TOY SATELLITE WITH RADIO SIGNAL GENERATING MEANS

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This invention relates to toys and more particularly to an educational toy satellite.

Real satellites are provided with transmitters for transmitting signals back to earth carrying various information. It is an object of this invention to provide a toy satellite having radio transmitter means for sending out a signal which can be detected by a conventional home or car radio.

While many toys provide little or no educational value, the toy of this invention provides means whereby radio transmission phenomena can be studied and observed. It is another object of this invention to provide a toy satellite having an educational value as well as an intrinsic value as a toy.

While many toys provide little or no educational value, the toy satellite of this invention has an educational feature in that it is simple in construction and can be provided in an educational "do-it-yourself kit" form. Therefore, it is another object of this invention to provide a toy satellite having a transmitter therein which is of a simple construction and readily adaptable to a "do-it-yourself kit" form.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description and the appended claims, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a pictorial view of the toy satellite in an assembled condition;

FIGURE 2 is a top elevational view of the toy satellite in which the upper shell member has been removed and in which some of the electrical components have been shown pictorially; and

FIGURE 3 is a schematic diagram of an oscillator circuit utilized in the toy satellite shown in FIGURES 1 and 2.

In general, the toy satellite comprises an outer shell assembly 10 having disposed therein and extending radially therefrom a plurality of antennas 12a, 12b, 12c, and 12d which are in turn secured to a mounting board 14 which is attached an oscillator circuit 16. Looking now to FIGURE 1, the outer shell assembly 10 comprises upper and lower hemispherically shaped shell members 18 and 20, respectively, having interfitting or overlapping portions 22 and 24, respectively, matably retained together by a press or interference fit. The upper shell member 18 has a centrally disposed aperture 25 extending therethrough for purposes to be described. The interfitting portions 22 and 24 each are provided with a plurality of notches 26 and 28, respectively, which, upon assembly of the shell members 18 and 20, define apertures extending into the outer shell assembly 10. While the shell assembly 10 is shown to be spherical in form, any substantially enclosed housing of any shape, approximating the shape of a satellite, nose cone, etc., could be utilized. Note that, while the shell assembly 10 can be made of any suitable material, in the preferred embodiment it is made of aluminum or some other metal which is a conductor of electricity for a purpose to be described.

The plurality of antennas 12a-12d are insulated from the upper and lower shell members 18 and 20 in the region of the notches 26 and 28 by means of tubular insulting members 30.

Looking now to FIGURE 2, the plurality of antennas 12a-12d are each secured to one corner of the mounting board 14 and hence maintain the mounting board 14 suspended within the interior of the shell assembly 10. The mounting board 14 is made of an insulating material, such as "Bakelite" in order that electrical components can be mounted thereupon. While the four antennas 12a-12d are shown, only two are utilized for the transmission of the electrical signals and in the preferred embodiment adjacent antennas 12a and 12b are selected for a purpose to be described.

Disposed upon the antenna 12a is a spring switch member 32 which serves a purpose to be described.

Looking now to FIGURES 2 and 3, the oscillator circuit 16 is disposed upon the mounting board 14 and comprises a transistor T of a p-n-p type having a base 34, an emitter 36 and a collector 38. The collector 38 is electrically connected to the base 34 via a biasing resistor R and is also serially connected to the negative side of a battery B which has its positive side grounded. The base 34 is serially connected to a capacitor C and thence to a coil L and to ground via switch 32. The coil L has connected thereto a tap 40 which divides the coil L into coil portions L1 and L2. The emitter 36 is connected to the tap 40 of the coil L. The battery B is grounded to the shell assembly 10 via a spring clip 35. The antennas 12a and 12b are connected to opposite ends of the coil L and are, of course, insulated from the shell assembly 10 by virtue of the insulting members 30. The switch 32 is a spring-like member which is slidably disposed upon the antenna 12a in electrical contact therewith; the switch 32 can be either moved into stationary contact with the shell assembly 10 or can be located proximate the shell assembly 10 and moved into contact intermittently with the shell assembly 10 by hand. In either situation, engagement of the switch 32 with the shell assembly 10 completes the circuit to the battery B and energizes the oscillator circuit 16.

Upon closing the switch 32, a small amount of current is caused to flow between the collector 38 and the base 34 and hence to the tank circuit comprising the coil portion L1 of the coil L and the capacitor C. This causes oscillations to occur, resulting in an amplified oscillating current flowing in the collector-emitter circuit and thence through the other coil portion L2 of the coil L. Since the portions of the coil L1 and L2 are wound on the same form and are thus inductively coupled, an auto-transformer action causes the voltage drop across the coil portion L2 to induce or feedback a voltage in the coil portion L1, hence causing a regenerative effect whereby the amplitude is increased. This regenerative effect continues until the oscillator circuit 16 reaches a point of saturation. Since in the preferred embodiment the output signal is to be picked up by a conventional AM receiver, the output signal should has a radio carrier component and an audio component. In the circuit of FIGURE 3, the initial buildup of current flowing through the transistor induces a positive voltage in the coil L via the coil portion L1, which voltage is coupled through the capacitor C to the base 34 of the transistor T. As previously discussed, the polarity is such that this voltage buildup results in an increase in current through the collector 38. The regenerative action continues until the transistor T is saturated and the collector current buildup is stopped as determined by the
gain limitations of the transistor T. With no change in current flowing through the coil L, the potential drop across coil L drops, thus causing a reduced potential to appear on the base 34 of the transistor T and causing the current through the collector 38 to decay. The inductive action of the coil L tends to maintain the current flow therethrough and hence the decay of current through collector 38 results in a negative voltage on the coil L, and hence on the base 34, which in turn tends to aid the decay of current flow through the transistor T.

This degenerative action causes the current through the collector 38 to become zero, at which time the transistor T is turned off and the sequence is then repeated. During the self-quenching sequence described, on successive cycles a charge is gradually built up on the capacitor C through the low resistance path of the base 34 and emitter 36 circuit. Eventually the charge on the capacitor C reaches a level sufficient to place the transistor T in an off condition. With the transistor T turned off, the capacitor C then discharges through the bias resistor R, which has a high value of resistance in comparison to the resistance of the base 34 emitter 36 circuit. This discharge occurs until the base 34 of the transistor T is once again at a potential such that the transistor T is in condition to conduct and the sequence starts again. Note, then, that actually two waves of oscillation are caused to occur. The first oscillation which has a frequency determined by the tank circuit comprised of the capacitor C and the coil portion Ls causes a high frequency oscillation to occur. At the same time, the charge and discharge effect of the capacitor C, which turns the transistor T on and off, causes a lower frequency oscillation to occur. By properly selecting the values of the parameters of the circuit, the high frequency oscillation can be selected to be an R-F frequency and can serve as a carrier wave while the low frequency oscillation can be selected as an audio signal. In the preferred embodiment the audio frequency was chosen to be approximately 1000 cycles per second. This frequency can be changed by varying either the value of the capacitor C or the value of the biasing resistor R. The carrier or high frequency wave, because of the gradual change in charge condition of the capacitor C, varies in frequency and, in the preferred embodiment, has a frequency variation in the range of from approximately 400 kc. to 1 mc.

The range of carrier frequency can be changed by varying the value of the capacitor C or of the inductance Ls. Thus, while the audio signal is a substantially constant tone, the carrier wave varies considerably over the R-F band. This variation in carrier frequency has a particular utility in the toy of this invention, since it allows the output signal from the toy to be picked up over a relatively broad band of tuning on a conventional AM tuner.

A thermal light 39 is connected between the emitter 36 and the collector 38 and operates such that when it is inserted into the circuit it initially short-circuits the collector 38 to the emitter 36 and hence prevents the transistor T from conducting; hence the circuit 16 from oscillating. Upon reaching a given temperature, the current to light 39 is interrupted internally in the light 39 by means well known in the art, thus allowing the transistor T to conduct and to go into oscillation. In the preferred embodiment, the thermal light 39 is selectively connectible into the circuit such that the oscillator circuit 16 can be used either in a continuous oscillating condition or in a situation in which, with the light 39 in the circuit, the oscillations are interrupted each time the light 39 is on or in a closed circuit condition. The light 39 could be placed in a different portion of the oscillator circuit 16 such that the circuit 16 would be in a condition of oscillation when the light 39 was on. While the transistor T is shown to be of p-n-p type, an n-p-n type could be used by simply reversing the connections to the battery B.

The antennas 12a and 12b, which are connected across the coil L, transmit the output signal occurring across the coil L. Note that the transmitting antennas 12a and 12b are at an angle less than 180° and hence provide a means whereby transmission of the output signal therefrom is omnidirectional.

The switch 32 is of a spring type and can be operated by hand to selectively open or close the circuit to the transistor T and hence be used to send a signal, i.e., such as the Morse code, etc. In the preferred embodiment the resistor R was 150K, the capacitor C was 0.004 mf., and the coil L was an air core coil wound on a 1/4-inch diameter form and was composed of 350 turns of #28 wire having a tap at approximately 50 turns (i.e. Lw would then be 50 turns). The output signal therefrom was capable of being detected by a conventional home receiver over a selectively wide frequency range of tuning on the receiver.

From the above description it can be seen that the toy satellite as described has many educational features. In the first place, it is simple in construction, and can be provided in a "do-it-yourself" type kit, thereby giving the user experience in constructing transistORIZED circuits. Also note that, with the antennas 12a and 12b at an angle less than 180°, the output signal is directional, thereby allowing observation of the directional effects of radio transmission, i.e., by aiming the antennas 12a and 12b away from the receiver, the tone out of the receiver is diminished in amplitude. Also, the toy satellite as described allows a user to gain knowledge in the transmission of coded signals via the use of the switch 32. Another educational value of the toy is in the demonstration of the transmission of radio waves through various materials, i.e., paper, etc., and the absorption of radio waves in other materials, i.e. lead, as by merely placing a sheet of such material in front of the transmitting antennas 12a and 12b. Another educational feature of the toy is the teaching of the range of radio transmission since, by merely moving the satellite towards or away from the receiver, the audio signal output from the radio will correspondingly increase or decrease in amplitude. The above are only a few of the educational advantages to be gained from a toy as shown and described and serve to enhance the intrinsic value thereof, which is simply as a toy.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible of a number of equivalent or alternate constructions and change without departing from the scope of the appended claims.

What is claimed is:

1. A toy satellite comprising a hollow housing and radio transmitter means for transmitting a radio signal including oscillator circuit means disposed within said housing for generating said signal, said oscillator circuit means comprising a transistor having a base, a collector, and an emitter electrode, a source of potential connected to said collector electrode having one end connected to said collector electrode, a coil having one end connected to the opposite end of said source of potential, a capacitor connecting the other end of said coil to said base electrode, a biasing resistor connected between said collector electrode and said base electrode, and a tap electrically connecting said emitter electrode to a portion of said coil, and a thermal light connected between said emitter electrode and said collector electrode for intermittently opening and closing the circuit between said emitter electrode and said collector electrode responsive to current flowing from said source of potential to said thermal light, said housing having an opening through which the light from said thermal light is transmitted.

2. A toy satellite comprising a pair of members having interfitting portions and defining a hollow housing upon assembly of said pair of members at said interfitting portions, each of said interfitting portions having a plurality of slots similarly peripherally disposed for defining upon
assembly of said pair of members a like plurality of apertures, and radio transmitting means for transmitting a radio signal including oscillator circuit means disposed within said housing for generating said signal and a plurality of antennas extending radially outwardly from said hollow housing through said plurality of apertures with said oscillator circuit means being connected to at least two of said plurality of antennas, said pair of members being made of an electrically conductive material and with said plurality of antennas insulated from said pair of members and with said oscillator circuit means including said pair of members, and a switch member in electrical contact with one of said at least two antennas and selectively engageable with one of said pair of members for closing a circuit of said oscillator circuit means upon contact with one of said pair of members for turning said oscillator circuit means on.

3. The apparatus of claim 2 further including a thermal light connected to said oscillator circuit means and extending outwardly and emanating light through an aperture in one of said pair of members and being operatively associated with said oscillator circuit means for providing an open and closed circuit thereacross responsive to current flowing through said thermal light.

4. A toy satellite comprising a hollow housing and radio transmitter means for transmitting a radio signal including oscillator circuit means disposed within said housing for generating said signal and electrical circuit means connected to said oscillator circuit means and being actuable to opened and closed conditions for interrupting the transmission of said radio signal when in one of said conditions, said electrical circuit means including a thermal light member actuable for opening and closing said electrical circuit means responsive to current flow therethrough, said housing having an opening through which the light from said thermal light is transmitted.

5. A toy satellite comprising a pair of members having interfitting portions and defining a hollow housing upon assembly of said pair of members at said interfitting portions, and radio transmitter means for transmitting a radio signal including oscillator circuit means disposed within said housing for transmitting said signal, an antenna extending radially outwardly from said hollow housing and electrically connected to said oscillator circuit, a thermal light, and circuit means connecting said thermal light to said oscillator circuit means for providing an open and closed circuit across said oscillator circuit means responsive to current flowing through said thermal light for interrupting said oscillator circuit means when closed when said thermal light is energized, said housing having an opening through which the light from said thermal light is transmitted.

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