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3,559,336

TOY HAVING CAPACITANCE SWITCH

Filed Sept. 16, 1968

2 Sheets-Sheet 1

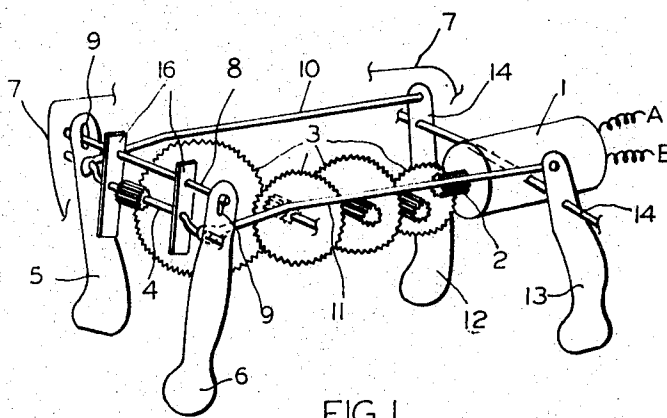


FIG. 1

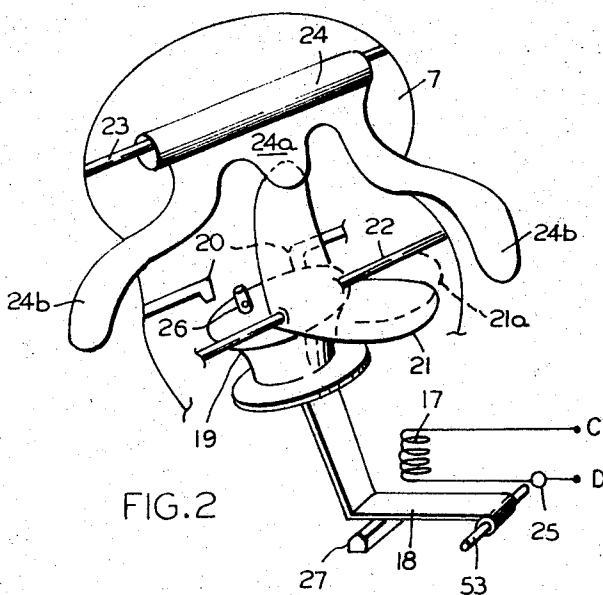


FIG. 2

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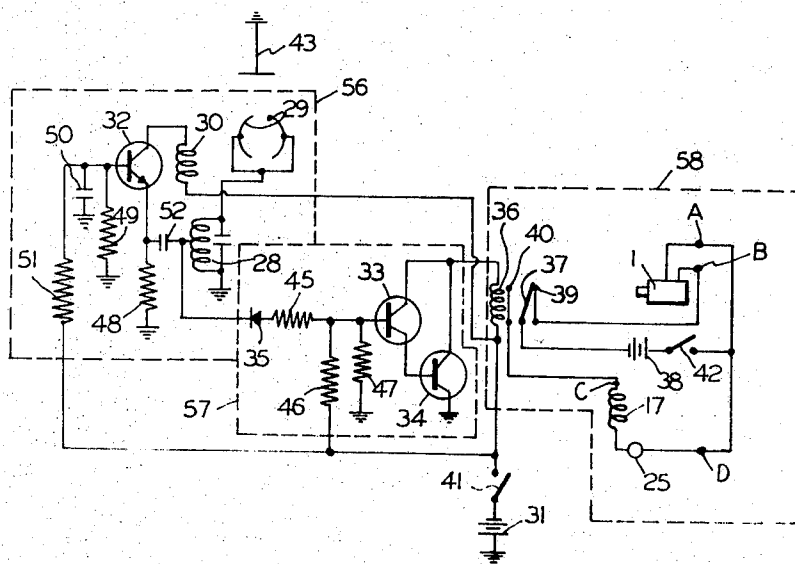


FIG. 3

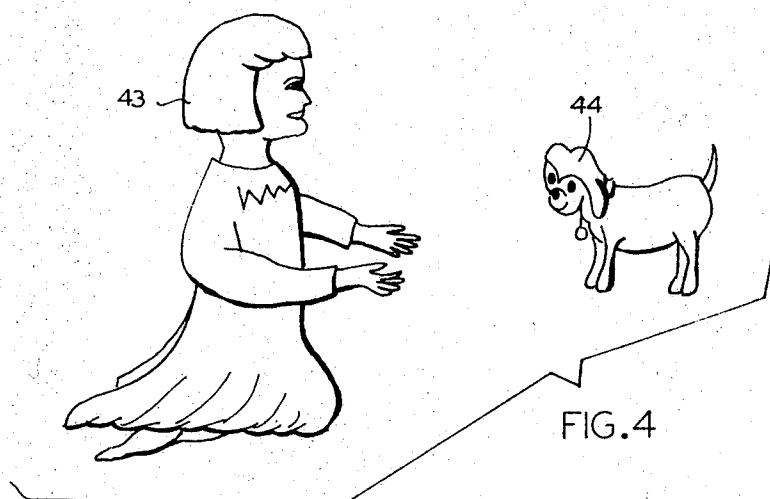


FIG. 4

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TOY HAVING CAPACITANCE SWITCH

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1 Claim

ABSTRACT OF THE DISCLOSURE

A self-propelled motorized toy whose movement is controlled by the distance between it and another object, such as a human operator. A transistor oscillator, resonant tank circuit, capacitive device whose capacitance is determined by the distance between it and the object connected to the resonant tank circuit, and a transistorized amplifier are connected together in such a manner that the increase or decrease in capacitance of the capacitive device causes a decrease or increase in the input signal applied to the amplifier. The amplifier is connected to a relay switch which in a first state directs current from a power source to a motor which operates to move the toy, and in a second state, directs current to other means which operate other movements of other parts of the toy, such as flaps and whistles.

This invention relates to motorized toys which are controlled by a capacitive device whose capacitance is determined by the distance between it and another object.

In order for toys to be commercially successful, they should have certain characteristics. For example, they should arouse the curiosity of the operator. They should have motion. And they should be simple to operate.

An object of this invention is to build a toy which is controlled by the relative position of the operator to produce movement toward or away from the operator and to produce other motion of parts of the toy, thus attaining a more amusing toy and increasing its commercial value.

The foregoing and other objects of this invention are attained in an illustrative embodiment thereof, which comprises a toy animal having movable legs operated by an electric motor and various shafts and gears, and also having other movable parts such as movable ears, tongue and means for producing noise. Contained within the toy are a transistor oscillator connected to a resonant tank circuit, a transistorized amplifier, a capacitive device whose capacitance is determined by the distance between the toy and the operator, switch means, battery, motor means and various shafts and gears for driving the legs.

When the toy is initially started, the switch means causes the motor means to be energized thereby causing the shafts and gears to move the legs. The toy is moved until it comes within a certain distance of the operator. This decreases the capacitance of the capacitive device. The impedance of the resonant tank circuit is increased and a signal is supplied to the transistorized amplifier of a magnitude sufficient to turn it on. The amplifier produces sufficient current to operate the switch means, which in turn, disconnects the battery from the motor, and hence causes the legs to stop moving. Concurrently, the battery is switched by another switch means to intermittently supply current to a relay which operates a lever, which lever in turn operates to expand and contract

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a bellows. The bellows is placed within the animal in a position such as to move a series of levers to move parts of the toy, such as ears and tongue of an animal. Also, a whistle is placed in the bellows such that expansion and contraction thereof will cause an intermittent noise.

A feature of this invention is the use of a capacitive device which has its capacitance determined by the distance between it and another object, to control the movement of a motorized toy and to control motions of parts of the toy.

These and other objects and features of this invention will become more evident from a consideration of the following detailed description and drawing, in which:

FIG. 1 depicts the motive mechanism for moving the legs of an illustrative embodiment of this invention;

FIG. 2 depicts the mechanism for moving various parts of the illustrative embodiment;

FIG. 3 depicts a schematic diagram of the control circuit of the illustrative embodiment; and

FIG. 4 depicts, pictorially, an illustrative toy animal in conjunction with a human operator.

Turning now to FIGS. 1 and 4, the movable toy animal 44 may be operated by a child 43 in a manner to be described hereinafter in greater detail. The legs 5, 6, 12, 13 of the toy animal 44, which may be a dog, are operated by the mechanism depicted in FIG. 1.

The motor 1 of FIG. 1, is energized through terminal leads A and B, and drives a rotatable shaft 4 via a series of gears 3 and shaft 2. The legs 5, 6, 12, 13 are movably connected to frame 7 by rods 8 and 14. Frame 7 is disposed inside of the toy animal 44. The rods 8 and 14 may be a single bearing shaft attached to the frame for each leg. The gears 3 are also movably disposed on the frame by shafts. The shaft 4 is crank shaped at both ends to produce offset reciprocating motion to the front legs 5, 6. The shaft 4 is also connected near the ends of the forward legs 5, 6 at a predetermined distance from the nonsurface contacting ends thereof. The ends also have holes 9 therein through which rod 8 is disposed. This arrangement enables the legs 5, 6 to be moved in a back-forth motion. The shaft 4 is held axially in a stationary position by plates 16 which are connected to the rod 8. Connected to each of the crank ends of shaft 4 is an offset shaft 10, 11. The other ends of the shafts 10, 11 are connected movably to the nonsurface contacting ends of rear legs 12, 13. The crank shape of the shaft 4 produces a reciprocating motion of the shafts 10, 11 thereby producing a back-forth motion of the legs 12, 13.

With the described motive mechanism, operation of the motor 1 causes rotation of gears 3, and rotation of shaft 4, and the reciprocating movement of the shafts 10, 11 and the consequent sequential back-forth movement of legs 5, 6, 12, 13.

In FIG. 2, there is shown a representation of a head of a toy animal, such as the dog 44 of FIG. 4. Connected movably to the head 7, by a shaft 23, is a single piece 24, having a tab portion 24A located inside the head, and a pair of ear portions 24B located outside of the head. Also located within the head 7 is an L-shaped tongue piece 21 held by rod 22 directly above the bellows 19. The tongue piece may be rotated about the rod 22 as the bellows expands and contracts. The expansion of the bellows 19 is limited by stops 20. When the bellows 19 expands, the upper part of the L-shaped

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piece 21 is moved forward to move tab portion 24A, and thus cause the ear portions 24B to move. At the same time the lower part of the L-shaped tongue piece is lowered from the position depicted by the dotted lines 21A to the depicted position. When the foregoing is done intermittently, the ears 24B will flap repeatedly, and the tongue 21 will move repeatedly.

Located on bellows 19 is a whistle 26, which is of a type that will make noise when air is being forced from the bellows. When the bellows is repeatedly expanded and contracted, noise will be emitted from the whistle. The bellows 19 is operated by an L-shaped trip lever 18, which is depicted resting on a pentagonal shaped rest stop 27, and which is rotatable about rod 53. The trip lever 18 is operated by solenoid 17 which may be energized through terminals C and D. Switch 25, which is of a type that will periodically open and close, is located between terminal D and the solenoid 17. The periodic opening and closing of switch 25 will cause trip lever 18 to expand and contract the bellows 19 periodically. This, as just discussed, causes the ears 24B and tongue 21 to move repeatedly, and also causes the whistle 26 to emit sounds.

The motor 1 and solenoid 17 are controlled by the control circuit depicted in FIG. 3, which circuit may be contained within the toy 44. The circuit comprises three portions, an oscillator portion 56, an amplifier portion 57, and a switching portion 58.

The oscillator portion 56 comprises an oscillator transistor 32, inductor 30, capacitor 50, and bias resistors 49 and 51, and output resistor 48. Battery 31 supplies bias voltage to all of the transistors when switch 41 is closed. Connected to the transistor 32 via a capacitor 52 is a resonant tank circuit 28 comprising a divided inductor and a capacitor and a variable capacitive device 29, having one plate located within the toy and another plate which may be formed of another object such as a human operator 43. The plate 43 is grounded. The capacitive device may be of a known type such as one having an aluminum plate as one electrode thereof.

When switch 41 is closed, the transistor oscillator is energized by battery 31 and is operated at a selected frequency. When the capacitance of capacitor 29 is decreased, due to the increase in distance between the toy containing the device 29 and the operator, which acts as plate 43, a high impedance is established at the coil side of capacitor 52. This causes an increase in voltage applied to the amplifier transistor 33 via diode 35. The oscillator assists in making the circuit more sensitive to changes in the capacitance of device 29.

The amplifier portion 57 comprises two series connected transistors 33, 34, bias resistor 47, and input resistors 45, 46. The increased voltage resulting from decreased capacitance of device 29, is applied to the transistors 33, 34, amplified thereby, and applied to coil 36 to cause its energization.

Before the coil 36 is energized, armature 37 is closed against contact 39. Thus, at the start of the operation, when switch 42 is closed and when there is no current in coil 36, battery 38 supplies current via the closed contacts 37 and 39, and terminal B to motor 1, and the current is returned via terminal A and closed switch 42 to the battery 38. When coil 36 is energized, the electrical connection between armature 37 and contact 39 is broken, and an electrical connection is established between armature 37 and contact 40.

In this latter condition, with switch 42 closed, battery 38 will supply current to coil 17 (of FIG. 2), via closed contacts 37, 40 and terminal C; and the current will return to battery 38 through intermittently operated switch 25, terminal D and closed switch 42. This will cause movement of the ears 24B, tongue 21, and emission of sound from whistle 26 in the manner described above.

The operation of this toy is simple enough for a child to learn and execute. Switches 41 and 42, which are posi-

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tioned on the toy 44 of FIG. 4 are first closed, and the toy 44 is set at a distance from the child 43. The motor will operate immediately and cause the legs 5, 6, 12, 13 to move as described above and the toy 44 will move toward or away from the operator 43 depending on the direction that it is headed. The transistor oscillator 56 is caused to operate. As the toy 44 comes close to the child 43, the value of the capacitance between plate 29 and the grounded plate 43, which is the child, decreases, causing the resonant tank circuit 28 to place a high impedance on the coil side of capacitor 52. This causes higher voltage to be placed on the input of the amplifier transistors 33, 34, and to cause energization of coil 36. This causes electrical connection between armature 37 and contact 39 to be broken and an electrical connection to be established between armature 37 and contact 40. This causes motor 1 to stop, and concurrently causes coil 17 to be energized thus causing the ears 24B (of FIG. 2) and tongue 21 to move, and the whistle 26 to make noises, in the manner described above.

If the child operator 43 should move away from the toy, the capacitance of the device 29 will increase and cause a decrease in the impedance of the resonant tank circuit 28, thereby decreasing the signal supplied to the transistor amplifier 57. This causes current to be removed from the coil 36, thereby causing armature 37 to break electrical connection with contact 40, and to establish contact with contact 39. Current is removed from solenoid 17, and supplied instead to motor 1, thus causing legs 5, 6, 12, 13 to move as described. The toy will thus again move toward the operator until the distance between the toy and the operator is such as to make the capacitance of device 29 of a value sufficient to make amplifier 57 operate and the foregoing steps to be repeated.

The grounded conductor or plate 43, although described in terms of a human operator, such as a child, may also be any other type of grounded conductor, such as a radiator. Also, with slight modifications evident to workers in the art, the circuit may be changed to cause the reverse of the foregoing operations, that is, to make the toy to move away from the operator until a certain distance is reached between the toy and the operator, whereupon, the ears, tongue, and whistle are caused to operate.

It is to be understood that the foregoing is only illustrative of the principles of this invention and that numerous modifications and additions may be made by one skilled in the art without departing from the spirit and scope of this invention.

What is claimed is:

1. A motorized toy controlled by the distance between said toy and another object, comprising
 - capacitive device having the capacitance thereof determined by the distance between said toy and said object,
 - electrical energy source means,
 - motor means for moving said toy, and
 - electrical switch means responsive to said capacitance of said capacitive device for connecting said electrical energy source means to said motor means thereby to cause said motor means to move and to stop said toy, said electrical switch means comprising a transistorized amplifier, a transistor oscillator, a resonant tank circuit, means for connecting said resonant tank circuit to said capacitive device whereby decrease of said capacitance upon said toy being a selected distance from said object causes said resonant tank circuit to place a signal on said transistorized amplifier sufficient to cause operation of said transistorized amplifier, first relay means responsive to signals from said transistorized amplifier for switching said electrical energy source means to energize said motor means, and whereby increase of said capacitance upon increase of the distance between

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said toy and said object causes decrease of said signal on said transistorized amplifier to cause de-energization of said first relay means, and said motorized means comprises at least two moveable legs having a common axis, an electrical motor and shaft means driven by said electrical motor for moving said legs about said axis, said distance between said toy and said object being travelled by said at least two moveable legs.

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