FLYING TOY AIRCRAFT WITH A TIMER DEVICE

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ABSTRACT
A flying toy aircraft having one or more low pressure channels acting as the primary lift mechanism. Each of the low pressure channels has a bottom member, two sidewalls, and an optional top member. The interior of the channel can be fitted with an airfoil or a trailing reflexed edge. The aircraft is propelled by propulsion units, which are controlled by a timer device that enables the user to select a predetermined time period for the flight of the aircraft.
FLYING TOY AIRCRAFT WITH A TIMER DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] Pursuant to 35 U.S.C. §§119(e) and 120, this application:

[0002] (a) is a continuation-in-part application of U.S. patent application Ser. No. 14/594,992, filed on Jan. 12, 2015, which claimed the benefit of U.S. Provisional Patent Application Ser. No. 61/925,682, filed on Jan. 10, 2014; and

[0003] (b) claims the benefit of U.S. Provisional Patent Application Ser. No. 62/116,616, filed on Feb. 16, 2015, the entire contents of each of which are incorporated herein by reference.

BACKGROUND

[0004] 1. Field of Invention

[0005] The present invention relates generally to the field of flying toys, and more particularly, to a self-timed flying toy aircraft having a low pressure channel as the main lift element.

[0006] 2. Description of Related Art

[0007] Radio controlled (RC) flying toys have been used for many years as an enjoyable source of entertainment. However, proper functionality of these toys demands a precise balance between weight, lift, and power. The weight of the toy depends on its size, shape, and construction. The lift of the toy depends on the size, shape, and orientation of the wings or other lift members. These flying toys tend to be difficult to control, and they often fly out of range of the radio controller, ending in a crash landing. Controlling these flying toys is often a difficult and frustrating task for the user, which detracts from the enjoyment of the toy.

[0008] The present invention seeks to overcome these problems by providing a self-timed, self-controlled flying toy aircraft that the user can enjoy without the distraction of operating a wireless control device to control the toy’s flight pattern.

SUMMARY OF THE PREFERRED EMBODIMENTS

[0009] The flying toy aircraft comprises one or more low pressure channels, a control system, and a propulsion system. The low pressure channel is generally defined by a base member and two sidewalls, one of each of which sidewalls is connected to the base member along the side of the base member. The leading section of the channel is located near the front of the flying toy aircraft, and the leading section acts as the air intake for air to pass through the low pressure channel as the toy aircraft glides during flight. The trailing section is located near the back portion of the flying toy aircraft.

[0010] Additional features of the low pressure channel could include an air foil located in the leading section, a reflexed edge located in the trailing section, and one or more rudder members. The reflexed edge is either fixed in a reflexive position, or it can be movable as desired, therefore acting like an elevator in the trailing section of the channel. The channel comprises one or more sets of wings that lift and stabilize the flying toy aircraft.

[0011] In one embodiment, the flying toy aircraft comprises at least two channels wherein the adjacent interior sidewalls are spaced apart. This orientation of adjacent interior sidewalls is configured to form an inverse channel along the underside of the flying toy aircraft. The inverse channel is defined on its sides by the interior sidewalls connected by a connection member. It is advantageous for the interior sidewalls to be aligned substantially parallel to the longitudinal axis of the flying toy aircraft such that the interior sidewalls act as aerodynamic guide members that assist in stabilizing the flying toy aircraft from undesired yawing motion during flight.

[0012] The control system comprises the electronic components for operation of the low pressure channel or the flying toy aircraft. In one embodiment, the control system comprises a timer device that is configured to electronically activate and deactivate the propulsion units. A selector device signals a control unit in the timer device to activate a propulsion unit for a predetermined time period. Once the predetermined time period expires, the control unit terminates the flow of electricity to the propulsion unit, thus causing the propulsion unit to cease operation. The flying toy aircraft then glides to a skid landing. In one embodiment, the control system further comprises a power source such as a battery, a circuit board, and other electronic components and wiring necessary to create electrical connectivity between the receiver, power source, and the propulsion units.

[0013] In one embodiment of the operation of the flying toy aircraft, the propulsion system comprises two propulsion units. The propulsion units are independently operable to promote a greater degree of steering and control by the user. An increase or decrease in power causes a corresponding increase or decrease in the thrust produced by the first propulsion unit, thereby creating a thrust differential between the first propulsion unit and a second propulsion unit. This thrust differential forces the toy aircraft to turn to in the opposite direction.

[0014] The propulsion system can comprise more than two propulsion units. However, the arrangement of propulsion units should comprise at least one propulsion unit attached to the flying toy figure on each side of the longitudinal axis.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is an isometric view of a flying toy aircraft.

[0016] FIG. 2A is an elevation view showing one embodiment of the structure of a panel or wall member of a low pressure channel.

[0017] FIG. 2B is an isometric view of a typical low pressure channel.

[0018] FIG. 3 is a top view of one embodiment of a low pressure channel having rudder members and a reflexed edge placed at the trailing section.

[0019] FIG. 4A shows a cross section of an alternate embodiment of a low pressure channel.

[0020] FIG. 4B shows a cross section of an alternate embodiment of a low pressure channel.

[0021] FIG. 4C shows a cross section of an alternate embodiment of a low pressure channel.

[0022] FIG. 4D shows a cross section of an alternate embodiment of a low pressure channel.

[0023] FIG. 5A shows a cross section of an alternate embodiment of a low pressure channel.

[0024] FIG. 5B shows a cross section of an alternate embodiment of a low pressure channel.

[0025] FIG. 5C shows a cross section of an alternate embodiment of a low pressure channel.
FIG. 5D shows a cross section of an alternate embodiment of a low pressure channel.

FIG. 5E shows a cross section of an alternate embodiment of a low pressure channel.

FIG. 6 shows a cross section of the elevation of one embodiment of a low pressure channel.

FIG. 7 shows a cross section of an alternate embodiment of a low pressure channel.

FIG. 8 is a top view of one embodiment of a flying toy aircraft.

FIG. 9 is a side view of an embodiment of a flying toy aircraft.

FIG. 10 is a front view of an embodiment of a flying toy aircraft.

FIG. 11 is a back view of an embodiment of a flying toy aircraft.

FIG. 12 is a partial cross section of one embodiment of the propulsion system showing a propulsion unit with a rudder.

FIG. 13 is a partial cross section of a low pressure channel showing the second set of wings attached to the low pressure channel.

FIG. 14 is a partial cross section of an embodiment of the propulsion system showing contra-rotating propellers.

FIG. 15 is a bottom view of one embodiment of the flying toy aircraft having two propulsion units.

FIG. 16 is a bottom view of one embodiment of the flying toy aircraft having two propulsion units.

FIG. 17 is a top view of one embodiment of the flying toy aircraft having one propulsion unit.

FIG. 18 is a diagram showing one embodiment of the connectivity between a power source, a timer device, and a propulsion unit.

FIG. 19 is a diagram showing one embodiment of the connectivity between a power source, a timer device, and a propulsion unit.

FIG. 20 is a diagram showing one embodiment of the connectivity between a power source, a timer device, and a propulsion unit.

FIG. 21 is a diagram showing one embodiment of the connectivity between a power source, a timer device, and a propulsion unit.

FIG. 22 is a top view of one embodiment of a flying vehicle without a top member in place, view of one embodiment of a flying vehicle without a top member in place.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, the flying toy aircraft will now be described with regard for the best mode and the preferred embodiments. In general, the device disclosed herein is a remote controlled or self-timed flying toy aircraft having an improved lift mechanism comprising one or more low pressure channels. The embodiments disclosed herein are meant for illustration of the device, and not for limitation of the inventive scope. An ordinary practitioner will appreciate that it is possible to create many variations of the following embodiments without undue experimentation.

As used herein, the terms “right,” “left,” “forward,” “rearward,” “top,” “bottom,” and similar directional terms refer to orientations when facing the direction of flight of the toy aircraft. The term “horizontal” means a plane or direction generally parallel to the ground or other surface above which the flying toy aircraft is flying. The term “vertical” means the plane or direction generally perpendicular to the ground or other surface above which the flying toy aircraft is flying. The term “longitudinal axis” means the axis about which the flying toy aircraft rolls.

Referring to FIGS. 1-3, the flying toy aircraft comprises one or more low pressure channels, a control system, and a propulsion system. The low pressure channel is an elongated channel oriented generally parallel to the longitudinal axis of the flying toy aircraft. The one or more low pressure channels are configured to produce lift during flight of the aircraft, as discussed below. The aircraft is made of lightweight material common in the flying toy industry, such as cardboard, foam, foam board, or the like. As shown in FIG. 2A, in one embodiment of the aircraft, the walls and panel members are constructed of frame elements that support sheet material, such as fabric, plastic sheets, or other similar material.

As shown in FIG. 2B, the low pressure channel generally defined by a base member and two sidewalls, each of which sidewalls is connected to the base member either continuously or discontinuously along or near the side of the base member. The low pressure channel has a leading section and a trailing section. The leading section is located near the front of the flying toy aircraft, and the leading section acts as the air intake for air to pass through the low pressure channel as the toy aircraft glides through the air during flight. The trailing section is located near the back portion of the flying toy aircraft.

Referring to FIGS. 4A through 4D, the base member could be a flat member, or it could have a cross sectional shape in the form of a V-shape, a U-shape, a partial polygon, or some other shape. The cross sectional shape of the sidewalls also accommodates various geometric forms, as shown in FIGS. 5A through 5E. The sidewalls could also be straight, or they could be concave or convex with respect to the interior of the channel. The base member and the sidewalls could have a constant thickness or a variable thickness. A variable thickness of these members could be oriented to create or expand the air passage way through the channel. For example, the base member or the sidewalls or both could be arranged with a wall thickness that expands along the length of the channel from the leading section of the trailing section. This variable wall thickness constrains the passage of air flowing through the channel. As the airway constrains, the flow of air speeds up, and this higher air speed causes a further decrease in pressure and enhances the lift effect created by the low pressure channel.

One or more embodiments of the low pressure channel further comprises lateral flanges attached to the top of the sidewalls and extending laterally away from the interior of the low pressure channel. The lateral flanges are configured to extend either continuously or discontinuously along the length of the sidewalls.

In one embodiment, the dimensions of the low pressure channel are variable along the length of the channel. For example, the low pressure channel could deepen towards the trailing section as compared to the leading section. This deepening is effected by increasing the height of the sidewalls along the length of the low pressure channel. Alternately, the base member could widen along the length of the low pressure channel, thereby spreading apart the distance between the sidewalls and widening the channel.
As shown in FIG. 6, additional embodiments of the low pressure channel 20 comprise additional features to enhance the aerodynamic lift effect generated by the channel 20. These additional features include an airfoil 27 located in the leading section 24, or a reflexed edge 28 located in the trailing section 25. The airfoil 27 is any member that increases the length of the airflow path above the base member 21 in comparison to the airflow path below the base member 21. The airfoil 27 is either permanently or removably affixed inside the low pressure channel 20 in the leading section 24, such as by attaching the airfoil 27 to the base member 21 or the sidewalls 22. A removable attachment between the airfoil 27 and the channel 20 comprises fastening members, such as hook and loop closures, clips, clasps, adhesives, or the like. The reflexed edge 28 is either fixed in a reflexed position, or it can be movable as desired, therefore acting like an elevator in the trailing section 25 of the channel 20.

In one embodiment, as shown in FIG. 7, the flying toy aircraft 1 comprises at least two channels 20 wherein the adjacent interior sidewalls 22a are spaced apart and connected by a connection member 31. In one version of this embodiment, the connection member 31 is a continuous member that begins at the leading section 24 and extends continuously or discontinuously to the trailing section 25. The adjacent interior sidewalls 22a are configured to form an inverse channel 32 along the underside of the flying toy aircraft 1. The inverse channel 32 is in the shape of an upside down U, an upside down V, or some similar shape. The inverse channel 32 is defined by its sides by the interior sidewalls 22a connected by the connection member 31. It is advantageous for the interior sidewalls 22a to be aligned substantially parallel to the longitudinal axis of the flying toy aircraft 1 such that the interior sidewalls 22a act as aerodynamic guide members that assist in stabilizing the flying toy aircraft 1 against undesired yawning motion during flight.

In another version of this embodiment, the connection member 31 comprises one or more discreet members for retaining the two low pressure channels 20 in a substantially fixed relation to each other. These connection members 31 comprise one or more rods, braces, brackets, or other such members. In any of these embodiments, the low pressure channels 20 can increase in width along the length of the channel 20 from the leading section 24 to the trailing section 25.

In one embodiment, shown in FIGS. 8-11, the control system 50 comprises the electronic components for operation of the low pressure channel 20 or the flying toy aircraft 1. The control system 50 typically comprises a power source, such as a battery, a circuit board, and other electronic components and wiring necessary to create electrical connectivity between the power source, and the propulsion units 61. These components of the control system 50 can be attached to a bracket member 33 or dispersed throughout the flying toy aircraft 1 as desired. The control system 50 components can be housed in a nacelle to reduce aerodynamic drag caused by these components, or inside the airfoil 27. In this configuration, the housing or nacelle can be configured to act as the airfoil 27. The main components of the control system 50 are attached to the flying toy aircraft 1 by tape, glue, screws, clips, or other suitable attachment materials or devices.

The various components of the control system 50 can be placed as desired throughout the flying toy aircraft 1 to balance a weight distribution or to control the overall center of gravity of the flying toy aircraft 1. For example, in embodiments where components of the control system 50 are housed within the airfoil 27 or a nacelle, the airfoil 27 or nacelle can be adjustably placed along the length of the longitudinal axis, which enables an adjustable center of gravity of the toy aircraft 1. Adjustment of this center of gravity enables adjustment to the pitch of the aircraft 1 during flight. A forward placement of the control system 50 moves the center of gravity forward in the low pressure channel 20, thus causing the aircraft 1 to pitch downward during flight. Adjusting the placement of the control system 50 to a more rearward location in the low pressure channel 20 moves the center of gravity toward the trailing section 25, thus causing the aircraft 1 to pitch upward during flight. In one embodiment, these components of the control system 50 are slidably disposed within the low pressure channel 20 to enable easy adjustment of the location of the control system 50.

In one embodiment, the propulsion system 60 comprises one propulsion unit 61. The propulsion unit 61 is attached to the low pressure channel 20 either directly or by a bracket member 33. The control system 50 is attached to the base member 21 in the leading section 25. The sidewalls 22 have lateral wings 26 that extend upwardly in a diagonal direction, thereby creating a dihedral effect of the low pressure channel 20.

In this embodiment, the aircraft 1 comprises one or more sets of wings, such as a first set of wings 15, and an optional second set of wings 16. The first set of wings 15 are attached to the low pressure channel 20 near the middle of the channel 20 or toward the leading section 24. The optional second set of wings 16, if present, is attached to the low pressure channel 20 between the first set of wings 15 and the back end of the low pressure channel 20. The second set of wings 16 therefore acts as tail fins for the aircraft 1. The first set of wings 15 can be larger than the second set of wings 16, as in a traditional airplane configuration. Alternatively, the respective sets of wings can be oriented in a canard arrangement, where the leading first set of wings 15 is smaller than the trailing second set of wings 16. In the preferred embodiment, both the first set of wings 15 and the second set of wings 16 are placed in a dihedral configuration.

In one embodiment, the aircraft 1 further comprises an optional cover member 17 to protect the propulsion unit 61 from inadvertent contact with foreign objects, such as the user’s body, clothing, or hair. A wide cover member 17 also causes the propulsion unit 61 to act as a deflector. Alternatively, the cover member 17 could be attached at the ends to the sidewalls 22 or the lateral wings 26 to or to the first set of wings 15. In this configuration, the cover member 17 optionally receives lateral bracing from the bracket member 33, such as by being attached to the bracket member 33 or being placed closely adjacent to it.

In one embodiment, shown in FIG. 12, a rudder 29 is attached to the aircraft 1 in the wake of the propulsion unit 1. The rudder 29 assists with steering the aircraft 1 as in a conventional airplane. Preferably, the rudder 29 is connected to the aircraft 1 by the propulsion system 60, by the bracket member 33, or by a separate bracket (not shown) that connects the rudder 29 directly to the low pressure channel 20 or some other part of the aircraft 1. In one embodiment, the rudder 29 is attached to the propulsion unit 61 or the bracket member 33 by an adjustable connection 34. The adjustable connection 34 could be a hinge member wherein the hinge pin 35 is disposed very snugly within the hinge such that the rudder 29 remains in a fixed relation to the aircraft 1 during...
flight. In this configuration, the hinge pin 35 is placed in the hinge loosely enough so that the user can adjust the orientation of the rudder 29 in relation to the aircraft 1, but tightly enough so that the hinge retains the rudder 29 in this fixed relation during the duration of the flight.

[0061] Referring to FIG. 13, in another embodiment, a similar adjustable connection 34 is used to attach the second set of wings 16 in adjustable relation to the low pressure channel 20. The user adjusts the orientation of the second set of wings 16 prior to setting the aircraft 1 into flight. The hinge pin 35 of this adjustable connection 34 is placed in the hinge loosely enough so that the user can adjust the orientation of the wings in the second set of wings 16 in relation to the aircraft, but tightly enough so that the hinge retains each wing in this fixed relation during the duration of the flight. In this manner, the individual wings of the second set of wings 16 act as rudder members for the aircraft 1.

[0062] The propulsion system 60 can comprise more than one propulsion unit 61. For example, referring to FIG. 14, one embodiment of the propulsion 60 system comprises two propulsion units 61 disposed in a substantially contra-rotating, co-axial arrangement. The first propulsion unit 61a has a propeller that rotates in a first direction, and the second propulsion unit 61b has a propeller configured substantially co-axially in relation to the first propulsion unit 61a. The propeller of the second propulsion unit 61b rotates in the direction opposite that of the first propulsion unit 61a. These contra-rotating propellers provide torque balance to the propulsion system 60.

[0063] As shown in FIG. 15, another embodiment of the aircraft 1 comprises an arrangement of multiple propulsion units 61 where the arrangement has at least one propulsion unit 61 attached to the flying toy FIG. 1 on opposite sides of the low pressure channel 20. The propulsion units 61 can be attached at angles that vary slightly from horizontal or vertical. For example, the propulsion units 61 could be angled slightly downward to provide a slightly upward lift angle produced by the thrust vector. Likewise, one or more propulsion units 61 in a multiple propulsion system could be angled slightly toward the longitudinal axis 11, or canted inward, to provide additional stability against yawing motion of the flying toy aircraft 1.

[0064] In one embodiment of the operation of the flying toy aircraft 1, the propulsion system 60 comprises two propulsion units 61. The propulsion units 61 are independently operable to promote a greater degree of steering and control by the user. For example, the control system 50 is configured to allocate more power or less power to a first propulsion unit 61. This increase or decrease in power causes a corresponding increase or decrease in the thrust produced by the first propulsion unit 61a, thereby creating a thrust differential between the first propulsion unit 61a and a second propulsion unit 61b. This thrust differential forces the toy aircraft 1 to turn to in the opposite direction. For example, if a turn to the right, the control system 50 allocates more power to the left propulsion unit 61 or less power to the right propulsion unit 61, thereby creating greater thrust on the left side of the body 10 and forcing the toy aircraft 1 to turn to the right. A corresponding left turn is produced by producing more thrust from the right propulsion unit 61 or less power from the left propulsion unit 61.

[0065] In another embodiment, shown in FIG. 16, the low pressure channel 20 comprises a flexible material, such as a foam material, than enables the channel 20 to be curved or bent by the user. Curving the low pressure channel 20 enables the user to predetermine the flight pattern based on the aerodynamic characteristics of the curved shape during flight. To enable a flight pattern turning to the right, either the leading section 24 or the trailing section 25, or both, is curved to the right before flight of the aircraft 1 is commencing. This curvature causes the air to push the aircraft 1 to the right during the flight pattern. The reverse is true for a turn to the left. To increase the pitch of the aircraft 1 during flight, either the leading section 24 or the trailing section, or both, is curved upward. The reverse is true to decrease the pitch of the aircraft 1 during flight.

[0066] In any of the embodiments disclosed herein, the flying toy aircraft 1 can further comprise a shock absorbing member 37 attached to the leading section 24, as shown in FIG. 17. The shock absorbing member 37 is a flexible member that absorbs the impact force caused by crash landings or collisions of the aircraft 1. The shock absorbing member 37 is made of a flexible wire, a flexible plastic member, a bumper or other such member. The shock absorbing member 37 is typically a thin member with a minimal aerodynamic profile so that the shock absorbing member 37 does not interfere with the flight characteristics of the flying toy aircraft 1. In some embodiments, however, the shock absorbing member 37 comprises airfoils features that provide additional lift to the flying toy aircraft 1 at the leading section 24.

[0067] In one embodiment, the shock absorbing member 37 is a foam bumper at the front of the aircraft 1. The bumper 37 is in the shape of an arch or curved bar, which is integrally or otherwise securely attached to the low pressure channel 20. The propulsion unit 61 is placed in the low pressure channel 20 in front of the control system 50.

[0068] In any of the foregoing embodiments, one embodiment of the control system 50 comprises a timer device 70 for controlling the propulsion units 61. This embodiment comprises no wireless control device 5. The control system 50 is modified to incorporate the timer device 70. Referring to FIG. 18, the timer device 70 is an electrical component that enables power to transfer from a power source 71 to the propulsion units 61. In this manner, the timer device 70 is configured to activate the propulsion units 61 upon the user’s command, and then deactivate the propulsion units 61 after a predetermined period of time. For example, in many embodiments, the power source 71 is a battery that is part of the control system 50, and the power is electrical power flowing from the battery to the propulsion units 61, each of which is an electric motor driving a propeller. Upon the user’s command, the timer device 70 activates the battery 71 to power the propulsion units 61, and then deactivate the battery 71 connectivity after a predetermined period of time, such as ten seconds, which deactivates the propulsion units 61.

[0069] In these embodiments, the user holds the flying toy aircraft 1 in one hand, and then activates the timer device 70 to start the propulsion units 61. The user then tosses the flying toy aircraft 1 into the air, and the aircraft 1 takes to flight. After the predetermined period of time expires, the propulsion units 61 cease operation, and the aircraft 1 glides softly to the ground in a skid-like landing. The timer device 70 can be configured to abruptly terminate the flow of electricity to the propulsion units 61, or the timer device 70 could be configured to gradually reduce the flow of electricity to the propulsion units 61 so that they are gradually powered down. Since this embodiment does not comprise a wireless control device, the user has no control over the aircraft 1 during flight.
There are several embodiments of user activation of the timer device 70. For example, in one embodiment the timer device 70 is attached to the low pressure channel 20. The control system 50 comprises an activation device 72 for activating the timer device 70. The activation device 72 is a switch, a button, a lever, or other device disposed in communication with the timer device 70 and configured for activating the timer device 70. In another embodiment, the low pressure channel 20 comprises a resilient material, such as deformable plastic or rubber, and the activation device 72 is placed below the surface of the low pressure channel 20. The user engages the activation device 72 by depressing the resilient material, thereby engaging the activation device 72. For example, the activation device 72 could be a button placed below a rubber surface on the low pressure channel 20. The user engages the activation device 72 by depressing the resilient member, which starts the timer device 70 and activates the propulsion units 61. The toy aircraft 1 is then ready to be tossed into flight.

In one embodiment, the predetermined time periods of timer device 70 activation are adjustable by the user. The predetermined time periods could be five seconds, ten seconds, fifteen seconds, or some other time interval. The predetermined time period could be fixed by the timer device 70, or it could be selected by the user via a selector device 73. The selector device 73 is a switch, a button, a lever, or other device enabling the user to alter the predetermined time period for the timer device 70. For example, the selector device 73 could be a switch having two different positions corresponding to time periods of ten seconds and fifteen seconds, respectively, or other predetermined time intervals. The selector device 73 could have a third position or more, corresponding to time periods of twenty seconds, twenty-five seconds, or some other time interval. In another embodiment, the selector device 73 is a button that the user depresses once for a five second time period, twice for a ten second time period, three times for a fifteen second time period, and so on. In another embodiment, the selector device 73 is a button, and the user controls the predetermined time period by depressing the button and holding it down. For example, depressing the button for one second, two seconds, and three seconds corresponds to predetermined time periods of five seconds, ten seconds, and fifteen seconds, respectively, or other incrementally increasing or decreasing time periods.

In another embodiment, shown in FIG. 8, the selector device 73 is combined with the activation device 72 such that the control system 50 comprises three buttons. Depressing first button 72a, 73a activates the propulsion unit(s) 61 for three seconds, depressing a second button 72b, 73b activates the propulsion unit(s) 61 for six seconds, and depressing a third button 72c, 73c activates the propulsion unit(s) 61 for twelve seconds. In another exemplary embodiment, a first button 72a, 73a is depressed to activate a propulsion unit 61 for a first predetermined time period, such as a second indoor flight time for use inside a building or a residential dwelling. A second button 72b, 73b is depressed to activate a propulsion unit 61 for a second predetermined time period, such as a second outdoor flight time for use in the outdoors or in a very large building. The foregoing examples are for illustration only and are not intended to limit the scope of the scope of the selector device 73 or the timer device 70.

In one embodiment, the timer device 70 further comprises a control unit 74, which comprises circuitry or other functionality configured to control the flight pattern of the aircraft 1 such that the aircraft 1 flies in a predetermined flight pattern. The control unit 74 is a circuit, a microprocessor, controller, or another electrical or processing unit configured to control the propulsion units 61. The predetermined flight pattern could be a figure-eight, a circle, a serpentine pattern, or some other pattern.

In one embodiment, the control unit 74 is configured to control power delivered to each propulsion unit 61 to control the predetermined flight pattern. The variable power allocation controls the thrust output of each of the propulsion units 61. For example, in one embodiment the control unit 74 allocates more power to the right propulsion unit 61 than to the left propulsion unit 61, thereby causing a thrust differential and turning the aircraft 1 to turn to the left, as described in more detail above. Maintaining this power allocation for the duration of the predetermined time period causes the aircraft 1 to fly in a circular pattern by circling to the left. As another alternative, the control unit 61 under powers the left propulsion unit 61 only for a segment of the predetermined time period before reversing the power allocation between the propulsion units 61 such that the left propulsion unit 61 receives more power than the right propulsion unit 61. This power allocation causes the aircraft 1 to turn back to the right. Alternating these two different power allocations during the predetermined time period causes the aircraft 1 to fly in a serpentine pattern, turning back and forth until the predetermined time period ends and the aircraft 1 glides to a skid landing.

Under powering one of two propulsion units 61 to enable a turn can sometimes cause the flying toy aircraft 1 to lose altitude and even crash. Therefore, in one embodiment, during the turning process the control unit 74 lowers the power to one propulsion unit 61 and raises it back to a normal level, and then repeats this cycle in rapid succession. This power pulsing effect enables the turning aircraft 1 to maintain altitude while making a turn.

The timer device 70 and the control unit 74 could be separate components or integrated into the same component within the control system 50. For example, the timer device 70 could be an electrical gate that permits electricity to flow from a power source 71, such as a battery, to the electrical propulsion units 61. The gate opens to enable operation of the propulsion units 61, and the gate closes to cut off the flow of electricity to the propulsion units 61, thereby terminating their operation.

For example, in one embodiment, shown in FIG. 19, the timer device 70 comprises a board supporting circuitry for the electrical components described herein. The timer device 70 comprises a transistor 75, such as a metal-oxide-semiconductor field-effect transistor ("MOSFET"), and a capacitor 76. Transistors 75 other than a MOSFET could be suitable for the purpose as well. The activation device 72 signals the MOSFET 75 to open the gate, thereby permitting electricity to reach the capacitor 76 and fill it. After the activation device 72 is released, the capacitor 76 provides enough electricity to keep the gate open, thereby enabling the flow of electricity from the power source 71 to the propulsion units 61. Once the capacitor 76 has exhausted its electricity storage, the gate closes, electricity ceases flowing to the propulsion units 61, and the propulsion units 61 cease operation. The flying toy aircraft 1 then glides to a skid landing as described above.

In one embodiment, the timer device 70 further comprises a resistor 77, which slows down the discharge of electricity from the capacitor 76. The gate in the MOSFET 75
therefore stays open for a longer period of time, enabling operation of the propulsion units 61 for a longer time period. A resistor 77 providing greater resistance prolongs energy dissipation from the capacitor 76, thereby enabling a longer operational time of the propulsion units 61. Correspondingly, a resistor 77 providing lower resistance will comparatively lessen the operational time of the propulsion units 61. The timer device 70 can further comprise an optional circuit overload diode 78.

[0079] In another embodiment, shown in FIG. 20, the timer device 60 comprises an integrated circuit 80 pre-programmed with timing functionality, and two potentiometers ("pots"), a first pot 81 and a second pot 82. The integrated circuit 80 is programmed to read the values from the two pots 81, 82. The signals from the first and second pots 81, 82 are converted to a time values and thrust values, respectively. The activation device 72 signals the integrated circuit 80 to turn on the propulsion units 61 for the predetermined period of time designated by the signal from the first pot 81 at the thrust level determined by the signal from the second pot 82. Then the predetermined period of time expires, the integrated circuit 80 signals the propulsion units 61 to cease operation, and the flying toy aircraft 1 glides to a skid landing.

[0080] An alternate embodiment of the timer device 70 and control system 50 is shown in FIG. 21. In this embodiment, three activation devices 72a, 72b, 72c are combined with three selector devices 73a, 73b, 73c. The control unit 74 is configured or programmed such that depressing the first activation/selector device 72a, 73a activates a propulsion unit 61 for a first predetermined time period, depressing the second activation/selector device 72b, 73b activates a propulsion unit 61 for a second predetermined time period, and depressing the third activation/selector device 72c, 73c activates a propulsion unit 61 for a third predetermined time period. In this embodiment, the timer device 70 and control system 50 further comprise a transistor 75, capacitor 76, one or more resistors 77, and a diode 78 as shown in FIG. 21. Configurations of these components other than the configuration shown in FIG. 21 could also be suitable for controlling the aircraft 1 flight for predetermined time periods, as will be appreciated by an ordinary practitioner.

[0081] In another embodiment, the flying toy aircraft 1 is generally controlled by a wireless control device 5 (shown in FIG. 22) having a transmitter to transmit an electronic signal to a control system 50 of the flying toy aircraft 1. The control system 50 controls a propulsion system 60 on the flying toy aircraft 1 to produce a gliding form of flight, as discussed above. In one embodiment, the electronic signal is a radio frequency signal typical for radio controlled (RC) toys.

[0082] In this embodiment, the control system 50 typically comprises a receiver, a power source such as a battery, a circuit board, and other electronic components and wiring necessary to create electrical connectivity between the receiver, power source, and the propulsion units 61. These components of the control system 50 can be attached to a bracket member 33 or dispersed throughout the flying toy aircraft 1 as desired. In most embodiments, the control system 50 comprises components that are appreciated in the RC toy industry.

[0083] In this embodiment, the control system 50 does not have a timer device 70. Instead, the user uses the wireless control device 5 to control the light pattern of the flying toy aircraft 1. Turns are effected, for example, by the control system 50 allocating a power differential between two separate propulsion units 61, which causes the aircraft 1 to turn as described above. The aircraft 1 is landed when the user uses the wireless control device 50 to power down the propulsion system 60, thereby causing the aircraft 1 to lose altitude and come to a skid landing.

[0084] The foregoing embodiments are merely representative of the flying toy aircraft and not meant for limitation of the invention. For example, persons skilled in the art would readily appreciate that there are several embodiments and configurations of wing members, low pressure channels, and other components will not substantially alter the nature of the flying toy aircraft. Likewise, elements and features of the disclosed embodiments could be substituted or interchanged with elements and features of other embodiments, as will be appreciated by an ordinary practitioner. Consequently, it is understood that equivalents and substitutions for certain elements and components set forth above are part of the invention described herein, and the true scope of the invention is set forth in the claims below.

1 claim:

1. A flying toy aircraft comprising:
   one or more low pressure channels defined by a base member and a sidewalk having a top, the low pressure channels having a leading section and a trailing section; a flange member attached to the top of the sidewalk and extending outwardly from the low pressure channel; a propulsion system comprising one or more propulsion units; and
   a control system comprising a timer device in operable communication with the one or more propulsion units, the timer device being configured to electrically activate and deactivate the one or more propulsion units.

2. The flying toy aircraft of claim 1, further comprising a first set of wings and a second set of wings, the first set of wings and the second set of wings attached to the low pressure channel, and the first set of wings spaced forwardly of the second set of wings.

3. The flying toy aircraft of claim 1, wherein at least one low pressure channel comprises an airfoil attached to the base member in proximity to the leading section, and a reflexed edge disposed in the base member in proximity to the trailing section.

4. The flying toy aircraft of claim 1, further comprising a rudder member attached to the low pressure channel and disposed within the wake of the one or more propulsion units.

5. The flying toy aircraft of claim 2, wherein the rudder member is the second set of wings, which are attached in adjustable relation to the low pressure channel.

6. The flying toy aircraft of claim 1, wherein at least one propulsion unit comprises contra-rotating propellers.

7. The flying toy aircraft of claim 1, wherein one or more components of the control system are slidably attached to the low pressure channel such that the location of said components of the control system adjusts the pitch of the aircraft during flight.

8. The flying toy aircraft of claim 1, wherein the low pressure channel further comprises a flexible material that enables the low pressure channel to be curved such that the aircraft follows a predetermined flight pattern determined by the curve of the low pressure channel.

9. The flying toy aircraft of claim 1, wherein the timer device further comprises a control unit, the timer device is operably connected to a selector device, and the selector
device is configured to signal the control unit to activate the one or more propulsion units for a predetermined time period.

10. The flying toy aircraft of claim 9, wherein the timer device is configured such that upon receiving a first signal from the selector device the control unit activates a propulsion unit for a first predetermined time period, and upon receiving a second signal from the selector device the control unit activates a propulsion unit for a second time period.

11. The flying toy aircraft of claim 9, wherein the timer device is configured such that upon receiving a signal from a first selector device the control unit activates a propulsion unit for a first predetermined time period, and upon receiving a signal from a second selector device the control unit activates a propulsion unit for a second time period.

12. The flying toy aircraft of claim 9, further comprising a rudder member attached to the low pressure channel and disposed within the wake of the one or more propulsion units.

13. The flying toy aircraft of claim 9, wherein at least one propulsion unit comprises contra-rotating propellers.

14. The flying toy aircraft of claim 9, wherein one or more components of the control system are slidably attached to the low pressure channel such that adjusting the location of said components of the control system adjusts the pitch of the aircraft during flight.

15. The flying toy aircraft of claim 9, wherein the low pressure channel further comprises a flexible material that enables the low pressure channel to be curved such that the aircraft follows a predetermined flight pattern determined by the curve of the low pressure channel.

16. The flying toy aircraft of claim 10, further comprising a rudder member attached to the low pressure channel and disposed within the wake of the one or more propulsion units.

17. The flying toy aircraft of claim 10, wherein at least one propulsion unit comprises contra-rotating propellers.

18. The flying toy aircraft of claim 10, wherein one or more components of the control system are slidably attached to the low pressure channel such that adjusting the location of said components of the control system adjusts the pitch of the aircraft during flight.

19. The flying toy aircraft of claim 10, wherein the low pressure channel further comprises a flexible material that enables the low pressure channel to be curved such that the aircraft follows a predetermined flight pattern determined by the curve of the low pressure channel.

20. The flying toy aircraft of claim 11, wherein one or more components of the control system are slidably attached to the low pressure channel such that adjusting the location of said components of the control system adjusts the pitch of the aircraft during flight.

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