There is disclosed a radio control flying toy in which an airframe can be easily floated and a running direction can be easily controlled. The toy is provided with: an airframe 11 formed into a rectangular plate shape having a flat bottom surface on a lower side; first to fourth propellers 16a, 16b, 16c, and 16d which are disposed in four corners forming at least a quadrangular shape on the lower side of the airframe 11 and which feed air toward a bottom-surface side to float the airframe 11; first to fourth driving means 17a, 17b, 17c, and 17d which drive the first to fourth propellers 16a, 16b, 16c, and 16d, respectively; a control unit 20 which individually controls driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d, respectively; a transmitter 30 for transmitting a control signal for flight from the outside to the control unit 20; and a battery 21 which supplies power to the first to fourth driving means 17a, 17b, 17c, and 17d and the control unit 20.
RADIO CONTROL FLYING TOY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a radio control flying toy which can feed air to an airframe on a bottom-surface side to float the airframe along a flat running plane, thereby freely flying the airframe.

[0003] 2. Description of the Related Art

[0004] Hereafter, Hovercraft (trade name), an air cushion vehicle or the like has been generally known as a ground effect machine or a vehicle which travels utilizing a lift force of an air cushion contained between a bottom surface of an airframe and a running surface such as a ground or water surface on a lower side, or ground effects of wings. As a toy which travels under remote control utilizing a principle of such ground effect machine, the present applicant discloses a technology concerning an air cushion toy in which a skirt portion formed into an expandable/contractible bag shape is attached to a lower peripheral edge of a main body, and air is sucked from the outside by a blower for floating disposed in the main body to introduce the air into a main body bottom part surrounded with the skirt portion. Moreover, the air is introduced into the skirt portion to expand the portion, the main body is accordingly floated, and a blower for propelling is disposed in an upper part of the main body (see, e.g., Japanese Utility Model Publication No. 6-20559 (second to sixth pages, FIGS. 1 to 9)).

[0005] In the conventional air cushion toy, the air is fed into the skirt portion disposed on the main body lower part peripheral edge by the blower for floating disposed in the main body to expand the skirt portion, the air is fed to the bottom part of the main body surrounded with the skirt portion, and the air is circulated between a lower-part side of the expanded skirt portion and a running surface such as a ground surface to float the airframe from the running surface. Therefore, the blower for floating having a large output has been required for uniformly circulating the air required for expanding or floating the skirt portion. To run the main body and freely change a direction, it has been necessary to dispose two blowers for propelling in the upper part of the main body, or install a mechanism which varies an air feed direction by means of one blower for propelling. Therefore, a large driving power supply is required for driving the blower for flying or propelling, and there is a fear that power consumption increases and flight for a long time cannot be performed.

SUMMARY OF THE INVENTION

[0006] The present invention has been developed in view of the above-described situations, and an object thereof is to provide a radio control flying toy capable of easily floating an airframe and simply controlling a running direction.

[0007] To achieve the above-described object, according to the present invention, there is provided a radio control flying toy comprising: an airframe formed into a rectangular plate shape and having a bottom surface which is flat on a lower side; first to fourth propellers which are disposed in four corners forming at least a quadrangular shape on the lower side of the airframe and which feed air to a bottom-surface side to float the airframe; first to fourth driving means for driving the first to fourth propellers, respectively; a control unit which individually controls driving outputs of the first to fourth driving means, respectively; a transmitter which transmits a control signal for flight from the outside to the control unit; and a battery which supplies power to the first to fourth driving means and the control unit. The transmitter transmits the control signal for flight to the control unit, and the control unit individually controls the driving outputs of the first to fourth driving means to change rotation speeds of the first to fourth propellers. Accordingly, the airframe can be easily floated, and the running direction can be easily controlled.

[0008] In the present invention, the airframe is constituted of an upper main body which contains the control unit and the battery and a lower main body disposed under the upper main body and formed into a rectangular plate shape; attaching holes are formed in positions of the four corners forming the quadrangular shape of the lower main body, and the first to fourth propellers are disposed in the attaching holes. The first to fourth propellers can be easily disposed in the attaching holes made in positions of the four corners of the lower main body forming the quadrangular shape.

[0009] In the present invention, the first to fourth propellers include a pair of propellers positioned along one diagonal line of the four corners forming the quadrangular shape of the airframe and rotated in one direction, and a pair of propellers positioned along the other diagonal line and rotated in the other direction. The pair of propellers positioned along one diagonal line and those positioned along the other diagonal line can be rotated in mutually opposite directions to thereby control advancing, back, or swiveling to the left/right.

[0010] In the present invention, the first to fourth propellers include a pair of propellers positioned on the right side of the four corners forming the quadrangular shape of the airframe and rotated in one direction, and a pair of propellers positioned on the left side and rotated in the other direction. The pair of propellers positioned on the right side of the four corners and those positioned on the left side are rotated in the mutually opposite directions to thereby control the advancing, back, or swiveling to the left/right.

[0011] In the present invention, the transmitter has an operation lever for generating a control signal to individually raise or lower the driving outputs of the first to fourth driving means. The operation lever can generate the control signal to individually raise or lower the driving outputs of the first to fourth driving means.

[0012] In the present invention, the operation lever has right and left operation lever which rotate the propellers from a perpendicular state toward one side and the other side, and generates the control signal to individually raise or lower the driving output of any of the first to fourth driving means in response to rotating operations of the right and left operation levers to one side and the other side, respectively. The running can be easily controlled by the operations of the right and left operation levers.

[0013] In the present invention, the transmitter has an operation button for generating a control signal to individually raise or lower the driving outputs of the first to fourth driving means, respectively. The operation button can generate the control signal to individually raise or lower the driving outputs of the first to fourth driving means.
In the present invention, the operation button has four operation buttons corresponding to the first to fourth driving means for front, back, left, and right, respectively. The running can be easily controlled by the operations of four operation buttons.

In the present invention, the radio control flying toy is provided with: the airframe formed into the rectangular plate shape having the bottom surface which is flat on the lower side; the first to fourth propellers which are disposed in the four corners forming at least the quadrangular shape on the lower side of the airframe and which feed the air to the bottom-surface side to float the airframe; the first to fourth driving means for driving the first to fourth propellers, respectively; the control unit which individually controls the driving outputs of the first to fourth driving means, respectively; the transmitter which transmits the control signal for flight from the outside to the control unit; and the battery which supplies the power to the first to fourth driving means and the control unit. Accordingly, the transmitter transmits the control signal for flight to the control unit, and the control unit individually controls the driving outputs of the first to fourth driving means, respectively, to change rotation speeds of the first to fourth propellers. In consequence, the airframe can be easily floated, and the running direction can be easily controlled.

FIG. 1 is a perspective view of a radio control flying toy in a first embodiment of the present invention;

FIG. 2 is a plan view of the radio control flying toy in the first embodiment of the present invention;

FIG. 3 is a sectional view along line A-A of the radio control flying toy of FIG. 2 in the first embodiment of the present invention;

FIG. 4 is a back view of the radio control flying toy in the first embodiment of the present invention;

FIG. 5 is a side view of the radio control flying toy in the first embodiment of the present invention;

FIG. 6 is a bottom plan view of the radio control flying toy in the first embodiment of the present invention;

FIG. 7 is a block diagram showing a control operation of the radio control flying toy in the first embodiment of the present invention;

FIG. 8 is an explanatory view of a state in which the radio control flying toy floats in the first embodiment of the present invention;

FIG. 9 is an explanatory view of a state in which the radio control flying toy moves forwards in the first embodiment of the present invention;

FIG. 10 is an explanatory view of an operation of a transmitter at a time when the radio control flying toy moves forwards in the first embodiment of the present invention;

FIG. 11 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves backwards in the first embodiment of the present invention;

FIG. 12 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels clockwise in the first embodiment of the present invention;

FIG. 13 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels counterclockwise in the first embodiment of the present invention;

FIG. 14 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels counterclockwise in the first embodiment of the present invention;

FIG. 15 is a perspective view of a radio control flying toy in a second embodiment of the present invention;

FIG. 16 is a plan view of the radio control flying toy in the second embodiment of the present invention;

FIG. 17 is an explanatory view of an operation of a transmitter at a time when the radio control flying toy floats in the second embodiment of the present invention;

FIG. 18 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves forwards in the second embodiment of the present invention;

FIG. 19 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves backwards in the second embodiment of the present invention;

FIG. 20 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels clockwise in the second embodiment of the present invention; and

FIG. 21 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels counterclockwise in the second embodiment of the present invention.

One embodiment of the present invention will be described hereinafter in more detail with reference to the drawings. FIGS. 1 to 7 are explanatory views of a constitution of a radio control flying toy in a first embodiment of the present invention. FIG. 1 is a perspective view of the radio control flying toy; FIG. 2 is a plan view of the radio control flying toy; FIG. 3 is a sectional view along line A-A of the radio control flying toy of FIG. 2; FIG. 4 is a back view of the radio control flying toy; FIG. 5 is a side view of the radio control flying toy; FIG. 6 is a bottom plan view of the radio control flying toy; and FIG. 7 is a block diagram showing a control operation of the radio control flying toy.

In these drawings, in the first embodiment of the present invention, a radio control flying toy 10 is a flying toy which can be enjoyed by floating and freely flying the toy above a flat running surface 1 such as a ground or water surface in the outdoor, or a floor surface in the indoor. This radio control flying toy 10 is provided with: an airframe 11; first to fourth propellers 16a, 16b, 16c, and 16d which are disposed in positions of four corners forming a quadrangular shape on the lower side of the airframe 11 so as to feed air toward the running surface 1 below; first to fourth driving means 17a, 17b, 17c, and 17d which drive the first to fourth propellers 16a, 16b, 16c, and 16d, respectively; a control unit 20 which individually controls driving outputs of the
first to fourth driving means 17a, 17b, 17c, and 17d, respectively, and which is disposed in the airframe 11; a transmitter 30 for transmitting a control signal for flight from the outside to the control unit 20; a battery 21 which supplies power to the first to fourth driving means 17a, 17b, 17c, and 17d and the control unit 20.

[0039] The airframe 11 is constituted of an upper main body 12, and a lower main body 13 disposed under the upper main body 12, and they are molded of, for example, lightweight plastic materials or the like, respectively. The upper main body 12 is formed into a forwardly or backwardly elongated case shape along a running direction, a circuit substrate constituting the control unit 20, the battery 21 and the like are contained in the upper main body, and a receiving antenna 22 is attached to an upper portion of the upper main body on a rear side. The lower main body 13 has a flat bottom surface 14 parallel to the running surface 1 on a lower side, front right and left portions of the lower main body in the running direction are protruded forwards into semicircular shapes, rear right and left portions of the lower main body in the running direction are protruded rearwards into semicircular shapes, and the lower main body is entirely formed into a rectangular plate shape. The upper main body 12 is attached to the upper surface of the center of the lower main body 13. Circular attaching holes 15a, 15b, 15c, and 15d are made in the positions of four front, rear, right, and left corners forming the quadrangular shape of the lower main body 13 formed into the rectangular plate shape. The first to fourth propellers 16a, 16b, 16c, and 16d for feeding the air toward the running surface 1 side, respectively, are disposed in these attaching holes 15a, 15b, 15c, and 15d. These first to fourth propellers 16a, 16b, 16c, and 16d are driven by the first to fourth driving means 17a, 17b, 17c, and 17d, respectively. These first to fourth driving means 17a, 17b, 17c, and 17d are electric motors disposed in, for example, central positions of the attaching holes 15a, 15b, 15c, and 15d while driving shafts are protruded downwards, and the first to fourth propellers 16a, 16b, 16c, and 16d are attached to the driving shafts, respectively. These first to fourth driving means 17a, 17b, 17c, and 17d are attached to the corresponding attaching holes 15a, 15b, 15c, and 15d of the lower main body 13 via a plurality of attaching members 18a, 18b, 18c, and 18d formed into plate shapes. That is, these first to fourth driving means 17a, 17b, 17c, and 17d are attached to positions where output shafts provided with the first to fourth propellers 16a, 16b, 16c, and 16d, respectively, are directed perpendicularly downwards in the centers of the corresponding attaching holes 15a, 15b, 15c, and 15d. As shown in FIG. 2, a pair of the first propeller 16a and the fourth propeller 16d is positioned along one diagonal line of four corners forming the quadrangular shape of the airframe 11 are rotated in the same clockwise direction, and a pair of the second propeller 16b and the third propeller 16c is positioned along the other diagonal line of are rotated in the same counterclockwise direction.

[0040] The control unit 20 is a control substrate disposed in the upper main body 12 to control running. As shown in FIG. 7, the control unit is constituted of: a power switch 19; a receiving circuit 23 which receives a control signal transmitted from the transmitter 30 via the antenna 22; a control circuit 24 which generates a control signal based on a signal received from this receiving circuit 23; a driving circuit 25 which controls driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d based on the control signal of this control circuit 24 and the like. The battery 21 disposed inside the upper main body 12 supplies power to the receiving circuit 23, the control circuit 24, the driving circuit 25, and the first to fourth driving means 17a, 17b, 17c, and 17d.

[0041] The transmitter 30 is a unit which transmits a control signal for running to the control unit 20, and is constituted of: a power switch 36; an operating section 33 which operates to control the running; a signal generation circuit 34 which generates a signal based on the operation of this operating section 33; a transmission circuit 31 which transmits a signal from this signal generation circuit 34 as a radio wave; an antenna 35 for transmission; a battery 32 which supplies power to the signal generation circuit 34 or the transmission circuit 31 and the like. As shown in FIG. 1, the transmitter 30 has a case section provided with the antenna 35 for transmission and manually held to operate, and the operating section 33 is provided with a right operation lever 37 and a left operation lever 38 which are to be operated with fingertips and which protrude perpendicularly from the surface of the case section. These right and left operation levers 37 and 38 can be rotated vertically with the fingertips against an urging force of a spring or the like from a state perpendicular to a side (upper side) provided with the antenna 35 and an opposite side (lower side). The right operation lever 37 is a lever for controlling driving outputs of the second driving means 17b and the fourth driving means 17d which are positioned on the right side of the lower main body 13. The left operation lever 38 is a lever for controlling driving outputs of the first driving means 17a and the third driving means 17c which are positioned on the left side of the lower main body 13. When this right operation lever 37 is rotated upwards, the driving output of the fourth driving means 17d is raised from usual 60% to about 100%. When the right operation lever is rotated downwards, the driving output of the second driving means 17b is raised from usual 60% to about 100%. When this left operation lever 38 is rotated upwards, the driving output of the third driving means 17c is raised from usual 60% to about 100%. When the left operation lever is rotated downwards, the driving output of the first driving means 17a is raised from usual 60% to about 100%.

[0042] Next, an operation of the radio control flying toy 10 constituted as described above will be described. FIGS. 8 to 14 are explanatory views of the operation of the radio control flying toy in the first embodiment of the present invention. FIG. 8 is an explanatory view of a state in which the radio control flying toy floats; FIG. 9 is an explanatory view of a state in which the radio control flying toy moves forwards; FIG. 10 is an explanatory view of an operation of a transmitter at a time when the radio control flying toy moves forwards; FIG. 11 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves backwards; FIG. 12 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves backwards; FIG. 13 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels clockwise; and FIG. 14 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels counterclockwise.

[0043] First, to operate the radio control flying toy 10, the flat bottom surface 14 of the lower main body 13 is disposed on the running surface 1. Subsequently, when the power
switch 19 is turned on, the driving circuit 25 of the control unit 20 drive all of the first to fourth driving means 17a, 17b, 17c, and 17d with the equal driving output of 60%, all of the first to fourth propellers 16a, 16b, 16c, and 16d attached to the respective output axes rotate at an equal speed, and air is sent downwards from the respective attaching holes 15a, 15b, 15c, and 15d toward a running surface 1 side. As shown in FIG. 8, the air sent downwards from these attaching holes 15a, 15b, 15c, and 15d is sent between the flat bottom surface 14 of the lower main body 13 and the running surface 1. When the air flows toward a periphery of the lower main body 13, a space is generated in which the air flows between the bottom surface 14 of the lower main body 13 and the running surface 1, and the airframe 11 floats above the running surface 1 in a stopped state. In this case, the first and fourth propellers 16a and 16d positioned along one diagonal line, and the second and third propellers 16b and 16c positioned along the other diagonal line are driven in mutually opposite directions at the equal speed. Therefore, a force for reversing the airframe 11 by rotating the respective first to fourth propellers 16a, 16b, 16c, and 16d is balanced, and the airframe 11 floats above the running surface 1 without swiveling counterclockwise or clockwise. In this case, in the transmitter 30 in which the power switch 36 is turned on, as shown in FIG. 10, the right and left operation levers 37 and 38 of the operating section 33 have perpendicular states without being operated with the finger-tips.

Next, to move forwards the floated radio control flying toy 10, as shown in FIG. 11, when the right and left operation levers 37 and 38 are simultaneously rotated toward an antenna 35 side (upwards) in the operating section 33 of the transmitter 30, the signal generation circuit 34 generates a signal to raise the driving outputs of the third and fourth driving means 17c and 17d from 60% to 100%, and the signal is transmitted from the transmission circuit 31 to the antenna 35. This forward moving signal is received by the receiving circuit 23 via the antenna 22 of the control unit 20, and further transmitted from the control circuit 24 to the driving circuit 25. The driving outputs of the corresponding third and fourth driving means 17c and 17d rise from 60% to 100%. The rises of the driving outputs of these third and fourth driving means 17c and 17d raise rotation speeds of the third and fourth propellers 16c and 16d disposed on the left and right sides. As shown in FIG. 9, a feed air amount on the rear side of the airframe 11 increases to move forwards the airframe 11. In this case, even when the rotation speeds of the third and fourth propellers 16c and 16d on the rear left and right sides rise, the propellers rotate in the mutually opposite directions. Therefore, the force for reversing the airframe 11 is balanced, and the airframe 11 can be moved forwards without swiveling counterclockwise or clockwise.

Next, to move backwards the floated radio control flying toy 10, as shown in FIG. 12, when the right and left operation levers 37 and 38 are simultaneously rotated on a side opposite to the antenna 35 (downwards) in the operating section 33 of the transmitter 30, the signal generation circuit 34 generates a signal to raise the driving outputs of the first and second driving means 17a and 17b as described above from 60% to 100% as described above. On receiving this signal, the driving circuit 25 of the control unit 20 raise the driving outputs of the first and second driving means 17a and 17b, and the rotation speeds of the first and second propellers 16a and 16b disposed on front left and right sides rise. As shown in FIG. 12, when the feed air amount increases on the front left and right sides of the airframe 11, the airframe 11 moves backwards. In this case, even when the rotation speeds of the first and second propellers 16a and 16b rise in the same manner as in the forward movement, the propellers rotate in the mutually opposite directions. Therefore, the force for reversing the airframe 11 is balanced, and the airframe 11 can be moved backwards without swiveling counterclockwise or clockwise.

Next, to swivel clockwise the floated radio control flying toy 10, as shown in FIG. 13, when the right operation lever 37 is rotated downwards with the finger-tip, and the left operation lever 38 is rotated upwards with the finger-tip in the operating section 33 of the transmitter 30, the rotation speeds of the front right second propeller 16b and the rear left first propeller 16a rise in accordance with the rises of the driving outputs of the second and third second driving means 17b and 17c corresponding to the respective levers. Since these second and third propellers 16b and 16c rotate in the same clockwise direction as shown in FIG. 2, the rises of the rotation speeds generate a force for swiveling clockwise the airframe 11. Therefore, the floated airframe 11 can be swiveled clockwise by performing the lever operation shown in FIG. 13. It is to be noted that it has been confirmed that the increase of the feed air amount accompanying the rises of the rotation speeds of the second and third propellers 16b and 16c generates a mutually canceling force, and does not largely influence a clockwise swiveling operation.

Next, to swivel counterclockwise the floated radio control flying toy 10, as shown in FIG. 14, when the right operation lever 37 is rotated upwards with the finger-tip, and the left operation lever 38 is rotated downwards with the finger-tip in the operating section 33 of the transmitter 30, the rotation speeds of the rear right fourth propeller 16d and the rear left first propeller 16a rise in accordance with the rises of the driving outputs of the fourth and first driving means 17d and 17a corresponding to the respective levers. Since these fourth and first propellers 16d and 16a rotate clockwise in the same direction as shown in FIG. 2, the rises of the rotation speeds generate a force for swiveling counterclockwise the airframe 11. Therefore, the floated radio control flying toy 10 can be swiveled counterclockwise by means of the lever operation shown in FIG. 14. It is to be noted that it has been confirmed that the increase of the feed air amount accompanying the rises of the rotation speeds of the fourth and first propellers 16d and 16a does not largely influence a counterclockwise swiveling operation in the same manner as in the clockwise swiveling.

As described above, in the radio control flying toy 10 of the first embodiment of the present invention, information first to fourth propellers 16a, 16b, 16c, and 16d disposed in four corners on the lower side of the airframe 11 to feed the air downwards to the running surface 1 side are driven by the first to fourth driving means 17a, 17b, 17c, and 17d, respectively. A pair of first and fourth propellers 16a and 16d positioned along one diagonal line to form the quadrangular shape of four corners, and the second and third propellers 16b and 16c positioned along the other diagonal line are rotated in the opposite directions. Based on the signal transmitted from the transmitter 30, the control unit 20 controls the driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d, respectively. Moreover, to float the airframe, the first to fourth propellers 16a, 16b, 16c,
..and 16d are rotated at the equal low speed of about 60%. To move the airframe forwards, the rotation speeds of the third and fourth propellers 16c and 16d on the rear left and right sides are raised. To move the airframe backwards, the rotation speeds of the first and second propellers 16a and 16b on the front left and right sides are raised. To swivel the airframe clockwise, the rotation speeds of the second and third propellers 16b and 16c are raised. To swivel the airframe counterclockwise, the rotation speeds of the first and fourth propellers 16a and 16d are raised. Therefore, in the radio control flying toy 10 of the present embodiment, a structure is simplified, a large driving power supply is not required for driving the blower for floating or propelling unlike a conventional air cushion toy, power consumption can be reduced, long-time flight is possible, and the toy can be enjoyed by floating and freely flying the toy above the flat running surface 1.

[0049] In the radio control flying toy 10 of the first embodiment, there has been described the example in which the pair of first and fourth propellers 16a and 16d positioned along one diagonal line are rotated clockwise, and the pair of the second and third propellers 16b and 16c positioned on the other diagonal line are rotated counterclockwise. However, one pair may be rotated counterclockwise whereas the other pair may be rotated clockwise. In this case, the advancing and backing level operations are the same, but the clockwise and counterclockwise swiveling operations are reversed. The driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d are raised from 60% to 100% in accordance with the lever operation of the transmitter 30. However, conversely, even when the driving outputs are lowered from 100% to 60%, the running can be controlled. In this case, the running operation by the same lever operation differs. Furthermore, when only one of the right and left operation levers 37 and 38 are rotated, the swiveling operation can be performed.

[0050] FIGS. 15 and 16 are explanatory views of a constitution of a radio control flying toy in a second embodiment of the present invention. FIG. 15 is a perspective view of the radio control flying toy, and FIG. 16 is a plan view of the radio control flying toy. It is to be noted that components and members corresponding to those of the first embodiment are denoted with the same reference numerals, and detailed description thereof is omitted.

[0051] In the second embodiment of the present invention, a radio control flying toy 40 is provided with: first to fourth propellers 16a, 16b, 16c, and 16d which are disposed in four corners forming a quadrangular shape of a lower main body 13 on a lower side of an airframe 11, respectively; first to fourth driving means 17a, 17b, 17c, and 17d which drive the first to fourth propellers 16a, 16b, 16c, and 16d, respectively; a control unit 20 which individually controls driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d, respectively; a battery 21 which supplies power to the first to fourth driving means 17a, 17b, 17c, and 17d and the control unit 20; a transmitter 50 for transmitting a control signal for flight by a button operation from the outside to the control unit 20 and the like in the same manner as in the first embodiment. Unlike the first embodiment, in the radio control flying toy 40, the first and third propellers 16a and 16c on the left side are rotated in the same counterclockwise direction, and the second and fourth propeller 16b and 16d on the right side are rotated in the same clockwise direction.

As shown in FIG. 15, the transmitter 50 has a case section provided with an antenna 35 for transmission and manually held to operate, and the operating section 33 is provided with four operation buttons 51, 52, 53, and 54 which are to be operated horizontally and vertically with fingertips. These operation buttons 51, 52, 53, and 54 are individually pressed, respectively, to transmit a signal to raise the driving outputs of the corresponding first to fourth driving means 17a, 17b, 17c, and 17d from usual 60% to about 100%, and another circuit constitution is similar to that of the transmitter 30 of the first embodiment.

[0052] Next, an operation of the radio control flying toy 40 constituted as above will be described. FIGS. 17 to 21 are explanatory views of the operation of the radio control flying toy in the second embodiment. FIG. 17 is an explanatory view of an operation of a transmitter at a time when the radio control flying toy floats; FIG. 18 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves forward; FIG. 19 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy moves backwards; FIG. 20 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels clockwise; and FIG. 21 is an explanatory view of an operation of the transmitter at a time when the radio control flying toy swivels counterclockwise.

[0053] First, to operate the radio control flying toy 40, when a power switch 19 is turned on, all of the first to fourth driving means 17a, 17b, 17c, and 17d are driven with the equal driving output of 60%, all of the first to fourth propellers 16a, 16b, 16c, and 16d are rotated at an equal speed, a space is generated in which air flows between the bottom surface 14 and a running surface 1, and the airframe 11 floats above the running surface 1 in a stopped state in the same manner as in the first embodiment. In this case, the first and third propellers 16a and 16c on the left side are rotated counterclockwise, and the second and fourth propeller 16b and 16d are rotated clockwise. Therefore, a force for reversing the airframe 11 is balanced, and the airframe 11 floats on the spot without swiveling counterclockwise or clockwise. In this case, in the transmitter 50, as shown in FIG. 17, any of the operation buttons 51, 52, 53, and 54 of the operating section 33 are not operated (not pressed).

[0054] Next, to move forwards the floated radio control flying toy 40, as shown in FIG. 18, the operation buttons 53 and 54 on a lower side are simultaneously operated with fingertips in the operating section 33 of the transmitter 50 (in FIG. 18, buttons to be operated are shown by arrows. This also applies to the following description of the button operation with reference to the drawings). When the buttons are operated in this manner, the driving outputs of the corresponding third and fourth driving means 17c and 17d rise from 60% to 100%, rotation speeds of the second and fourth propeller 16b and 16d disposed on rear left and right sides rise, and the airframe 11 moves forwards in the same manner as in the first embodiment. In this case, even when the rotation speeds of the third and fourth propellers 16c and 16d on the rear left and right sides rise, the propellers rotate in the mutually opposite directions. Therefore, the force for reversing the airframe 11 is balanced, and the airframe 11 can be moved forwards without swiveling counterclockwise or clockwise.
Next, to move backwards the floated radio control flying toy 40, as shown in FIG. 19, the upper operation buttons 51 and 52 are simultaneously operated in the operating section 33 of the transmitter 50. When the buttons are operated in this manner, the driving outputs of the corresponding first and second driving means 17a and 17b rise from 60% to 100%, the rotation speeds of the first and second propellers 16a and 16b are disposed on front left and right sides, and the airframe 11 moves backwards in the same manner as in the first embodiment. In this case, even when the rotation speeds of the first and second propellers 16a and 16b on the front left and right sides rise, the propellers rotate in the mutually opposite directions. Therefore, the force for reversing the airframe 11 is balanced, and the airframe 11 can be moved backwards without swiveling.

Next, to swivel clockwise the floated radio control flying toy 40, as shown in FIG. 20, both or one of the left operation buttons 51 and 53, for example, the lower operation button 53 is operated with the fingertip in the operating section 33 of the transmitter 50. When the button is operated in this manner, the driving output of the corresponding third driving means 17c rises from 60% to 100%, and the rotation speed of the third propeller 16c rises. This rise of the rotation speed of the third propeller 16c generates a force to swivel the third propeller 16c in a clockwise direction opposite to the counterclockwise rotating direction in the airframe 11. Therefore, as shown in FIG. 20, the floated radio control flying toy 40 can be swiveled clockwise by operating the button. In this case, since a force to move the airframe 11 is simultaneously added owing to the increase of the air feed amount accompanying the rise of the rotation speed of the third propeller 16c, an operation different from that in clockwise swiveling of the first embodiment is performed. It is to be noted that in a case where both of the left operation buttons 51 and 53 are operated, the air feed amount increases accompanying the rises of the rotation speeds of the first and third propellers 16a and 16c, and a clockwise swiveling operation is confirmed after the airframe 11 moves rightwards.

Next, to swivel the floated radio control flying toy 40 counterclockwise, as shown in FIG. 21, both or one of the right operation buttons 52 and 54, for example, the lower operation button 54 is operated with the fingertip in the operating section 33 of the transmitter 50. When the button is operated in this manner, the driving output of the corresponding fourth driving means 17d rises from 60% to 100%, and the rotation speed of the third propeller 16d rises. This rise of the rotation speed of the fourth propeller 16d generates a force to swivel the fourth propeller 16d in a counterclockwise direction opposite to the clockwise rotating direction in the airframe 11. Therefore, as shown in FIG. 21, the floated radio control flying toy 40 can be swiveled counterclockwise by operating the button. In this case, since a force to move the airframe 11 is simultaneously added owing to the increase of the air feed amount accompanying the rise of the rotation speed of the fourth propeller 16d, an operation different from that in the counterclockwise swiveling of the first embodiment is performed. It is to be noted that in a case where both of the right operation buttons 52 and 54 are operated, the air feed amount increases accompanying the rises of the rotation speeds of the right second and fourth propeller 16b and 16d, and a counterclockwise swiveling operation is confirmed after the airframe 11 moves leftwards.

As described above, in the radio control flying toy 40 of the second embodiment of the present invention, the first to fourth propellers 16a, 16b, 16c, and 16d are to be driven by the first to fourth driving means 17a, 17b, 17c, and 17d corresponding to the operation buttons 51, 52, 53, and 54 from usual 60% to about 100%. Therefore, when the driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d are individually changed by the operation buttons 51, 52, 53, and 54, the forward moving, backward moving, and counterclockwise and clockwise swiveling can be performed. The toy can be floated above the flat running surface 1, freely floated, and enjoyed in the same manner as in the first embodiment.

In the radio control flying toy 40 of the second embodiment, there has been described the example in which the left first and third propellers 16a and 16c are rotated in the same counterclockwise direction, and the right second and fourth propeller 16b and 16d are rotated in the same clockwise direction. However, the left propellers may be rotated in the same clockwise direction whereas the right propellers may be rotated in the same counterclockwise direction. In this case, the button operations for the forward and backward movements are the same, but the clockwise swiveling operation is opposite to the counterclockwise swiveling operation. The driving outputs of the first to fourth driving means 17a, 17b, 17c, and 17d are raised from 60% to 100% in accordance with the lever operation of the transmitter 30, but the driving outputs may be conversely lowered from 100% to 60%. In this case, the running operation by the same lever operation differs.

It is to be noted that in the first and second embodiments, the airframe 11 may be formed into an arbitrary shape as long as the airframe has the flat bottom surface 14 parallel to the running surface 1 on the lower side, and is entirely formed into the rectangular plate shape, and the first to fourth propellers 16a, 16b, 16c, and 16d are disposed in four corners forming quadrangular shape, respectively. Moreover, the operation levers 37, 38 of the transmitter 30 of the first embodiment, and the operation buttons 51, 52, 53, and 54 of the transmitter 50 of the second embodiment may be constituted so as to be operated to thereby raise or lower the driving outputs of the corresponding first to fourth driving means 17a, 17b, 17c, and 17d, respectively. Furthermore, the radio control flying toy 10 of the first embodiment can be operated with the transmitter 50 in the same manner as in the second embodiment, and the radio control flying toy 40 of the second embodiment can be operated with the transmitter 30 in the same manner as in the first embodiment.

The present invention is applicable to a radio control flying toy in which air is fed toward a bottom-surface side of an airframe so that the airframe can be floated above a flat running surface, and freely floated.

What is claimed is:
1. A radio control flying toy comprising:
an airframe formed into a rectangular plate shape and having a bottom surface which is flat on a lower side;
first to fourth propellers which are disposed in four corners forming at least a quadrangular shape on the lower side of the airframe and which feed air to a bottom-surface side to float the airframe;

first to fourth driving means for driving the first to fourth propellers, respectively;

a control unit which individually controls driving outputs of the first to fourth driving means, respectively;

a transmitter which transmits a control signal for flight from the outside to the control unit; and

a battery which supplies power to the first to fourth driving means and the control unit.

2. The radio control flying toy according to claim 1, wherein the airframe is constituted of an upper main body which contains the control unit and the battery and a lower main body disposed under the upper main body and formed into a rectangular plate shape, attaching holes are made in positions of the four corners forming the quadrangular shape of the lower main body, and the first to fourth propellers are disposed in the attaching holes.

3. The radio control flying toy according to claim 1, wherein the first to fourth propellers include a pair of propellers positioned along one diagonal line of the four corners forming the quadrangular shape of the airframe and rotated in one direction, and a pair of propellers positioned along the other diagonal line and rotated in the other direction.

4. The radio control flying toy according to claim 1, wherein the first to fourth propellers include a pair of propellers positioned on the right side of the four corners forming the quadrangular shape of the airframe and rotated in one direction, and a pair of propellers positioned on the left side and rotated in the other direction.

5. The radio control flying toy according to claim 1, wherein the transmitter has an operation lever for generating a control signal to individually raise or lower the driving outputs of the first to fourth driving means.

6. The radio control flying toy according to claim 5, wherein the operation lever has right and left operation levers which rotate the propellers from a perpendicular state toward one side and the other side, and generates the control signal to individually raise or lower the driving output of any of the first to fourth driving means in response to rotating operations of the right and left operation levers to one side and the other side, respectively.

7. The radio control flying toy according to claim 1, wherein the transmitter has an operation button for generating a control signal to individually raise or lower the driving outputs of the first to fourth driving means, respectively.

8. The radio control flying toy according to claim 7, wherein the operation button has four operation buttons corresponding to the first to fourth driving means for front, back, left, and right, respectively.

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