June 9, 1964 L. H. STRAYER 3,136,544

ROTATING TOYS WITH VARYING SPEED AND ORBIT

Filed May 15, 1962 2 Sheets-Sheet 1

FIG. 1

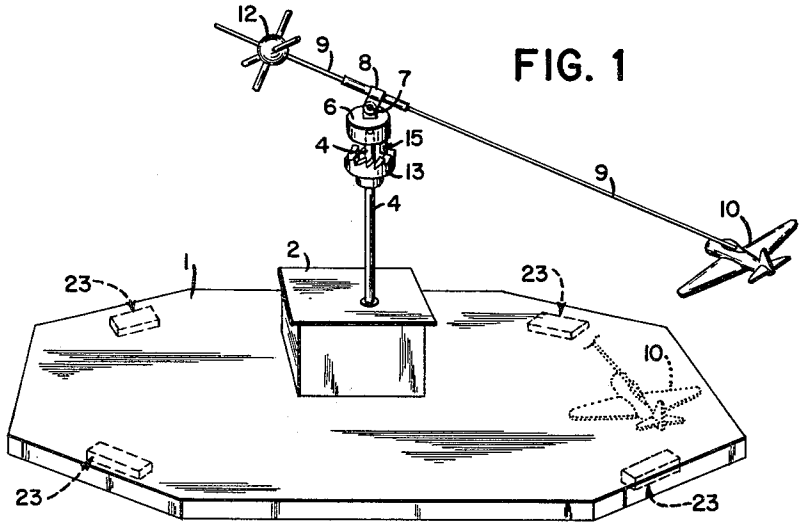

FIG. 2

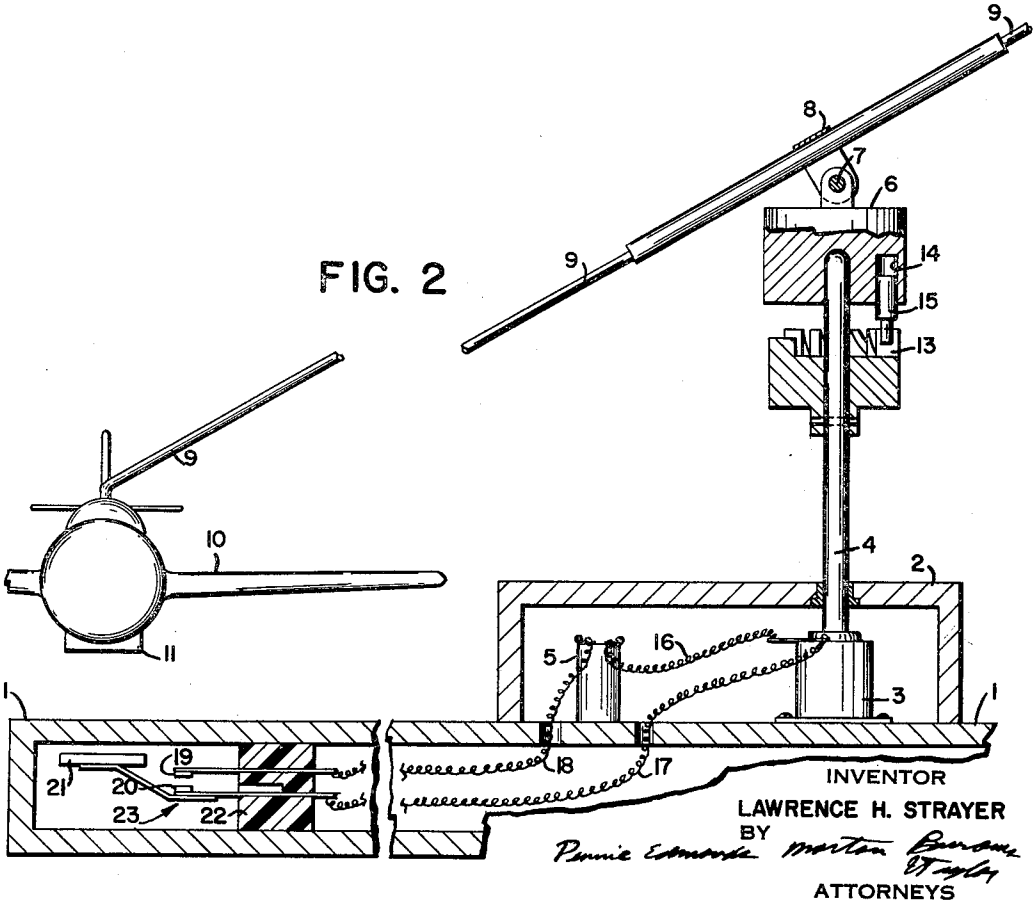

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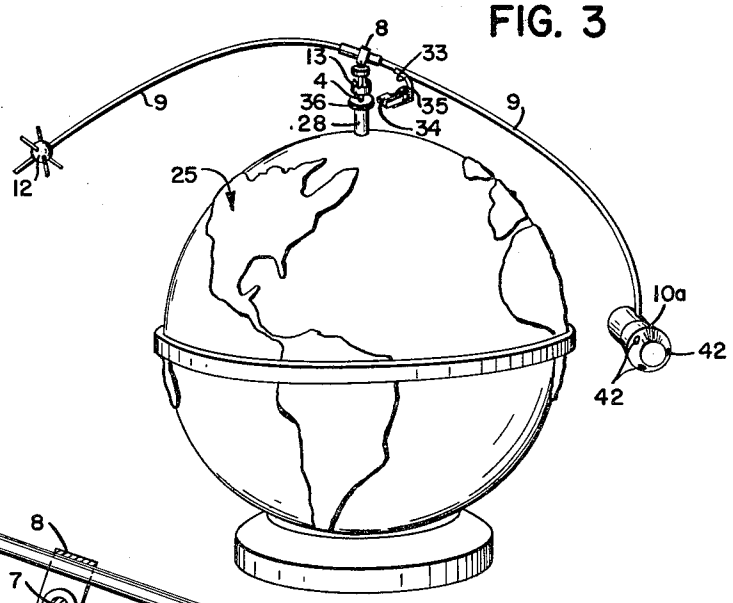
FIG. 3



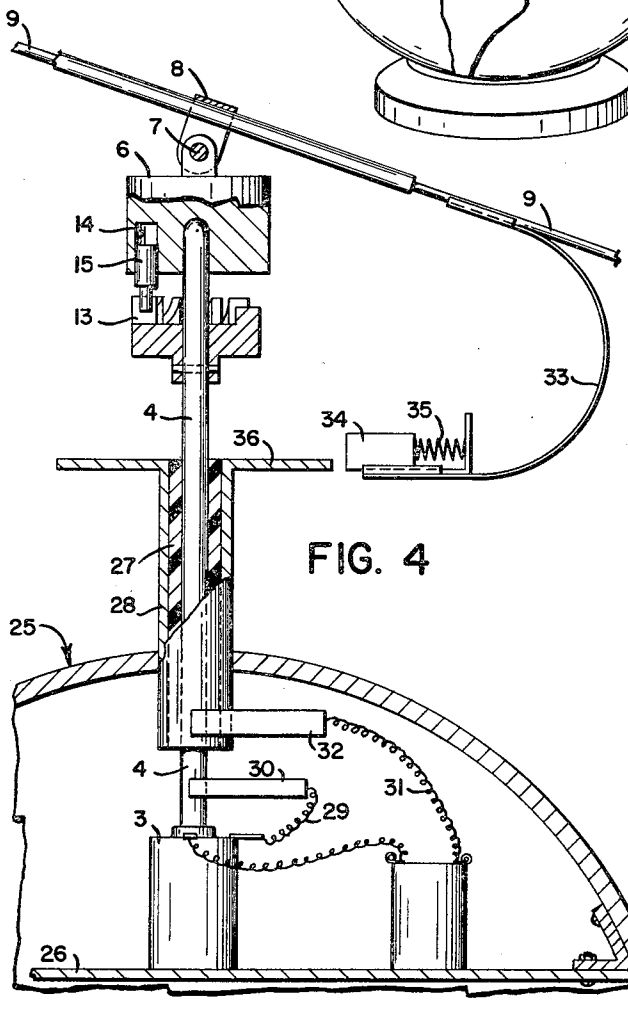


FIG. 4

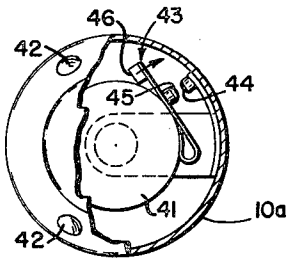


FIG. 5

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ROTATING TOYS WITH VARYING SPEED AND ORBIT

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This invention relates to improvements in rotating toys which rotate in an orbit, and includes a rotating toy which rotates with varying speed and with varying orbit, and also an improved method of operating said toys to effect varying speed and varying orbit.

The toy has a vertical drive shaft connected to and driven by a battery-operated electric motor, a rotating member mounted on the drive shaft to rotate freely thereon in one direction, with a cross-member pivoted thereto carrying an orbiting flying object at one end and a counterweight at the other end which weighs less than the flying object. The drive shaft and the rotating member are provided with ratchet members, so that the rotating member will be driven by the drive shaft when it is operated by the motor, but so that the rotating member can continue to rotate freely on the drive shaft when the motor stops.

The motor is not connected to the battery so that it will operate continuously. Instead, the motor is connected to the battery only momentarily and periodically, with automatic control of the operation of the motor so that it will be placed in operation momentarily at predetermined periods of time and will be immediately stopped when it has served its purpose of effecting rapid rotation of the rotating members of the toy.

When the motor stops, the rotating members of the toy will continue to rotate for a considerable period of time, but with gradual decrease in speed of rotation and change in orbit. And when a predetermined decrease in speed and change in orbit is reached, the motor will be again momentarily connected to and operated by the battery to cause another burst of speed of the rotating members, followed by stopping the motor and continued rotation in a new cycle of operations.

The operation of the toy is one in which there is marked economy in power requirements because the motor operates only momentarily and at spaced intervals, and the battery is called upon to operate the motor only momentarily and at spaced intervals, so that both the motor and the battery are in operation only a small portion of the time, while the toy is maintained in continuous rotation with varying speed and varying orbit.

The operation of the device and the process of operation thus involve periodic and substantially instantaneous rapid driving of the rotating object by the motor, followed by disconnection of the motor but continued prolonged rotation of the rotating toy. And when the rotation has slowed down to a predetermined extent or the orbit has reached a predetermined level, there is automatic instantaneous connection of the motor with the battery to give the device another burst of speed, followed by a further prolonged period of coasting or free rotation with progressive change in the speed of rotation and change of orbit.

The orbiting or flying object may be a toy aeroplane or other aircraft, or a missile, satellite, space ship or space capsule, or may be in the form of toys such as toy animals, or advertisements suitable for use as an orbiting object.

The counterweight, which weighs somewhat less than the orbiting or flying object, may be an ordinary weight which is relatively inconspicuous and serves merely to counterbalance the flying object to the desired extent. The counterweight, however, may also itself be a flying

object similar to or different from the flying object for which it is a counterweight. When the counterweight is itself a flying object, there will be two flying objects, one on each end of the transverse supporting member, and the flying objects in this case are advantageously different in nature. Thus, one may be an aeroplane and the other an advertisement.

With the orbiting object carried by one end of the pivoted cross-member heavier than the counterweight at the other end of this member, the orbiting object will tend to fall to a lower level, with reference to the pivoted support, and the counterweight will go to a higher level, when they are rotating slowly. But with a sudden burst of speed brought about by the instantaneous driving action of the motor on the drive shaft and the corresponding high speed of the rotating members, the increased speed and the increased centrifugal force will tend to cause the heavier orbiting object to rise and the counterweight to be lowered. And when the motor is disconnected, and the rotation at progressively slower speed continues, the action of centrifugal force will decrease and the action of gravity will increase, with the result that the orbiting object tends to rotate at a lower level and in a varying orbit, while the counterweight rotates at a higher level and in a varying orbit.

When the slowing down of the rotating toy results in again connecting the motor and speeding up the toy, centrifugal force again tends to raise the orbit of the main flying object and lower the orbit of the counterweight, and with further gradual change in orbit as the speed of rotation gradually changes.

The starting and stopping of the operation of the motor by the battery is accomplished by a switch in the electrical connection between the motor and battery, which switch is automatically closed to effect operation of the motor when the rotating object has been reduced in speed and lowered in orbit to a predetermined point. And the switch is one which is automatically opened and the motor disconnected with the speeding up of the rotating object due to the instantaneous operation of the motor in increasing the orbiting speed.

Different kinds and locations of switches can be used, and different methods of operating the switches by the orbiting objects can be used. One advantageous form of switch has one of its contact elements carried by the rotating elements of the toy, which comes into contact with the other element of the switch, to close the switch and activate the motor, when the rotating element reaches the predetermined lower location of the lower element; with breaking of the contact and opening of the switch, with increase of speed of the rotating members and raising of the switch element carried thereby. With this type of switch, there is momentary closing of the switch and activation of the motor at a predetermined lower position of orbit and opening of the switch with increase in speed and raising of the orbit. One or the other of the switch elements is advantageously magnetic, and one of the switch elements is advantageously resilient or spring-supported, so that the switch will be closed by magnetic action and will be held closed momentarily until the increased speed of rotation and raising of the rotating element overcomes the magnetic action.

Another advantageous type of switch is a magnetically operated switch with a magnet carried by the orbiting member which acts upon a stationary switch which is normally held open by a spring and which is closed by the action of the magnet when it comes into close proximity with the switch. In this type of switch, neither of the contacts of the switch is carried by the rotating elements of the toy, but they are located at a predetermined lower level such that the orbiting toy, at a predetermined lower

orbit of rotation, comes sufficiently close to the switch to act upon it to close it. And with continued rotation of the orbiting toy, the switch will be again opened when the toy has passed away from the location of such switch.

The invention, with its varying speed and varying orbit of the rotating orbiting members, and with the sudden and rapid increase in speed when driven by the drive shaft of the motor, followed by gradual change of speed and orbit, makes the toy an attractive toy for observation, particularly as it will continue to operate for long periods of time without supervision and with automatic speeding up periodically of the rotating member, and with gradual slowing down and with an interesting change in orbit brought about by the varying speeds.

The rotating article or object, if an aeroplane, simulates the action of an aeroplane in gradually slowing down and lowering in its orbit until it approaches a landing surface, when the sudden increase in speed, due to activating the electric motor momentarily, causes the aeroplane then to rise rapidly from its lowered position into a higher orbit.

If the area below the toy is a globe or a rounded upper portion of a globe, the transverse member carrying the rotating toy element may be bent to a location such that it approaches the surface of the globe when in its lowered or slowed position, but raises rapidly therefrom into a higher orbit when the speed is suddenly increased by the direct momentary connection with the motor.

The orbiting object may be a space capsule which will become illuminated with the sudden increase in speed and with turning off of the illumination with decrease in speed. A space capsule may thus be provided with a battery and with rear lights and with a governor operated by centrifugal force to connect the battery with the lights and turn them on when the capsule is caused to rotate at a high rate of speed, but disconnect the lights from the battery when the speed slows down.

The invention will be further described in connection with the accompanying drawings, which illustrate certain embodiments thereof, in a somewhat conventional and diagrammatic manner, but it will be understood that the invention is illustrated thereby but is not limited thereto.

In the accompanying drawing,

FIG. 1 shows one form of the invention in perspective;

FIG. 2 is a detail view partly in section and partly in elevation of portions of the toy of FIG. 1;

FIG. 3 shows a modified form of the invention in perspective;

FIG. 4 shows part of the device of FIG. 3 in vertical elevation and part in section; and

FIG. 5 is a rear view of the orbiting object of FIGS. 3 and 4, with parts cut away to show a centrifugal governor for turning on and off the lights of this object.

In the toy of FIGS. 1 and 2, the base **1** serves as a support for the toy and has an enclosure or box **2** thereon containing the motor **3** with its drive shaft **4** extending upwardly in a vertical direction, and also containing one or more dry cells **5**.

A rotatable member **6** is supported on and rotatable by the drive shaft **4**, and pivotally connected thereto, by the pivot **7**, is the member **8**, carrying the cross wire **9** having a toy aeroplane **10** at one end thereof, which toy aeroplane carries a magnet **11**. On the other end of the wire **9** is the counterweight **12**, which weighs somewhat less than the aeroplane.

The ratchet **13** on the drive shaft **4** cooperates with a pin **15** carried in the recess **14** of the member **6**, so that, when the motor is in operation, the ratchet will engage the pin **15** and cause the rotating member to rotate at the same speed as the drive shaft, but when the motor stops, the pin **15** will slide over the ratchet and permit free continued rotation of the rotating member.

The electrical connections between the dry cell and motor include a connection **16** and wire connections **17** and **18** which connect the dry cell and motor respectively

with the terminals **20** and **19** of the switch. The bottom terminal **20** is in the form of a light spring carrying at its end a metal member **21** which is magnetic or magnetized. The switch members are supported in suitable insulation **22**.

In FIG. 1, four switches **23** are shown conventionally in dotted lines and without the electrical connections. One of these switches, with the electrical connections, is shown in detail in FIG. 2, located beneath the surface of the top of the support **1** of FIG. 1, so that it is invisible from the top, but near the surface, so that the switches can be acted upon by a magnet carried by the rotating aeroplane when, during its rotation, it slows down to a point where it approaches the surfaces of the base **1** and passes over onto the switches. In FIG. 2, the switch is shown open and the aeroplane is shown at a distance above the support **1**. It will be understood that when, during the continued rotation, the aeroplane approaches closely to the bottom **1** and passes over the switch, it will attract the magnet or magnetizable element **21** and raise it so that the switch is closed. As the aeroplane passes on, the magnetic action of the switch will no longer keep it closed, and the spring support of the member **21** will cause the switch to open.

The provision of four different switches in the base of the toy, as shown conventionally in FIG. 1, enables any one of these switches to be acted upon by the magnet on the rotating aeroplane to close the switch and activate the motor, with resulting acceleration of the speed of the aeroplane to a high rate of speed. As soon as the aeroplane has passed over the switch and has been accelerated to a higher speed and higher orbit, the switch will be opened and the motor will be stopped, but the aeroplane will continue in its orbit for a considerable period of time. The high rate of speed imparted to it by the action of the motor will be gradually reduced, and the orbit will correspondingly be lowered until the areoplane again passes over and in close contact with one of the switches in the base of the device, when the motor will be again connected with the battery and the speed of the aeroplane will suddenly jump from a slow speed near the switch to a high speed in a higher orbit.

The fact that the aeroplane weighs somewhat more than the counterweight results in gradual lowering of the orbit of the aeroplane with decrease in speed until it is lowered to a point where the magnet acts upon and closes the switch in the base and connects the motor and speeds up the drive shaft and the rotation of the aeroplane. The sudden increase in speed is caused by the direct action of the motor. The change in the orbit results from the increased speed and from the action of centrifugal force, which tends to raise the aeroplane to a higher orbit, which may approach that of a horibontal plane passing through the pivot point; while the gradual decrease in speed and of centrifugal force causes a gradual change and lowering of the orbit.

The time of operation of the motor, when the switch is closed, is almost instantaneous and may be as little as a second or two or less. But the continued free rotation of the rotating device will continue for half a minue or a minute or more, until the gradual slowing down or lowering of orbit results in again closing the switch and connecting the battery and motor and giving a new burst of speed to the rotating toy.

FIGS. 3 and 4 show a modified form of the invention. These figures show the toy with a globe as part of the toy and with a space capsule orbiting near the globe at a low speed of rotation and at a higher orbit further away from the globe at a high speed of rotation.

In FIGS. 3 and 4, the same or corresponding parts are, for the most part, indicated by the same numerals as in FIGS. 1 and 2. But in this case, the motor and battery are located inside the top of the globe **25** and supported by supports shown conventionally at **26** therein,

with the vertical drive shaft extending upwardly and carrying the rotating toy, which in this case is a capsule **10***a*.

Around the drive shaft **4** is an insulating layer **27** and an outer thin metal sleeve **28**. The battery or dry cell has one terminal connected by the wire **29** with a brush **30**, which makes contact with the rotating shaft, and the battery is also connected by the wire **31** with a brush **32** which makes contact with the metal sleeve **28**. Depending from the rotating wire **9** is a support **33** which supports the magnet **34** which is movable on the support and has the spring **35** which permits the magnet to move outwardly on the support against the action of the spring.

The switch in this case is closed when the magnet **34** comes in contact with the disc **36** at the upper end of the sleeve **28**. As the magnet approaches this disc **36**, and before it would otherwise be brought into direct contact, the magnetic action will cause the magnet to move slightly against the spring and close the contact. When the contact is thus closed and the motor activated and the speed of rotation suddenly increased, the raising of the capsule **10***a* will pull the magnet away from the disc and open the switch and stop the motor. The rotating device will continue to rotate at high speed with gradual slowing of the speed until the lowering of the heavier rotating member **10***a* again brings the magnet into contact with the disc **36**, when the motor is again started and high speed again given to the rotating toy.

A switch which has a magnet as one of its contact members and has a resilient or yieldable member such as a spring in one or the other of the contact members, will enable contact to be made by the magnet without chattering. The magnet will tend to close the switch due to magnetic action, and the spring-supported or yieldable nature of one of the contacts will permit the magnet to close the switch slightly in advance of the point where it would be closed, if there were no such yieldable or spring-supported contact. And similarly, the magnetic action of the magnet on the other contact, because of such resilient or yieldable action, will momentarily delay the opening of the switch until the increased rotation and centrifugal force pulls the magnet away from the contact and opens the switch and stops the motor.

The rotating or orbiting element of FIGS. 3 and 4 simulates a space capsule, which is shown in somewhat more detail in FIG. 5. This capsule is provided with means for lighting up the capsule at a high rate of speed and for turning off the light when the speed falls. This is accomplished by providing inside the capsule **10***a* of FIG. 5 a battery **41** with lights **42** at the rear of the capsule and with connecting wires (not shown) connecting the battery and lights through the switch **43**. The switch member **44** is fixed in location, but the switch member **45** is in the form of a spring with a weight **46** which will be acted upon by centrifugal force to close the switch at high speed of rotation, to light the lights. But when the speed is reduced and the centrifugal action is reduced to a point that no longer overcomes the action of the spring in holding the member **46** in an outward position, the spring will cause the switch to open and the lights will go off.

Such a capsule will have the lights off during its slow rate of rotation in the lower position of orbit. But when the switch is closed and the speed of the capsule suddenly increased, centrifugal action will close the switch and turn on the lights, which will remain turned on until the centrifugal action no longer overcomes the spring which holds the switch in an open position.

While two different forms of the invention have been illustrated and described, it will be evident that variations can be made in the details of the construction and operation and that different types of switches can be used with different electrical connections for connecting the motor with the battery and causing speeding up of the rotating toy at a high rate of speed for an instant, followed by shutting off of the motor and continued rotation at a progressively decreasing speed and varying orbit until the closing of the switch again momentarily activates the motor and starts the toy again rotating at a high speed of rotation.

In the modification of the invention shown in FIGS. 3 and 4, there is a direct connection of the members of the switch brought about at a predetermined slowing of the speed of the rotating toy and the lowering of the orbit to a predetermined low position; followed by opening of the switch and stopping of the motor when the sudden increase in speed of the rotating toy raises the orbit.

The switch illustrated in FIGS. 1 and 3, which is concealed from sight in the bottom support and is operated by the passage of a magnet carried by the aeroplane as it passes over and in close proximity to the bottom of the toy, gives the impression of magic because it is not apparent why the aeroplane should be given such a quick and rapid start from its lower position. The magic effect of this operation of the rotating members by a concealed switch is illustrated if a magnet other than that carried by the aeroplane is held in the hand and passed over one of the switches in close proximity thereto. When the magnet is brought over the switch, it will suddenly cause the toy to rotate rapidly from whatever position it may be in. And if the hand and magnet are held for longer than an instant over the switch, the toy will continue to rotate at high speed. But when the magnet is withdrawn, the motor will be stopped and the toy will return to its normal operation of gradually decreased speed and change in orbit until the toy aeroplane itself comes down to a point where it passes over one of the switches in the base support and causes another sudden burst of speed of the aeroplane.

While only two different orbiting objects are illustrated, the aeroplane in FIGS. 1 and 2 and the space capsule in FIGS. 3 and 4, it will be evident that different forms of orbiting objects can be used, including advertisements of a type which are appropriate.

It is one of the advantages of the rotating toy of the present invention that, when once started in operation, it will continue to operate for long periods of time without attention or supervision. The fact that the dry cell or battery and the motor are inactive the greater portion of the time and act only momentarily and at spaced intervals, enables a single dry cell to operate for a long period of time before it requires renewal.

And while the operation is a continuous operation, it is nevertheless an operation which varies in speed of rotation and in orbit, and this variation is automatically taken care of in the operation of the toy without the need of supervision. From the standpoint of the observer, the toy presents a fascinating variation in speed and orbit which is periodic in nature, such that the toy holds the interest of the observer for long periods of time.

The toy has the further advantage that it can be used with background or surrounding material, as in a display window or as part of a display of goods on a counter. A continuously moving toy with its varying speed and orbit attracts the attention of the observer to the toy and indirectly to the background and surrounding material, thus making the toy a valuable toy for use for advertising, etc.

In referring to the counterweight as weighing less than the orbiting space member, it will be understood that the weight referred to is considered with reference to the distance of the counterweight and of the flying object with reference to the pivot point. A heavier counterweight may be located nearer the pivot point, and a lighter counterweight at a further distance from the pivot point. But whatever the distance of the counterweight from the pivot point, its effective weight with reference to the weight of the orbiting flying object will be less in effect, so that the flying object will have a lower orbit during slow rotation.

I claim:

1. A rotating toy with varying speed and orbit, comprising a vertical drive shaft connected to and driven by an electric motor, a battery for driving said motor and connected thereto by connections having a switch therein, a rotating member mounted on said drive shaft to rotate freely thereon with a cross-member pivoted to said rotating member and rotatable therewith and carrying on one end a flying object and at the other end a counterweight which weighs less than the flying object, a ratchet member for connecting the drive shaft with the rotating member for transmitting the speed of the drive shaft to the rotating member and members rotatable therewith when the motor is operated and to permit rotation of the rotating members freely on the drive shaft at progressively decreasing speed when the motor stops, and automatic means carried by said rotating members for closing the switch and starting the motor when the rotating flying object reaches a predetermined low position in its rotation and for opening the switch and stopping the motor when the high speed of rotation caused by the motor raises the object from such lowered position.

2. A rotating toy as defined in claim 1 in which the automatic means for closing and opening the switch includes a switch adapted to be closed by the action of a magnet passing thereover and to open when the magnet has passed by the switch, and a magnet carried by the flying object which will act upon the switch and close it when the object reaches its predetermined low position and passes over the switch.

3. A rotating toy as defined in claim 1, in which one contact of the switch is located at a fixed level and the other contact is a spring-supported magnet carried by the rotating members that closes the switch momentarily when the flying object reaches the level of said first contact.

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