SAFETY SYSTEM FOR POWERED RIDE-ON TOY VEHICLES

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Abstract

Described are safety-enhancing systems for remotely controlling the delivery of electric current to the drive mechanisms of electrically powered toy vehicles. Such systems comprise a vehicle-mounted receiver module that includes a receiver capable of receiving a control signal and a control-signal-responsive relay disposed in the electrical circuit between the vehicle’s energy source and drive mechanism. Receipt of an appropriate control signal actuates the relay, thereby interrupting the flow of electric current between the vehicle’s power supply and drive mechanism and causing the vehicle to stop. In preferred embodiments, the control signal is transmitted by a transmitter activated by, for example, a parent observing a child operating a powered ride-on vehicle in an unsafe manner.

Conceptual diagram of operation of certain preferred embodiments of the invention.
Figure 1 – Conceptual diagram of operation of certain preferred embodiments of the invention.
Figure 2. - Design perspective view of a representative embodiment of a transmitter.
Figure 3 – Design perspective view in cutaway of a representative receiver module.
Figure 4 - Flowchart depicting the operation of a representative embodiment of the invention
Figure 5 - Schematic view of the invention
SAFETY SYSTEM FOR POWERED RIDE-ON TOY VEHICLES

RELATED APPLICATION

[0001] This application claims the benefit of and priority to U.S. provisional patent application Ser. No. 60/552,238, filed 11 Mar. 2004, which application is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] Recent advances in technologies and manufacturing in the market of powered ride-ons (battery powered rideable electric toy vehicles) for children, as well as increased consumer disposable income, have created a marked and continuing increase in the number and presence of these toy vehicles. Although powered ride-ons bring great pleasure to the children who ride them and to the parents who purchase and own them, they do present safety challenges to their owners that cannot be met by the product as it is packaged and sold to the consumer today.

[0003] The principal challenge the powered ride-on vehicle presents is the inability of the supervising adult or guardian (i.e., the “observer”) to get the child to stop the vehicle on command or in the event of an impending problem. This is usually attributable to one or more of 3 factors: (1) the child cannot hear, see, or understand the command being given by the observer, (2) the child is not capable of stopping the vehicle, or (3) the child simply refuses to obey the command of the observer to stop the vehicle.

[0004] Among the other challenges the powered ride-on vehicle presents is that of stopping the vehicle in order to avoid collisions with such things as: another ride-on or other toy vehicle, a bystander (e.g., an infant, child, or adult), an immovable object (e.g., a street curb, a tree, a wall, a parked vehicle, etc.), or most dangerous of all, a moving automobile. As an observer should always be present when the child is operating the ride-on vehicle (as the manufacturers recommend), the task of essential and constant vigilance naturally falls to the observer. In addition, many times the observer is the one who must take immediate, critical action to avoid compromising the safety of the child operating the powered ride-on, as in the situations mentioned above. To do so, at present the observer typically does his/her best to physically restrain the powered ride-on vehicle at the time s/he realizes that a potentially dangerous or other undesirable situation is developing. Of course, in many cases with the current generation of powered ride-ons it is not possible for the observer to take corrective or preventative action in time, due to such factors as the toy being operated too far from the observer, the speed at which the powered ride-on may be traveling, or the observer being otherwise unable to physically restrain the toy vehicle in time to avoid the undesired outcome. The invention addresses these shortcomings and makes the experience of having and using a powered ride-on vehicle much safer and enjoyable for both children and adults.

SUMMARY OF THE INVENTION

[0005] The object of the invention is to provide a remote safety system for disabling the drive mechanism of a powered ride-on vehicle. Using this system takes the ultimate control of a powered ride-on vehicle from the vehicle operator (usually a child) and puts it into the hands of the supervising observer. Doing so ensures a higher degree of safe operation and thereby decreases the probability of damage and/or injury to the powered ride-on operator and/or other people or objects.

[0006] Thus, one aspect of the invention concerns systems that enable the remote disablement of the drive mechanism of an electrically powered ride-on toy vehicle. Such systems comprise a vehicle-mounted receiver module that comprises a receiver capable of receiving a control signal and a relay disposed in the electrical circuit between the vehicle’s energy source, typically a battery (or group of batteries), and its drive mechanism, typically one or more electric motors. Depending on the system’s configuration, the control signal either causes the relay to close, making it possible to energize the drive mechanism upon an appropriate input from the vehicle operator, or, alternatively, to open, thereby interrupting the delivery of electrical energy to the drive mechanism regardless of the input provided by the vehicle operator.

[0007] In preferred embodiments, an observer-operated transmitter transmits the control signal. The control signal can be any suitable signal, including electromagnetic waves and sound waves. Especially preferred are low power radio frequency (RF) signals. To avoid confusion between different transmitters, the control signal of one transmitter is preferably encoded or otherwise distinguished from the control signals of other transmitters so that its matched receiver can distinguish it. Distinction between control signals can be achieved in any suitable way. Representative examples include using transmitters that each emit control signals that are uniquely encoded. Alternatively, a transmitter can be programmed to transmit a control signal of one of a plurality of different control signals. For example, a transmitter may have the capacity to transmit any one of 1028 different control signals, each of a different radio frequency. The particular frequency to be transmitted can be fixed, or it can be adjusted in the field. In any event, the control signal transmitted by the transmitter will be capable of being received and, if encoded, decoded, by the receiver of the receiver module. The transmitter can be of any size and shape, although hand-held transmitters similar in size and shape and “keyless remote entry” transmitters used in the automotive industry are currently preferred.

[0008] In other embodiments, the control signal is transmitted constantly or intermittently by a device programmed to emit control signals, such as radio waves, sound waves, or particularly, low-strength magnetic fields, without the requirement for an observer. For example, a control signal comprised of a low-strength magnetic field may be emitted by a conductor (e.g., a wire or wire bundle) buried to a shallow depth around the perimeter of a parcel of land. When a powered ride-on vehicle carrying a receiver programmed to receive the control signal receives the appropriate signal, the relay of the receiver module is actuated to interrupt the energy supply to the drive mechanism, thereby automatically bringing the vehicle to a stop.

[0009] A closely related aspect of the invention concerns kits for retrofitting powered ride-on toy vehicles already in the field with a receiver module according to the invention. When used in conjunction with a transmitter paired to work
with the particular receiver module, the resulting system enhances the safe operation of the powered ride-on vehicle on which the system is installed. Such retrofit kits are installed by inserting the receiver module in the vehicle’s power circuit.

[0010] Another aspect of the invention concerns methods of controlling the operation of a powered ride-on toy vehicle equipped with a safety system according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] This patent application contains at least one figure executed in color. Copies of this patent application with color drawing(s) will be provided upon request and payment of the necessary fee.

[0012] FIGS. 1-5 illustrate certain representative embodiments of the invention. These and other aspects and embodiments of the present invention will become evident upon reference to the Detailed Description and the drawings that represent certain preferred embodiments of the invention, which can be summarized as follows:

[0013] FIG. 1 is a perspective view showing the preferred use of the invention.

[0014] FIG. 2 is a design perspective view of the transmitter.

[0015] FIG. 3 is a design perspective view of the receiver component of the invention with a cutaway depicting the major subcomponents.

[0016] FIG. 4 is a flowchart depicting the operation of the invention.

[0017] FIG. 5 is schematic view of the invention.

[0018] As those in the art will appreciate, the embodiments represented in the drawings are representative only and do not depict the actual scope of the invention. For example, the various components of an electroplate according to the invention may be arranged differently or include additional and/or different components.

DETAILED DESCRIPTION

[0019] Before the present invention is described in detail, it is understood that the invention is not limited to the particular circuits, configurations, and methodology described, as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the invention defined by the appended claims.

[0020] The systems of the invention comprise a transmitter device and a receiver module operatively disposed in the electrical system of an electrically powered ride-on vehicle (i.e., in electrical communication with the vehicle’s power supply and motor(s)) such that the flow of electrical current between the vehicle’s power supply and its drive mechanism can be interrupted, for example, by an observer. In preferred embodiments, the system operates via a small radio frequency transmitter carried by an observer supervising the child operating the ride-on toy. In some of these embodiments, the transmitter is similar in size and construction to an automobile remote “keyless entry” device (or keyfob), but ideally it has only one large “panic” style button for actuating transmission of a control signal. Such a transmitter can be carried in the observer’s hand or can be optionally worn on a chain around the neck like a pendant. As will be appreciated, the transmitter provides the observer ultimate control over the operation of the motor(s) of the powered ride-on toy. The transmitter is used in the event that the observer deems the ride-on toy must be stopped and the child cannot or will not stop it himself. In such a situation, the observer presses the button on the transmitter. As a result, the transmitter emits a control signal. The receiver in the receiver module mounted on the toy receives the control signal and actuates the relay to interrupt the supply of electric current to the toy’s drive mechanism, thereby causing the powered ride-on toy to stop. In preferred embodiments, the child is unable to again operate the vehicle until the observer presses the button on the transmitter again. Alternatively, the transmitter has a second button, the depression of which activates the transmitter to send a second control signal to the receiver to close the relay and thus restore to the toy operator the ability to control the delivery of electrical energy to the toy’s drive mechanism.

[0021] In preferred embodiments, the receiver module is completely contained inside the powered ride-on toy and essentially out of view, and it can be activated only when a valid, uniquely encoded control signal (e.g., a radio signal) is received by it from the transmitter. The uniquely encoded control signal is received from the transmitter when the button on the transmitter is pressed. The received control signal is decoded and matched to the code of the receiver module. If the code matches, the receiver module then energizes a relay switch in the module to switch or toggle the circuit that controls the activation state of the motor(s) on the ride-on vehicle. The toggle operation of the switch allows the receiver module to disable the ride-on vehicle (by interrupting the supply of electrical energy from the power supply to the drive mechanism), and, upon receipt of a second control signal, to subsequently re-enable the vehicle’s operation at the command of the observer solely through the use of the transmitter. When the ride-on vehicle is enabled (the normal state of operation), the control(s) which operate the motor(s), such as pedals, operate normally. When the ride-on vehicle is disabled, the control(s) that operate the motor(s) under normal conditions are non-functional.

[0022] The following descriptions are based on the drawings included herewith.

[0023] FIG. 1 is a bird’s eye view conceptual diagram of how certain preferred embodiments of the invention are intended to be used and operate. As shown in the drawing, the powered ride-on vehicle (1b) includes a receiver module (1c) that is capable of interrupting the supply of electrical energy from one or more batteries (not shown) and the drive mechanism (not shown). The observer (1a) holds the transmitter (1b) in his/her hand or wears it around his/her neck as a pendant. The receiver module (1e) is contained in the powered ride-on vehicle (1d) and is essentially out of sight. The receiver module (1e) constantly monitors for transmissions. The child operates the powered ride-on vehicle (1d) normally. When the observer (1a) recognizes a situation that requires intervention, s/he simply presses a button on the transmitter (1b). The transmitter (1b) transmits, via radio frequency, a control signal (c), which signal may be optionally encoded so as to be matched with the particular receiver in the receiver module (1e). The control signal is then
received by the receiver module (1c). If the control signal is encoded, the receiver module decodes it, and upon successfully matching the security code, energizes the relay switch (not shown) of the receiver module (1e) to disable the motor(s) of the powered-ride-on vehicle by interrupting the flow of electric current between the batteries and motor(s).

**FIG. 2** is the design perspective of a transmitter component used in certain embodiments of the invention. Here, the transmitter (2) is similar in design and operation to a keyless entry system for automobiles, although any suitable configuration can be used. Other configurations include housing the transmitter and associated components in a housing designed to be worn on the wrist in a fashion analogous to a wristwatch or around the neck in a pendant style configuration using the pendant ring (2b) to connect a chain or such to. In FIG. 2, the simple, effective, transmitter illustrated comprises a housing that encloses the single, panic style “transmit” button (2a), the depression of which causes the transmitter enclosed in the housing to transmit a control signal. In currently preferred embodiments, the button can be large and conforms to the human thumb, thereby making it easier to locate, hold, and press without looking at the transmitter itself. Such an ergonomic design makes the sense as the transmitter may be employed in a moment of panic or duress, depending on the situation facing the observer at the time. Other simple, yet effective features may also be incorporated into the transmitter to provide immediate, visual feedback to the observer. These visual feedback features are not essential to the invention, but can further enhance its use and function. As shown in the drawing, the transmitter device also includes a low battery level indicator (2c) and a control signal transmission indicator (2d). The low battery indicator (2c) preferably an LED that lights and stays lit when the battery in the transmitter falls below an acceptable, preprogrammed level. The LED can be a color that calls the observer’s attention, such as red. In the embodiment shown, the transmit indicator LED (2d) will momentarily light each time the transmit button (2a) is pressed and a signal is transmitted. Although the transmitter can be operated without looking at the device, the transmit indicator LED provides visual reinforcement that the transmitter is operating correctly, thus giving the observer a higher degree of confidence that safety will be assured.

**FIG. 3** illustrates a design perspective view of a currently preferred embodiment of the receiver module (3a) of the invention, showing its potential location within the powered-ride-on vehicle (3), and showing a cutaway depicting the major subcomponents of the receiver module. In this embodiment, the receiver module (3a) comprises a receiver circuit module (3b), a relay switch (3c), connectors for power supply with ground (3d), and relay pole connectors (3e) which activate or deactivate the motor(s) of the powered ride-on vehicle (3). The receiver module (3a) is self-contained and is a printed circuit board (PCB) housing the subcomponents thereon. In this embodiment, the module is sealed and completely enclosed and mounted inside the powered-ride-on vehicle (3). Here, the receiver module (3a) uses the power supply of the ride-on vehicle (3) (although this is not essential, as the receiver module may be independently powered, if desired). In this embodiment the receiver module (3a) is connected directly to the receiver component’s connector for power supply and ground (3d). The receiver module (3a) is connected into and becomes part of the electrical circuit of the powered ride-on (3) with the purpose and function of controlling electrical current flow to the motor(s) of the powered ride-on (3) from the power supply for the drive mechanism. The receiver circuit module (3b) preferably includes the antenna for receiving control signals, and may optionally include, for example, other circuitry required to properly receive uniquely encoded radio frequency control signals from the transmitter, decode the received control signals, validate the control signals with its own unique security code, and energize the relay switch (3c). The relay switch (3c) is energized by the receiver circuit module (3b), which causes the current activation state of the motor(s) of the ride-on vehicle (3) to be toggled via the relay pole connectors (3e). Each time the relay switch (3c) is energized, a different relay pole connector (3e) is energized, and the motor activation state is changed. For example, pressing the transmitter button and energizing the relay switch (3c) for the first time disables the motor(s) of the ride-on vehicle (3). Pressing the button the second time and energizing the relay switch (3c) enables the motor(s) of the ride-on vehicle (3). The third time disables, the next time enables, and so on.

**FIG. 4** is a flowchart that summarizes the operation of certain embodiments of the invention. Reading the flowchart from top to bottom and left to right the operation is as follows:

1. The button on the transmitter is pressed (4a) causing a control signal that includes a predetermined security code to be encoded (4b) and then transmitted (4c). While transmitting the signal (4c), the Transmitt LED is momentarily energized (4d). The battery is then tested for low voltage (4e). If the voltage is below a predetermined level, the low battery LED is energized (4f) (and may, for example, stay constantly or intermittently energized until the battery is changed). Then the flow proceeds to the receiver component process (4g).

2. The receiver module receives signals of an incoming control signal transmission (4h) and then decodes the signal (4i) to extract the security code. After extracting the security code, it is compared to a predetermined security code (4j) stored onboard the receiver module circuitry. If the codes do not match, the receiver continues to receive incoming transmissions and the energy supply to the vehicle’s drive mechanism is not interrupted. If the codes do match, the relay switch is energized (4k). If the motor(s) are enabled at the time the switch is energized, the motor(s) are then disabled (4l). If the motor(s) are disabled at the time the switch is energized, the motor(s) are then enabled (4m). The receiver then continues (4p) to receive incoming transmissions.

**FIG. 5** is schematic view of the invention, which details the major elements of the receiver component and the relationship to the electrical circuit of the powered ride-on vehicle. The electrical circuit of the powered ride-on as depicted in this schematic is not definitive for all powered ride-on vehicles, but rather is a generalization showing the components of the circuit affected by the invention and is based on the prototype developed by the inventor.

**FIG. 6** The receiver component in the schematic is comprised of a receiver circuit (5b) and a relay switch (5c). The relay switch is energized whenever the receiver circuit (5b) receives a signal transmitted to it by the transmitter (5a),
decodes the security code and matches it with a predetermined security code. Once energized, the relay switch (5c) acts as a toggle switch causing the electrical circuit to the motor(s) (5d) of the powered ride-on vehicle to either open or close. When the circuit is opened, the motor(s) (5d) are disabled and the child cannot operate the vehicle. When the circuit is closed, the motor(s) (5d) are re-enabled and the child can operate the ride-on vehicle normally. The receiver component uses the battery of the powered ride on vehicle (5e) for electrical current.

[0031] The specific embodiments of the invention described in this specification are representative of preferred embodiments and are exemplary and not intended as limitations on the scope of the invention. Other objects, aspects, and embodiments will occur to those skilled in the art upon consideration of this specification and are encompassed within the spirit of the invention as defined by the scope of the claims. It will be readily apparent to one skilled in the art that varying substitutions and modifications may be made to the invention disclosed herein without departing from the scope and spirit of the invention. The invention illustratively described herein suitably may be practiced in the absence of any element or elements, or limitation or limitations, which is not specifically disclosed herein as essential. Also, the terms “comprising”, “including”, “containing”, etc. are to be read expansively and without limitation. It must be noted that as used herein and in the appended claims, the singular forms “a”, “an”, and “the” include plural reference unless the context clearly dictates otherwise. The invention has been described broadly and generically herein. Each of the narrower species and subgeneric groupings falling within the generic disclosure also form part of the invention. This includes the generic description of the invention with a proviso or negative limitation removing any subject matter from the genus, regardless of whether or not the excised material is specifically recited herein.

[0032] Notwithstanding the foregoing, the following describes several non-limiting alternative embodiments of one or more of the components that comprise the systems of the invention:

[0033] The transmitter can use licensed or unlicensed radio frequencies for transmission.

[0034] The transmitter may use visual or other frequencies of electromagnetic radiation (such as infrared instead) of radio frequencies for transmission.

[0035] The transmitter may or may not include visual feedback features or may include more or less visual feedback features.

[0036] The transmitter can have other feedback features such as audible feedback or tactile feedback to alert the user when the transmitter has been actuated.

[0037] Although referred to as the observer herein, the user of the transmitter can be any individual possessing the transmitter.

[0038] The transmitter can be worn by the observer in implements, forms, or manners other than those mentioned herein.

[0039] The a plurality of transmitters can be used in conjunction with a single receiver component of a particular toy, with each transmitter having the capacity to render the vehicle inoperable (i.e., by shutting off it’s supply of electrical power (or, in the case of powered ride-on vehicles powered by a small internal combustion engine, by interrupting the fuel supply, or preferably, ignition impulses transmitted to the spark plug). Conversely, the receiver module can receive transmissions from more than one transmitter. This allows for multiple individuals supervising a child on a powered ride-on to control the vehicle.

[0040] The transmitter and receiver can employ other technologies, techniques, or methods for generating a unique transmission capable of preventing the unwanted activation or deactivation of a ride-on vehicle not associated with the transmitter. These technologies, techniques, or methods may or may not include the use of encoding or encryption.

[0041] The transmitter can employ other techniques or technologies for causing transmission to the receiving component (e.g., pressure, movement, sound, and the like).

[0042] The receiver component can comprise components employing other techniques or technologies for causing reception of transmission from the transmitter (e.g., pressure, movement, sound, multiple transmitters, perimeter transmitters, and the like).

[0043] The receiver component can use switches other than those of the type and class known as relay switches and reed switches to accomplish the task of activation and deactivation of the motor(s) of the powered ride-on vehicle.

[0044] The receiver component may employ one or more switches to accomplish the task of activation and deactivation of the motor(s) of the powered ride-on vehicle.

[0045] The receiver component can include feedback features such as audible or visual feedback.

[0046] Although the invention has been described with reference to the above examples, it will be understood that modifications and variations are encompassed within the spirit and scope of the invention. Accordingly, the invention is limited only by the appended claims.

[0047] The invention illustratively described herein suitably may be practiced in the absence of any element(s) not specifically disclosed herein. Thus, for example, in each instance herein any of the terms “comprising”, “consisting essentially of”, and “consisting of” may be replaced with either of the other two terms. The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention that in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by preferred embodiments and optional features, modification and variation of the concepts herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention as defined by the appended claims.

What is claimed is:

1. A system for interrupting operation of an electrically powered ride-on toy vehicle, comprising a vehicle-mounted receiver module that comprises a receiver capable of receiving a control signal and a control-signal-responsive relay
disposed in the electrical circuit between the vehicle's energy source and drive mechanism.

2. A system according to claim 1 further comprising a transmitter that transmits a control signal that can be received by the receiver and cause actuation of the control-signal-responsive relay.

3. An electrically powered ride-on toy vehicle that comprises a system according to claim 1 operatively connected between the vehicle's energy source and drive mechanism.

4. A system according to claim 3 further comprising a transmitter that transmits a control signal that can be received by the receiver and cause actuation of the control-signal-responsive relay.

5. A method of interrupting the operation of an electrically powered ride-on toy vehicle, comprising:
   a. operating an electrically powered ride-on toy vehicle according to claim 3 in an environment wherein a control signal can be received by the receiver to cause actuation of the control-signal-responsive relay;
   b. transmitting a control signal that is received by the receiver and that causes actuation of the control-signal-responsive relay to interrupt the supply of electric current between the vehicle's energy source and drive mechanism, thereby interrupting the operation of the vehicle.