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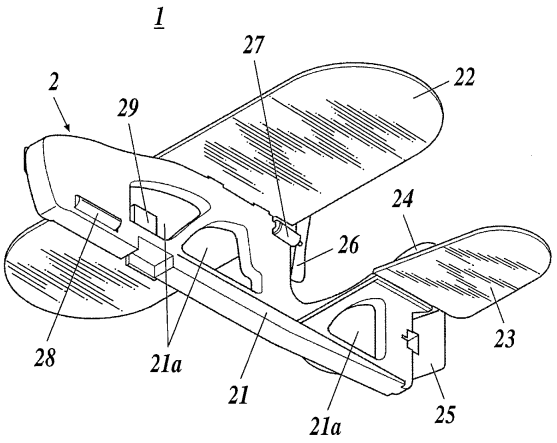
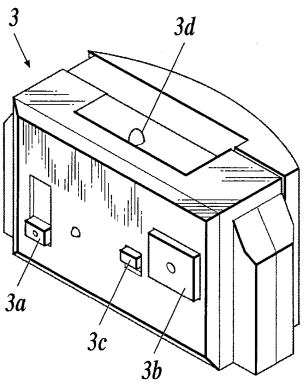
(54) **Aircraft toy**

(57) An aircraft toy includes an aircraft toy body (2) which receives a control data in an infrared ray which is transmitted from a controller (3) by an infrared sensor module (29) and flies according to the control data; and a chip composing the infrared sensor module (200a) is attached on a front surface of a substrate (29), the substrate includes a translucent portion which passes the infrared ray from a rear side of the substrate, and the chip (200a) is attached to the translucent portion of the substrate.

FIG.1





EP 1 878 478 A1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an aircraft toy, and more particularly to an aircraft toy comprising an aircraft toy body which flies by an infrared control data.

Description of the Related Art

[0002] Conventionally, an aircraft toy which comprises an aircraft body and a controller for operating the aircraft body is known as an aircraft toy. This aircraft toy is constructed so that the aircraft body is made to fly in a straight line or in a circle by an infrared control data from the controller (for example, JP7-40897A).

[0003] Concerning this aircraft toy, the main body of the aircraft body is formed with foamed resin.

[0004] In the aircraft toy in which the main body of the aircraft body is formed with foamed resin, an infrared sensor module which receives the infrared control data is generally attached to a fuselage. In this case, a chip which composes the infrared sensor module is attached to the fuselage via a substrate.

[0005] In the case of the above described aircraft toy, there is a need to make the infrared control data from the controller be receivable regardless of the direction in which the aircraft toy body is located with respect to the controller.

[0006] However, there are cases where the infrared sensor module cannot receive the infrared control data when the infrared control data is transmitted from a side of the surface (rear surface) of the aircraft toy body which is opposite of the surface (front surface) of the aircraft toy body to which the chip composing the infrared sensor module is attached.

[0007] In such case, the aircraft toy body becomes temporarily inoperable.

SUMMARY OF THE INVENTION

[0008] In view of the above problem, an object of the present invention is to provide an aircraft toy which can surely receive a control data of infrared ray.

[0009] In accordance with a first aspect of the present invention, an aircraft toy comprises an aircraft toy body which receives a control data in an infrared ray which is transmitted from a controller by an infrared sensor module and flies according to the control data; and a chip composing the infrared sensor module is attached on a front surface of a substrate, the substrate comprises a translucent portion which passes the infrared ray from a rear side of the substrate, and the chip is attached to the translucent portion of the substrate. In such case, the adhesive agent which adheres the chip is preferably transparent. Further, the electrode pattern for electrically connecting the chip is preferably translucent. However, in case where the electrode pattern is not made to be translucent, there is a need to compose the electrode pattern in a lattice pattern so that the light passing from the rear side of the substrate is not blocked. The translucent portion may be formed by forming holes on the substrate.

[0010] Preferably, a fuselage of the aircraft toy body is constructed in a thin plate shape and is constructed so that both of principal surfaces face a left and a right of the aircraft toy body, and the substrate is attached to the fuselage so that the both of principal surfaces face the left and the right of the aircraft toy body.

[0011] According to the present invention, the chip which composes the infrared sensor module is attached to the translucent part of the substrate. Therefore, the infrared control data from the side of the surface (front surface) of the aircraft toy body to which the chip composing the infrared sensor module is attached and the infrared control data from the side of the surface (rear surface) of the aircraft toy body which is opposite of the surface to which the chip is attached can be received surely.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will be fully understood from the detailed description given hereinafter and the accompanying drawings given by way of illustration only, and thus are not intended as a definition of the limits of the present invention, wherein:

FIG. 1 is a perspective view showing an outer appearance of an aircraft toy to which the present invention is applied;
FIG. 2 is a plan view of an aircraft toy;
FIGS. 3A and 3B are diagrams showing the structure of a tail unit of an aircraft toy;
FIG. 4 is a block diagram showing the circuit structure of a controller;
FIG. 5 is a block diagram showing the circuit structure of an aircraft body of an aircraft toy;
FIG. 6 is a diagram showing steps of a manufacturing method of a foamed molded body; and
FIG. 7 is a diagram of a substrate in a state where an infrared sensor module is attached.

PREFERRED EMBODIMENT OF THE INVENTION

[0013] Hereinafter, an aircraft toy according to the present invention will be described with reference to the drawings.

[0014] FIG. 1 is a perspective view of an aircraft toy; FIG. 2 is a plan view of an aircraft body; FIGS. 3A and 3B are diagrams showing the attachment arrangement of a rudder; Fig. 4 is a block diagram showing the circuit structure of a controller; and FIG. 5 is a block diagram showing the circuit structure of an aircraft body.

(Overall structure of the aircraft toy)

[0015] As shown in FIG. 1, an aircraft toy 1 comprises an aircraft body 2 and a controller 3. The aircraft body 2 is operated by the controller 3, and for example, the aircraft body 2 can be flown in a small space such as inside of a room or the like. In such case, the flight speed of the aircraft body 2 can be adjusted by the controller 3, and the aircraft body 2 is allowed to fly in a left circle and a right circle by the controller 3.

(Structure of the aircraft body)

1. Overall

[0016] The main body of the aircraft body 2 comprises a fuselage 21, a main wing 22, a horizontal tail 23, a trimtab 24, and a rudder 25. The above components are composed of foamed resin molded bodies. Concerning the aircraft toy 1 of the embodiment, polystyrene is used as a material of the foamed resin molded body, for example. The manufacturing method of the foamed molded body will be described later.

2. Main wing

[0017] In the aircraft body 2 of the embodiment, the main wing 22 is a left and right integrated type. The main wing 22 is attached above the front part of the fuselage 21. However, the main wing 22 may be the left and right integrated type which is to be attached to the fuselage 21 by being inserted in a slit formed on the fuselage 21. Further, the main wing 22 may be a left and right separated type in which the left wing and the right wing are to be attached to the left side and the right side of the fuselage 21, respectively. Moreover, the main wing 22 may be attached under the front part of the fuselage 21.

3. Fuselage

[0018] In the aircraft body 2 of the embodiment, the fuselage 21 to which the main wing 22 is attached is not specifically limited, and the fuselage 21 is constructed by pasting two foamed plastic thin plates together from the left and the right. A plurality of through holes 21a which penetrate the fuselage 21 in the left-and-right direction are formed on the fuselage 21. In such way, the weight of the aircraft body 2 is reduced. In the fuselage 21, a rear side of the part to which the main wing 22 is attached is in a notched shape at an upper part thereof. A motor 27 for propeller drive is attached to the fuselage 21 so that a propeller 26 positions at the notched part. The motor 27 for propeller drive is driven and controlled according to the control data from the controller 3. In the aircraft body 2 of the embodiment, the propeller 26 is constructed so as to rotate in the clockwise direction when seen from the rear of the aircraft body 2. By all means, the propeller 26 may rotate in the counterclockwise direction. Further, it is needless to say that the propeller 26 may be attached at the front end of the fuselage 21.

[0019] Moreover, the rear portion of the notched part functions as a vertical tail in the fuselage 21.

4. Horizontal tail

[0020] The horizontal tail 23 is attached above the rear end of the fuselage 21. Although it is not specifically limited, in the aircraft body 2 of the embodiment, the horizontal tail 23 is constructed so that the left wing and the right wing are integrated. A notch 23a is formed at a center in a left-and-right direction of the rear edge of the horizontal tail 23. The notch 23a is left-right asymmetric when seen as a plan view. The notch 23a is to regulate the left and the right rudder angles of the rudder 25, and the edge of the notch 23a composes a stopper when the rudder 25 moves.

[0021] The trimtab 24 formed in a vertical tail-like shape is attached on an upper surface of the horizontal tail 23 so as to project upward.

5. Trimtab

[0022] The trimtab 24 is attached to the fuselage 21 in a state of being slanted with respect to the central axis of the fuselage 21 so that, compared with the front part of the trimtab 24 in the direction of flight, the rear part of the timtab 24 in the direction of flight be away from either the left or the right side of the aircraft body 2 in which the propeller slipstream is stronger. Concerning the propeller aircraft toy 1 of the embodiment, the propeller 26 rotates in the clockwise direction when seen from the rear of the aircraft body 2. Because the propeller slipstream is stronger in the right side of the aircraft body 2, the trimtab 24 is attached to the fuselage 21 in a state of being slanted with respect to the fuselage 21, so that the rear end of the trimtab 24 in the direction of flight shifts to the left side of the aircraft body 2 comparing to the front end of the trimtab 24 in the direction of flight, when the aircraft body 2 is seen from above.

6. Rudder

[0023] The rudder 25 is attached at a rear end of the fuselage 21. As shown in FIG. 3, the rudder 25 is linked to a vertical shaft 21b which is attached to the fuselage 21. That is, one end of the linkage member 25a is fixed to the rudder 25. The linkage member 25a is inserted into a coil C which is attached to the fuselage 21, and the other end of the linkage member 25a engages with the vertical axis 21b. The linkage member 25a is composed of a non-magnetic body, and a permanent magnet 25b is attached to the part of the linkage member 25a which is inserted into the coil C. The permanent magnet 25b is attached to the linkage member 25a so that either the N pole or the S pole faces either the left side or the

right side of the aircraft body 2 and the other of the N pole or the S pole faces the other side of the aircraft body 2. When the electric current flows in the coil C, the rudder 25 is to move in either the left or the right direction according to the current direction.

[0024] The upper end of the rudder 25 projects from the notch 23a of the horizontal tail 23. When the rudder 25 moves in a left-and-right direction, the movement of the rudder 25 is to be regulated by the edges of the notch 23a. In such case, the notch 23a is constructed so that the maximum rudder angle in either the left side or the right side of the aircraft body in which the propeller slipstream is stronger is smaller comparing to the maximum rudder angle in the other side of the aircraft body. Concerning the propeller aircraft toy 1 of the embodiment, the propeller 26 rotates in the clockwise direction when the aircraft body 2 is seen from the rear. Because the propeller slipstream is stronger in the right side of the aircraft body 2, the notch 23a is formed so that the maximum rudder angle in the right side of the aircraft body 2 is smaller comparing to the maximum rudder angle in the left side of the aircraft body 2.

7. Manufacturing method of the foamed molded body (FIG. 6)

[0025] A manufacturing method of the foamed molded body having a thickness of 2mm, for example, will be described. First, the primary foaming is carried out for resin beads by using a foaming machine which is different from the mold. In this case, for example, resin beads having diameters between 0.3mm and 0.8mm are used. The resin beads are made into resin beads of 3mm in diameter. Next, the resin beads for which the primary foaming is carried out are introduced in the cavity in a state where a space is provided between the matching surfaces of each mold which are used for the secondary foaming.

[0026] Subsequently, the molds are clamped after filling the cavity with the resin beads for which the primary foaming is carried out. That is, the matching surfaces of each mold are made to be in contact with one another completely. In such way, spaces between the resin beads become smaller. In this condition, the secondary foaming is carried out for the resin beads and the resin beads are molded. Accordingly, foamed molded bodies formed in thin plates having high foaming ratio and which are homogeneous can be obtained.

[0027] As described above, by filling the cavity with the resin beads for which the primary foaming is carried out in a state where the matching surfaces of each mold are separated from one another, even the resin beads which are larger than the space thickness of the cavity (2mm; the space thickness in a clamped condition) can fill the cavity. Further, the above case is advantageous comparing to the case where the cavity is filled with the resin beads in a clamped condition because the cavity can be surely filled with the resin beads for which the primary foaming is carried out even when the resin beads which are smaller than the space thickness (2mm) of the cavity is used. For example, in a case where the cavity is filled with the resin beads in a clamped condition, the mold cannot be surely filled unless the resin beads are made to be about 1mm in diameter by reducing the ratio of primary foaming when the space thickness of the cavity is about 2mm. Further, when the secondary foaming is carried out while the cavity is not surely filled with the resin beads, the molded body will be full of holes. Meanwhile, when the resin beads for which the primary foaming is carried out are introduced in the cavity in a state where a space is provided between the matching surfaces of each mold which are to be used for the secondary foaming, even the resin beads having diameter of more than 1mm can surely fill the cavity.

[0028] When the main wing 22 composed of the foamed molded body is made according to the above described method, a main wing of 22.8 cubic centimeters in volume and 0.36g in weight (that is, 0.0157g per 1 cubic centimeter) was obtained.

8. Other

[0029] For example, a battery 28 such as an electrolytic double layer capacitor or the like is attached at the front end of the fuselage 21. Further, a substrate 29 to which various types of electronic/electrical parts and electronic/electrical circuits are provided is attached to the fuselage 21. A terminal 27 to charge the power source 28 is provided on the substrate 29.

(Construction of the controller 3)

[0030] FIG. 1 shows the controller 3. A knob 3a for controlling the propeller and a knob 3b for controlling the rudder are provided on the controller 3. Among them, the knob 3a for controlling the propeller is to control the rotating speed of the propeller 26. Meanwhile, the knob 3b for controlling the rudder is to move the rudder 25 in the left-and-right direction. Further, a power switch 3c and an infrared LED 3d are provided on the controller 3.

[0031] FIG. 4 is a block diagram showing the circuit structure of the controller 3. As shown in FIG. 4, the controller 3 comprises an IC 300 for control, an input unit 301, an IC 302 for infrared remote control transmission, an amplifier 303, a transmission unit 304, and a charging unit 305. Among the above, the charging unit 305 is to charge the battery 28 (for example, an electrolytic double layer capacitor) of the aircraft body 2. Here, though it is not shown in the drawing, a battery which is the power source is installed in the controller 3.

[0032] Here, the input unit 301 comprises the knob 3a for controlling the propeller and the knob 3b for controlling the rudder. The IC 300 for control comprises a ROM and a RAM which are omitted from the drawing. The IC 300 for control generates the control data based on operation information which is input from the input unit 301. The IC

302 for infrared remote control transmission encodes and modulates the control data which is generated by the IC 300 for control according to a given rule. The amplifier 303 amplifies the control data which is modulated by the IC 302 for infrared remote control transmission, and the transmission unit 304 transmits the control data which is amplified by the amplifier to the aircraft body 2. The transmission unit 304 comprises the infrared LED 3d.

(Circuit structure of the aircraft body 2)

[0033] The circuit structure of the aircraft body 2 is shown in FIG. 5. As shown in FIG. 5, the aircraft body 2 comprises an infrared sensor module 200a, an IC 200b for receiving an infrared remote control, an IC 201 for control, a motor drive unit 202, and a coil drive unit 203. The infrared sensor module 200a comprises a receiving unit such as a photoconductive diode, a phototransistor, or the like which receives the infrared control data, an amplifying unit to amplify the infrared control data which is received by the receiving unit, and a detection unit to detect the infrared control data which is amplified by the amplifying unit. The infrared sensor module 200a is composed by one chip. The IC 200b for receiving the infrared remote control comprises a registor to temporarily store the infrared control data which is detected by the detection unit, a clock generating unit to generate a control clock, and a decoder to decode the data which is encoded according to a given rule (encoded data) . The IC 201 for control comprises a CPU, a ROM, and a RAM, which are omitted from the drawing. Further, the IC 201 for control stores the control data in the RAM, and controls the movement of the aircraft body 2 according to the program in the ROM. The motor drive unit 202 stops the driving of the motor M for propeller drive according to an order from the IC 201 for control, starts the driving of the motor, and changes the rotation speed of the motor. Meanwhile, the coil drive unit 203 stops supplying the power to the coil C for rudder drive, starts supplying the power to the coil C, and changes the direction of the electricity current which supplies electricity to the coil C according to an order of the IC 201 for control.

[0034] Here, as shown in FIG. 7, the infrared sensor module 200a, the IC 200b for receiving the infrared remote control, and the IC 201 for control are adhered to the substrate 29. The substrate 29 is attached to the fuselage 21 so that both of the principal surfaces face the left and the right of the aircraft body 2. In the embodiment, a material such as glass epoxy is used as the substrate 29, for example, and a substrate in which the thickness is about 0. 4mm is used. Therefore, the substrate 29 allows the infrared ray to pass through.

[0035] In such case, the chips which compose the infrared sensor module 200a and the IC 200b for receiving the infrared remote control, respectively, are adhered to the substrate 29 by a transparent resin adhesive agent (for example, transparent epoxy resin) and are coated with transparent resin. Further, an electrode pattern 29a which is formed on the substrate 29 is in a lattice pattern. Concerning the watermarked part of the lattice pattern, it is constructed so as not to block the light passing though from the rear side of the substrate 29. Therefore, the infrared control data from the side of the surface (front surface) of the aircraft toy body to which the chip composing the infrared sensor module 200a is attached and the infrared control data from the side of the opposite surface (rear surface) can be received surely.

[0036] Moreover, the IC 201 for control is coated with resin for blocking ultraviolet ray (for example, black epoxy resin).

[0037] Here, each chip and the electrode pattern are electrically connected directly or via a wire.

[0038] The embodiment of the present invention is described above. However, the present invention is not limited to the embodiment, and can be variously modified within the gist of the invention.

[0039] The entire disclosures of Japanese Patent Application No. 2006-191824 filed on July 12, 2006 including specification, claims, drawings and abstract thereof are incorporated herein by reference in its entirety.

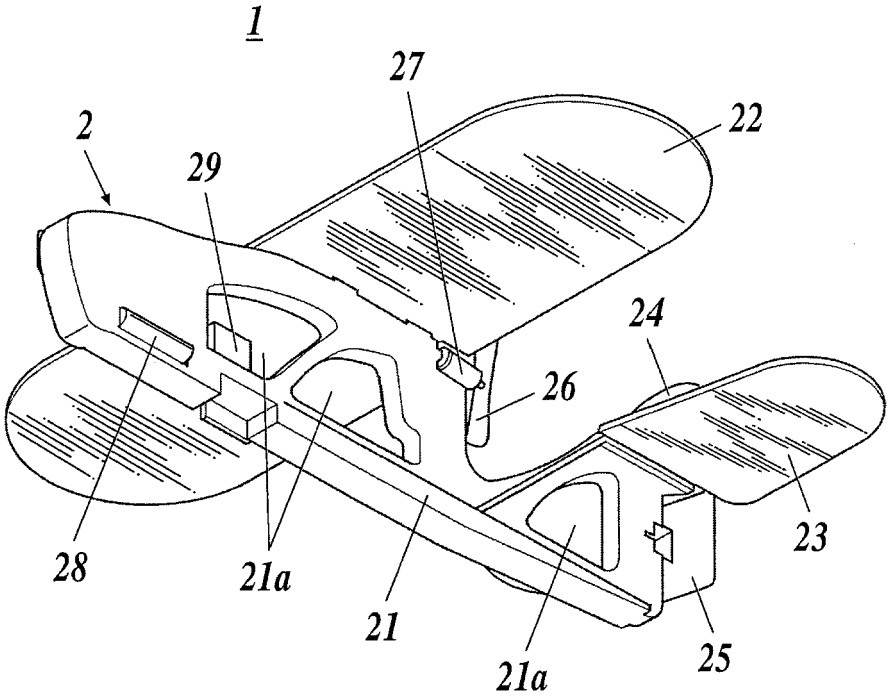
Claims

1. An aircraft toy, comprising:

   an aircraft toy body which receives a control data in an infrared ray which is transmitted from a controller by an infrared sensor module and flies according to the control data, wherein
   a chip composing the infrared sensor module is attached on a front surface of a substrate, and
   the substrate comprises a translucent portion which passes the infrared ray from a rear side of the substrate, and
   the chip is attached to the translucent portion of the substrate.

2. The aircraft toy as claimed in claim 1, wherein
   a fuselage of the aircraft toy body is constructed in a thin plate shape, and is constructed so that both of principal surfaces face a left and a right of the aircraft toy body, and
   the substrate is attached to the fuselage so that the both of principal surfaces face the left and the right of the aircraft toy body.

FIG.1



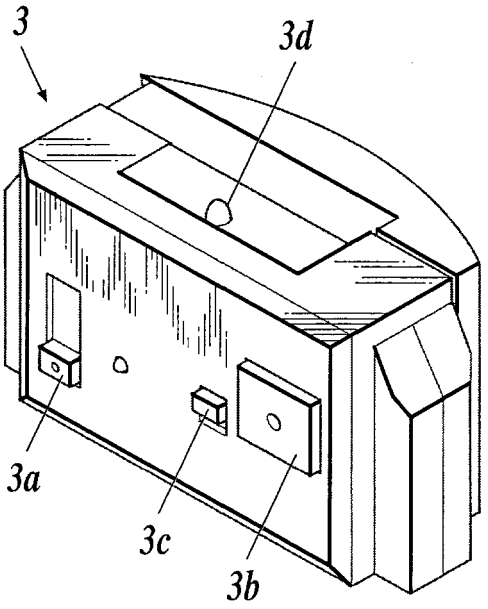


FIG.2

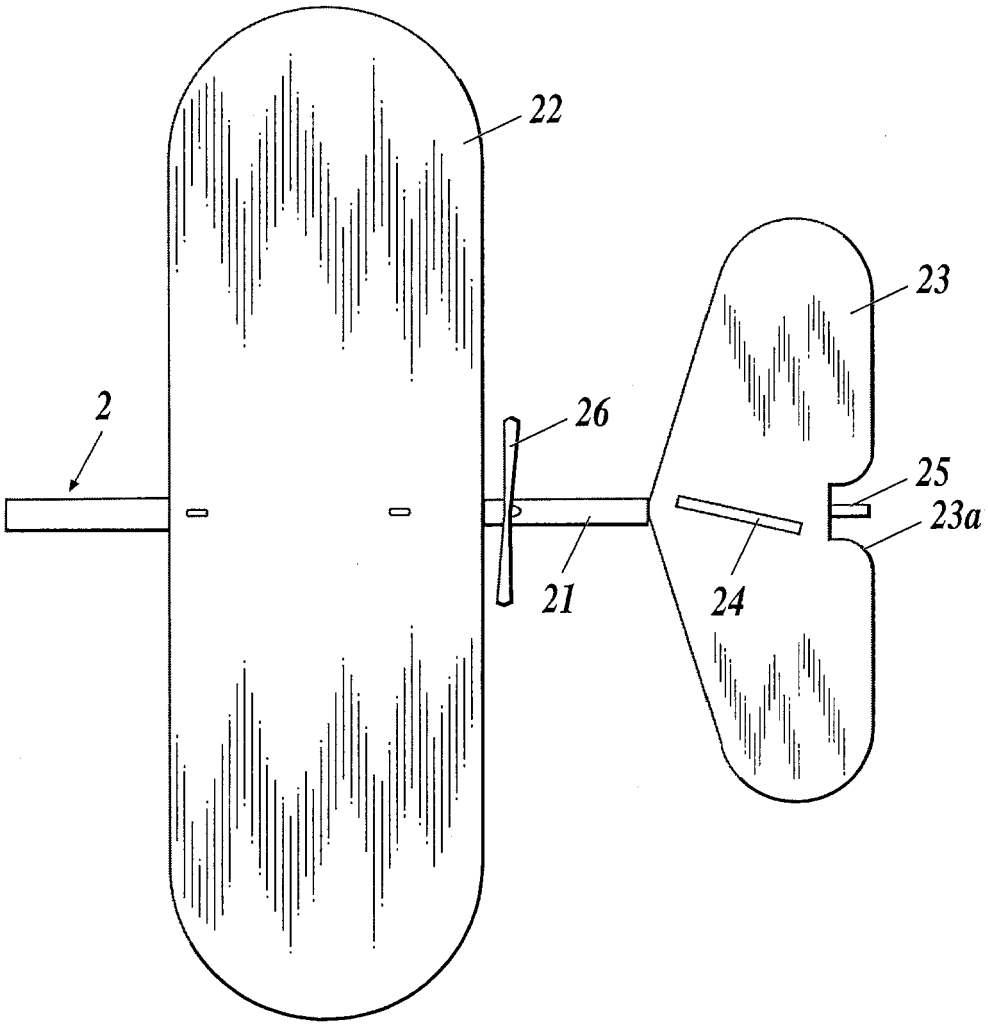


FIG.3A

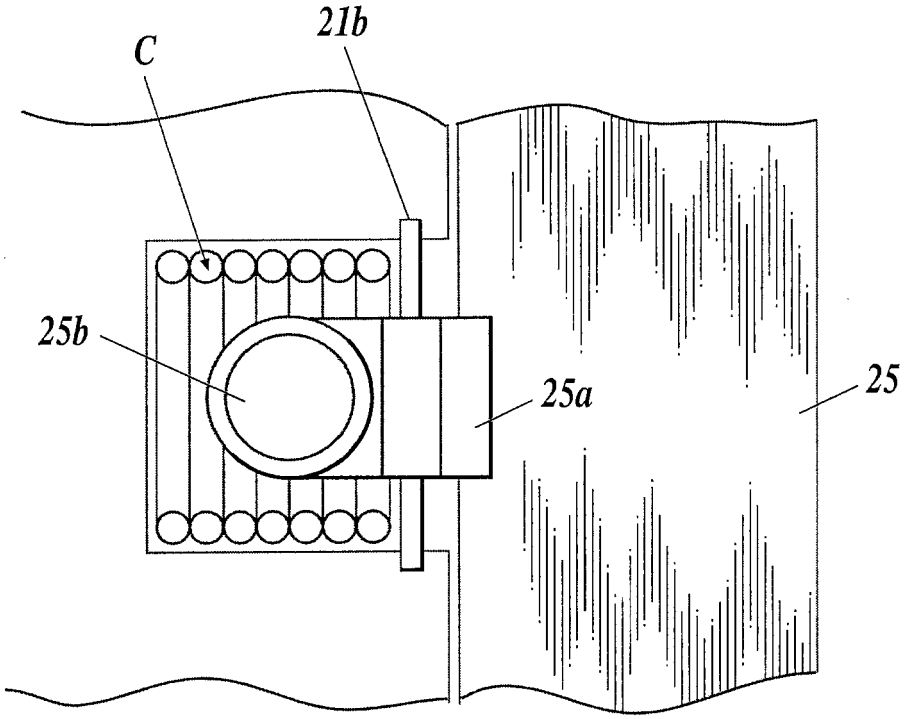


FIG.3B

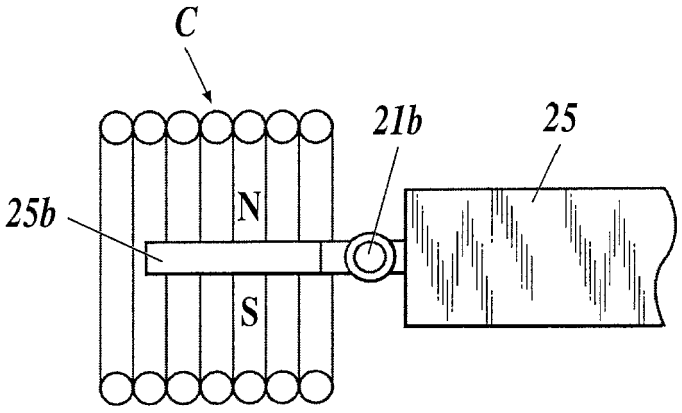


FIG.4

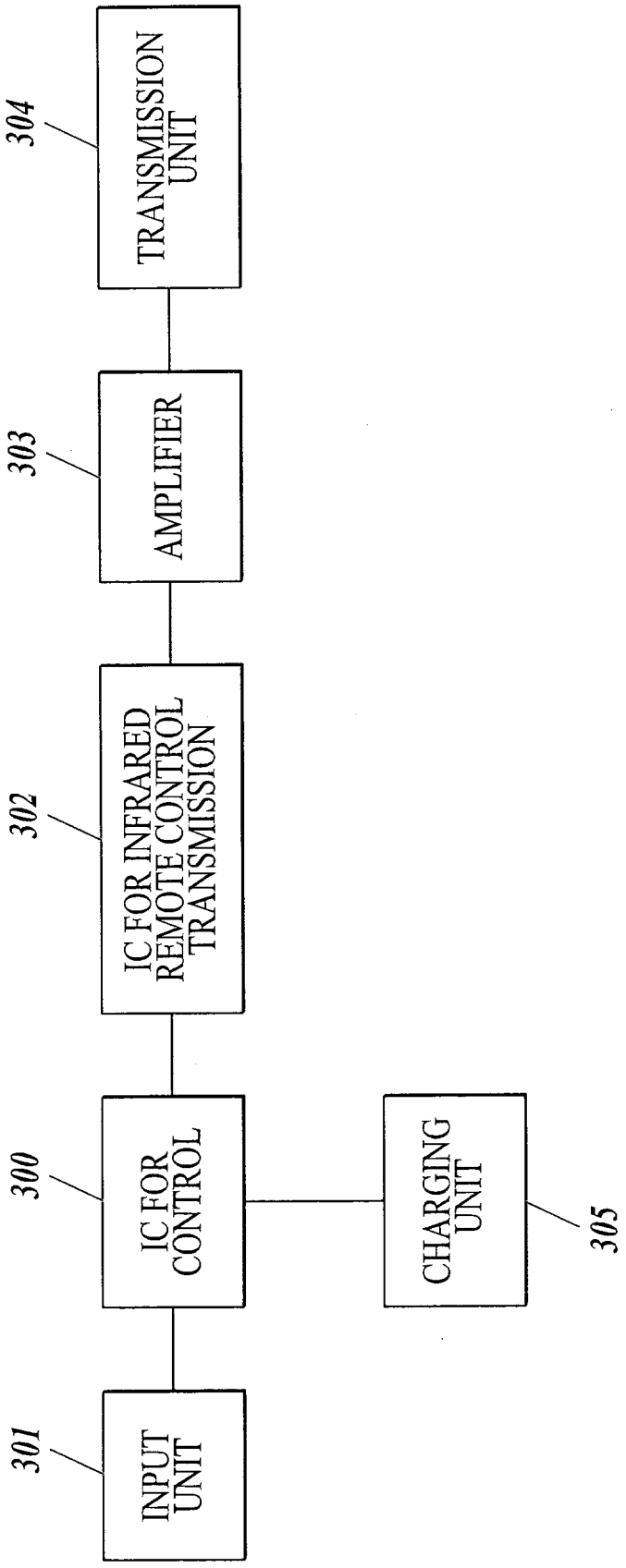

304
TRANSMISSION UNIT
303
AMPLIFIER
302
IC FOR INFRARED REMOTE CONTROL TRANSMISSION
300
IC FOR CONTROL
CHARGING UNIT
305
301
INPUT UNIT

FIG 5

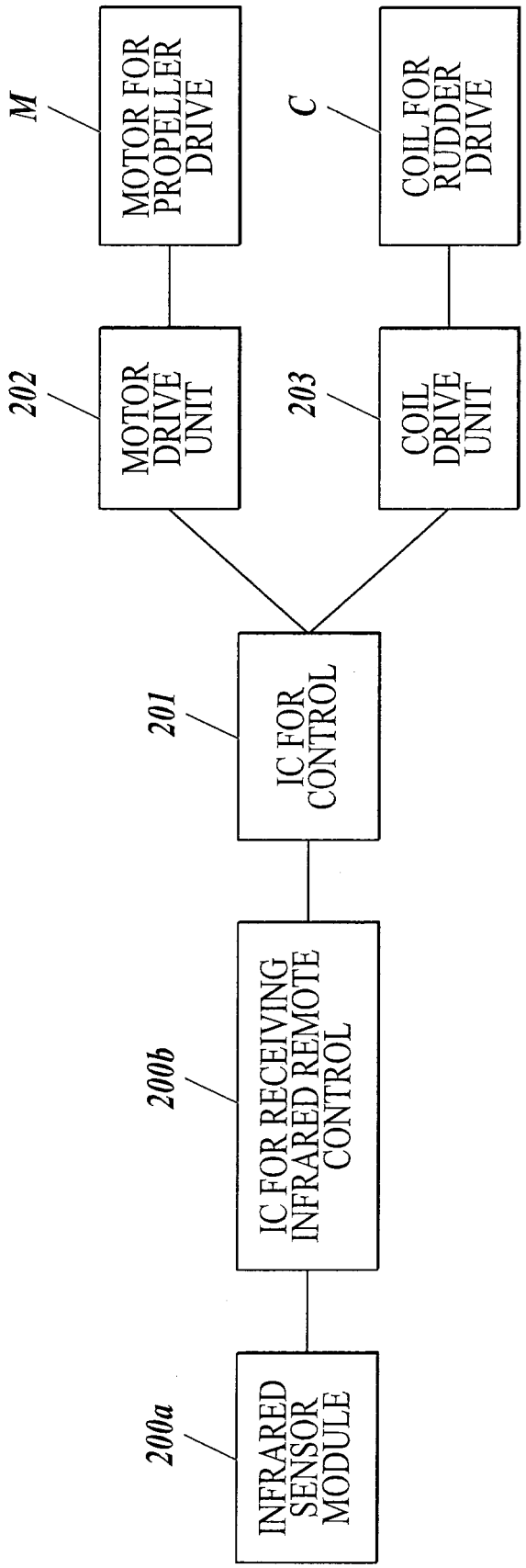

200a
INFRARED SENSOR MODULE
200b
IC FOR RECEIVING INFRARED REMOTE CONTROL
201
IC FOR CONTROL
202
MOTOR DRIVE UNIT
203
COIL DRIVE UNIT
M
MOTOR FOR PROPELLER DRIVE
C
COIL FOR RUDDER DRIVE

FIG.6

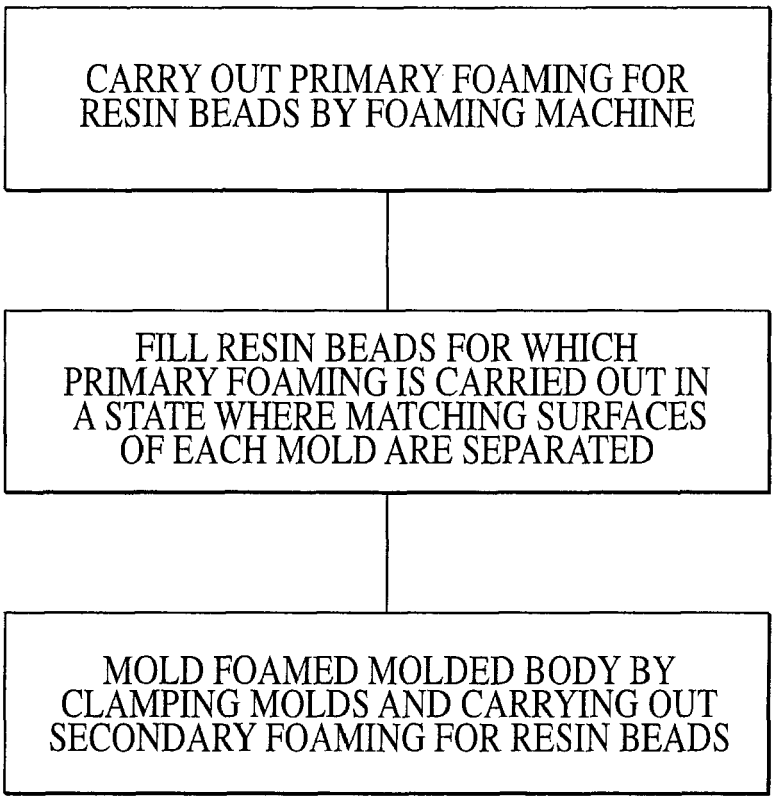
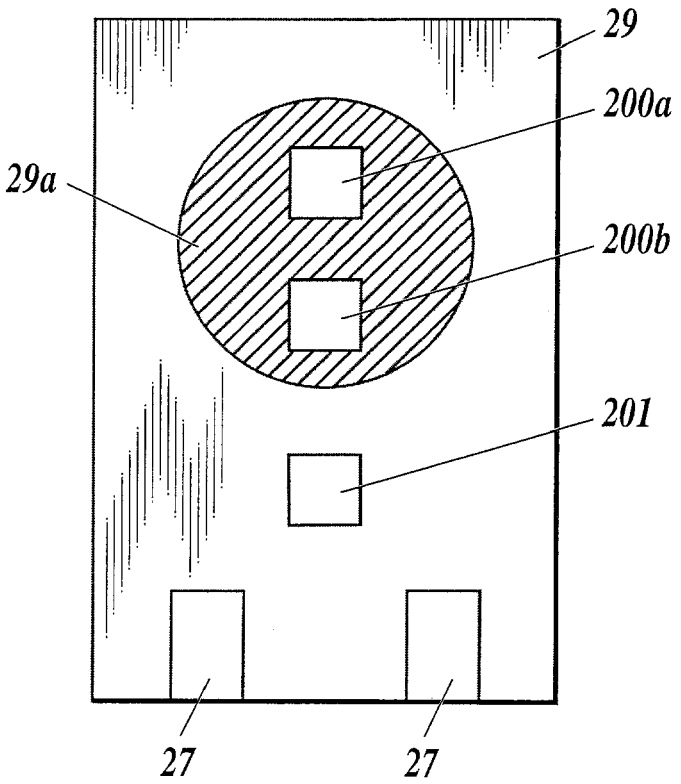

CARRY OUT PRIMARY FOAMING FOR RESIN BEADS BY FOAMING MACHINE
FILL RESIN BEADS FOR WHICH PRIMARY FOAMING IS CARRIED OUT IN A STATE WHERE MATCHING SURFACES OF EACH MOLD ARE SEPARATED
MOLD FOAMED MOLDED BODY BY CLAMPING MOLDS AND CARRYING OUT SECONDARY FOAMING FOR RESIN BEADS

FIG.7



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 1664

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2003/136876 A1 (CARROLL ERNEST A [US]) 24 July 2003 (2003-07-24) * paragraph [0023]; figure 1 *	1 2	INV. A63H27/00
X Y	US 2002/106966 A1 (JIMENEZ OSCAR [US] ET AL JIMENEZ OSCAR [US] ET AL) 8 August 2002 (2002-08-08) * paragraph [0023]; figures *	1 2	
A	US 2005/073018 A1 (YANO SHINJI [JP] ET AL) 7 April 2005 (2005-04-07) * paragraph [0041]; figures *	1	
A	DE 42 32 644 A1 (SIEMENS AG [DE]) 31 March 1994 (1994-03-31) * abstract; figures *	1	
A	WO 01/08777 A (TIAN YU [CN]) 8 February 2001 (2001-02-08) * abstract; figures *	2	
			TECHNICAL FIELDS SEARCHED (IPC) A63H B64C H01L G05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 September 2007	Shmonin, Vladimir

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
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1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 11 1664

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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24-09-2007

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- JP 7040897 A **[0002]**
- JP 2006191824 A **[0039]**