

Aug. 5, 1969

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3,458,950

SOUND CONTROLLED TOYS HAVING A TIME DELAY MOTOR CIRCUIT

Filed April 3, 1968

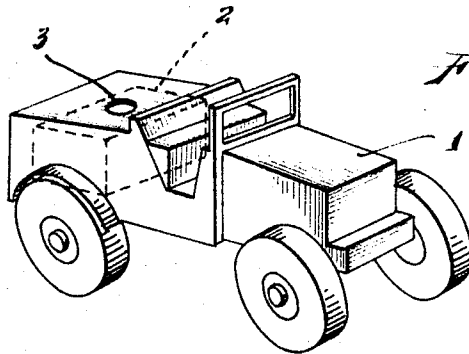


Fig. 1.

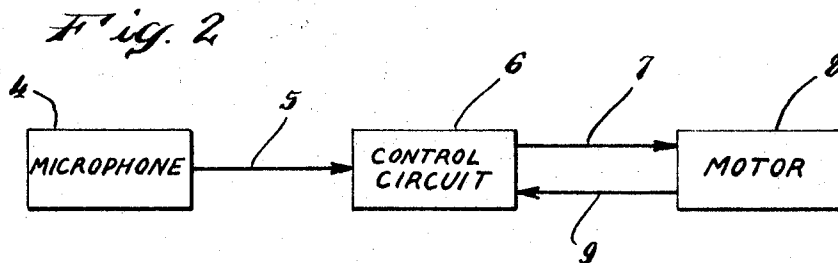


Fig. 2

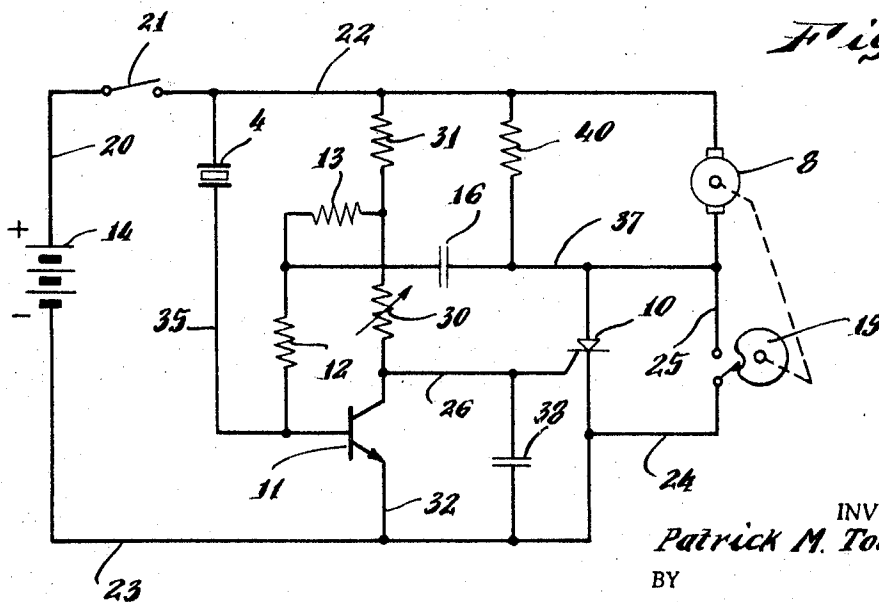


Fig. 3

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Filed Apr. 3, 1968, Ser. No. 718,409

Int. Cl. A63h 33/26

U.S. Cl. 46—243

7 Claims

ABSTRACT OF THE DISCLOSURE

Motor actuated toys are provided which are controlled by sound waves. A time-delay circuit prevents responsiveness to sound for a pre-determined period after motor action ceases. This prevents undesired, extrinsic noises, such as those caused by the stopping of the motion of the toy, from actuating the sound responsive circuit.

Background of the invention

Various toys have been made in the past which are controlled by sound waves. These devices include toy vehicles, toy animals, and the like. The sound responsive means used in them can either by a microphone, a microphone tuned to receive only a particular frequency, or a sound box responsive to only selected frequencies. The circuitry associated with the sound receiving means is adapted to control a motor and so start the operation of the toy car, if so wired, stop the operation of the toy.

These devices have sometimes had problems because the operation of the toy, or the cessation of operation of the top, has in itself created noises which would feed back into the sound receiving device and cause further, but undesired, actuation.

This is obviated by use of the present invention.

Summary of the invention

In the practice of my invention, a toy, such as a toy truck, is provided with a motor and with a control circuit for the motor. The control circuit responds to sounds which are either picked up by a microphone, a frequency responsive sound box, or some equivalent. The motor is controlled by an amplifier circuit which, in the specific instance shown here, is turned on when a sound wave is received.

The toy operates for a pre-determined period determined by the setting of a gear train with a cam actuated switch. At the end of the period, the circuit turns the motor off. The toy is not thereafter immediately responsive to sounds and further actuation of the motor because of a time delay control built into the motor control circuit. This time relay prevents response to extraneous sounds, such as the sounds of the motor stopping, for a pre-determined period, preferably of approximately one-second.

The time delay control is provided by an SCR controlled circuit with resistance-capacitor combination serving to bias the SCR to its non-conducting cut-off state for the pre-determined time period. After the expiration of the period, the SCR is then again responsive to opening of the gate circuit therein.

The drawings

As shown in the attached drawings FIG. 1 is representative of the type of motorized toys that may be controlled by my invention and shows a perspective view of a small truck.

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FIG. 2 is a block diagram showing the general nature of operation of the control circuitry of my invention.

FIG. 3 is a detailed control circuit showing one type of control circuit which may serve to operate the toy of my invention and provide the necessary time delay.

Detailed description of the invention

FIG. 1 shows a motorized toy truck 1, the motor itself not being shown. Positioned within the truck is a control box 2 which includes sound responsive means and a control circuit. Preferably there is an opening 3 in truck 1 so that sound may enter the system more easily.

The general operation of my invention is shown in FIG. 2. A sound responsive device, such as a microphone 4, receives sound waves. The device 4 may be designed to be responsive to a particular note or frequency or may respond to any noise. If it is responsive to a particular frequency, it may be controlled by the child by blowing a whistle that emits that frequency. If not responsive to a particular frequency, it may be controlled by speaking to the toy, or, for example, the clap of the hands.

Regardless, the output from the microphone is fed through lead 5 to the control circuit depicted generally by the numeral 6. Control circuit 6 will include the necessary amplification circuitry, a switch controlled by the circuitry to apply to the motor, and the time delay function. In the preferred form the time delay will serve to de-activate the control circuit for a predetermined period after the motor has stopped.

Control circuit 6 serves to close the circuit to the motor and allows it to operate. This control is indicated by line 7 leading to the motor 8. Operation of motor 8 also operates a cam switch which determines the length of time or operation of the motor and also actuates the time delay circuitry of control circuit 6, as indicated by lead 9.

Circuit details are shown in FIG. 3. In essence, FIG. 3 contains motor 8, battery 14, microphone 4, an amplification circuit represented by transistor 11, a motor control gating circuit represented by SCR 10 with associated time delay circuit formed by capacitor 16 and series resistor 12 and a cam switch 15 mechanically linked with motor 8 and in series with it.

Reviewing the circuit in more detail we find that the positive side of battery 14 is connected through lead 20 to on-off switch 21, and thence through lead 22 to one side of motor 8. The negative side of battery 14 is connected through lead 23 and series lead 24 to cam switch 15, and then through lead 25 to the other side of motor 10.

SCR 10 is in parallel with cam switch 15, the gate of SCR 10 being controlled by transistor 11 and is connected to the collector of that transistor by lead 26.

Transistor 11 receives its power from battery 14. The collector of transistor 11 is connected to variable resistor 30 and series resistor 31 to lead 22 and thence to the positive side of battery 14. The emitter transistor 11 is connected by lead 32 to lead 23 and thence to the negative side of battery 14. One side of microphone 4 is connected to the positive side of battery 14 by lead 22; the other, by lead 35 to the base of transistor 11. Thus, the output of microphone 4 is amplified through transistor 11 and the output thereof passes through lead 26 to the gate of SCR 10.

Proper biasing for transistor 11 is achieved with resistors 30 and 31, previously described, and with series resistors 12, 13 and 31 connecting the base of transistor 11

to the positive side of battery 14 by leads 20 and 22 in series with switch 21.

SCR 10, as stated above, is across cam switch 15. The cathode of SCR 10 is connected to lead 24; and the anode, to lead 25. The anode is also connected through lead 37 to the time delay control capacitor 16, in series with resistance 12, and thence to the base of transistor 11. The gate of SCR 10, in addition to being connected through lead 26 to the collector of transistor 11, is also connected to capacitor 38 and thence to the negative side of battery 11. This latter capacitor serves to prevent any "spikes" produced by the stopping of the motor from reaching the gate of SCR 10.

A pulse depressing resistance 40 is also connected in parallel with motor 8.

Cam switch 15, operatively connected to motor 8, is in the open position, opening the circuit between leads 24, and 25, when motor 8 is stopped. As soon as motor 8 is started, as will be described below, cam switch 15 closes, thus completing the circuit between the motor and battery 14, until the cam completes a rotation and the switch again opens.

To operate the toy of my invention, switch 21 is closed. This connects the positive side of battery 14 with motor 8. The negative side of battery 14 is not yet connected to the motor, however, since cam switch 15 is open and SCR 10 is non-conducting. When microphone 4 receives a sound of sufficient magnitude, this sound is amplified through transistor 11 and applied to the gate of SCR 10, causing it to conduct and so closing the circuit through SCR 10 between the negative side of battery 14 and motor 8. Motor 8 thus starts to operate and so operates the toy.

As soon as motor 8 starts to rotate, the interconnection between the motor and cam switch 15 causes switch 15 to close, by-passing SCR 10. This permits the operation of motor 8 to continue irrespective of the continued conductivity of SCR 10.

Motor 8 will continue to operate until cam switch 15 again opens. The period of operation can be set for whatever pre-determined interval is desirable.

The closing of cam switch 15, however, also serves to apply a negative voltage through leads 24 and 25 to the anode of SCR 10, making it again non-conductive. This same negative voltage is also applied to capacitor 16, giving it a negative charge.

Upon completion of the full, pre-determined cycle of operation of the toy, cam switch 15 opens. Since SCR 10 is now non-conducting, motor 8 will stop. In addition, the negative charge on capacitor 16 will be applied to the anode of SCR 10 and so hold SCR 10 non-conducting. This will be so even if additional sounds are now received by microphone 4, sounds which would ordinarily serve to open the gate of SCR 10, as described above, and cause the motor to operate.

Once switch 15 is open, however, the negative bias is removed from capacitor 16, and so the capacitor may discharge. In my preferred circuit, discharge takes place in approximately 0.9 second. Once the discharge is completed, sounds coming through microphone 4 may serve again to actuate SCR 10 and the cycle can be repeated.

If desired of course, various adjustments for time or sensitivity may be incorporated in the circuit. By way of an example, it may be seen that resistor 30 is a variable resistor allowing for adjustment of sensitivity of the unit to the magnitude of the sound received.

Thus, it can be seen that a toy has been provided which is motor-operated and controlled by sound, but in which sounds received by the microphone, or other sound responsive device cannot again turn the motor on for a short period after the motor has ceased operating. This will prevent undesired sounds, such as occurring from the cessation of operation from the motor, from feeding back into the system and again causing it to operate.

In the circuit herein described, it has been found that

satisfactory operation, with the acceptable time delay of 0.9 of a second can be achieved when the circuit parameters are as follows:

Battery 14—32
Capacitance 16—15 mf.
Resistance 12—47K
Capacitance 38—0.1 mf.

It will be readily observed that the same kind of arrangement may be used for other types of motor control without departing from the spirit of my invention. For example, it may be that it is desirable to have a sound actuated motor control that both turns the motor on and turns it off. In this instance, time delay may be desired to delay the unit from turning itself off just after it has been turned on.

What is claimed:

1. A motor-actuated toy capable of being controlled by sound waves, including

- (a) an animated toy having a motor therein;
- (b) sound responsive means associated with said toy;
- (c) a control circuit wired to control operation of said toy in response to sound waves received by said sound responsive means, said circuit including a delay circuit preventing operation of said motor for a pre-determined period after each cessation of operation of said motor, whereby unwanted sounds do not control said motor during said pre-determined delay period.

2. A toy as set forth in claim 1 in which said sound responsive means is a sound box with a resonant frequency.

3. A toy as set forth in claim 1 in which said delay circuit includes an SCR and an R-C circuit, said R-C circuit biasing said SCR to cut-off during said pre-determined delay period.

4. A toy as set forth in claim 3 including a switch operated by said motor, said switch by-passing said SCR during operation of said motor and inter-connecting said RC circuit, whereby said R-C circuit may be biased to said SCR cut-off voltage.

5. A motor-actuated toy adapted to be controlled by sound waves other than those created by actions of the toy itself, said toy including

- (a) a motor and power supply therefor;
- (b) a normally open switch operated by said motor;
- (c) an SCR in series with said motor and said power supply and in parallel with said switch;
- (d) sound-responsive means adapted to trigger the gate of said SCR and thereby connect said power supply and said motor; and
- (e) means to bias said SCR to cut-off during operation of said motor, said means maintaining said bias for a pre-determined period after said motor stops operation.

6. A motor-actuated toy adapted to be controlled by sound waves other than those created by actions of the toy itself, said toy including:

- (a) a motor and power supply therefor, said motor being operatively associated with said toy to actuate same,
- (b) a control circuit for said motor,
- (c) sound responsive means operatively associated with said control circuit to actuate same upon receipt of a sound wave,
- (d) means associated with said control circuit for maintaining the operation of said motor for a predetermined period of time after action, and
- (e) a delay circuit associated with said control circuit to prevent operation of said motor for a second pre-determined period after the cessation of operation of said motor at the end of said first predetermined period whereby unwanted sounds do not actuate said control circuit to turn on said motor during said second predetermined delay period.

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7. A motor-actuated toy as set forth in claim 6 in which said delay circuit prevents actuation of said motor controlled circuit upon the receipt of sound by biasing said control circuit to a non-responsive state.

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