of conductive rails activated on that track segment as determined by a microprocessor or analog means.

6. A system according to claim 5 wherein a modular track segment designed to function as a pit stop track can be configured in such a way as to recognize either a specific toy vehicle or any toy vehicle on the racing track by manipulating an attached control mechanism which correlates the active rails on the pit track segment with those of a specific vehicle and control unit on the track, preventing other race teams from using another team's pit stop.

7. A system wherein a signal decoder having a microprocessor means is installed in a toy vehicle which responds to a control unit for the purpose of controlling a toy vehicle by identifying whether the control unit is indigenous to its system or is an indigenous control unit using either of its selectable modes: analog or digital control, whereby the vehicle motor responds to speed inputs from an analog control unit by bypassing its zener diode while automatically operating optionally attached lighting functions so that attached lights will be "on" while electrical power is present and brake lights would brighten when powered by back electromagnetic field during dynamic braking; otherwise when digital mode on the control unit is selected the decoder means will pass electrical pulses which are over its zener voltage to the vehicle motor while sending all electrical signals, even those under its zener voltage to its microprocessor means which will operate user-configurable vehicle functions including but not limited to: head/tail lights, brake lights and an integrated, proportional braking function which uses the a back electromagnetic field generated and contained within the toy vehicle.

8. A system according to claim 5 wherein a guide mechanism is attached to the bottom of a toy vehicle which protrudes downward into a continuous slot on a toy race track for the purpose of guiding the toy vehicle, where such guide mechanism connects the electronic and/or electrical components such as a decoder as specified in claim 6 or the engine and/or other accessories of the toy vehicle to the electrically conductive rails of the track system while allowing the operator to configure its pickup brushes in such a way so as to allow at least one toy vehicle to be uniquely controllable and identifiable on a toy race track system.

9. A method whereby both digital communication and a modulated pulses are transmitted simultaneously at more than one distinct voltage between a control means and an electrically powered item or toy vehicle per the embodiment of this invention, superimposing the waveform of the lower voltage pulses and 0 volt intervals upon the waveform of the higher voltage pulses, for the purposes of communicating digital signals to a microprocessor means within a device or toy vehicle using a lower voltage pulse and directly powering an associated component as an electrically powered toy vehicle motor, while not limited to such, via the higher voltage pulse which is above the voltage of zener diode between the motor and the electrical source.

10. A method whereby multiple electrically powered devices, including though not limited to electrically powered toy vehicles, may share a common electrical ground while each is distinctly controlled by individual control means through manipulation of input current through a plurality of electrically conductive connecting points; and such a method also supports a plurality of power supplies and thus a plurality of connecting ground lines allowing these aforementioned devices to share a common connection point for input current while being attached to any one of the plurality of grounding means of the plurality of power supplies; hence the number of current input points or positive leads multiplied by the number of grounding points would dictate the total number of uniquely controlled devices which could be powered by a system implementing this method as in the case of the system according to claim 1.

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