FLYABLE TOY AIRCRAFT WITH JETTISONABLE BATTERY PACK

Inventor: Richard S. Chang, Rolling Hills Estates, Calif.

Assignee: Mattel, Inc., Hawthorne, Calif.

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ABSTRACT

An improvement in a flyable toy aircraft of the type having a battery-powered, electric motor-driven propeller wherein the battery pack is releasably held to the aircraft fuselage assembly and simultaneously electrically connected to the toy's electric motor, the electrical connector and release mechanism holding the battery pack in position and completing the motor current supply circuit until the incidence of a crash-induced impact force at the forward end of the toy's fuselage assembly.

10 Claims, 8 Drawing Figures
FLYABLE TOY AIRCRAFT WITH JETTISONABLE BATTERY PACK

BACKGROUND OF THE INVENTION

The background of the invention will be set forth in two parts.

FIELD OF THE INVENTION

The present invention pertains generally to the field of toy aircraft, and more particularly to flyable toy aircraft powered by a self-contained battery-energized electric motor.

DESCRIPTION OF THE PRIOR ART

Flyable toy aircraft are well known and have been powered by rubber bands and then, later, more often by miniature liquid-fueled reciprocating engines. Only recently have such toys been powered by electric motors having the required power-to-weight ratio to make this type of operation possible. As a practical matter, most of these advanced toys utilize relatively heavy rechargeable batteries that comprise a significant portion of the total mass of the toy.

Through the use of highly efficient miniature electric motors, the problem of lifting power, has, to a great extent, been overcome. However, the relatively great mass of these flying toys becomes a significant disadvantageous factor when, as is sometimes the case, the craft gets into some difficulty and crashes into an object or the earth. This problem is basically due to the fact that the damage sustained by the craft and caused by the impact forces, incident usually at the forward end of the toy's fuselage, is directly related to the toy's mass and to its velocity squared, \( E = \frac{1}{2}mv^2 \). It should therefore be evident that a new and improved technique which would tend to lessen the impact damage caused to a flyable toy aircraft subject to crash-induced impact forces, would constitute a significant advancement of the flyable toy aircraft art.

SUMMARY OF THE INVENTION

In view of the foregoing factors and conditions characteristic of the prior art, it is a primary object of the present invention to provide a new and improved flyable toy aircraft.

Another object of the present invention is to provide an improved flyable toy aircraft which is less susceptible to impact damage.

Still another object of the present invention is to provide an improved flyable toy aircraft that jettisons a portion of its mass upon crash-induced impact, in order to lessen crash damage to the toy.

Yet another object of the present invention is to provide an improved flyable toy aircraft that carries a jettisonable battery pack.

According to the present invention, an improvement is provided in a flyable toy aircraft having an electric motor power source carried by the toy, the improvement including flyable toy aircraft fuselage and wing assemblies, the fuselage having a forward end. An electric motor is mounted in the fuselage assembly and receives energizing current through electric conductors connected thereto. A battery pack is also detachably carried by the fuselage assembly, the battery pack including battery terminals to supply electrical current. The toy further includes electrical coupling and release means associated with the fuselage and the battery pack for detachably holding the battery pack and simultaneously disengagably electrically connecting the battery terminals to the electric conductors, and for jettisoning the battery pack upon the incidence of a crash-induced impact force at the forward end of the fuselage assembly.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by making reference to the following description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like components in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial side sectional view of a flyable toy aircraft constructed in accordance with the present invention;

FIG. 2 is a perspective view of a battery pack frame carried by the aircraft of FIG. 1;

FIG. 3 is a sectional view of the battery pack illustrated in FIG. 1, taken along line 3–3;

FIG. 4 is a sectional view of the battery pack taken along line 4–4 of FIG. 3, the pack shown in its "stored" position;

FIG. 5 is a view similar to that of FIG. 4, showing the battery pack being jettisoned;

FIG. 6 is a sectional view taken along line 6–6 of FIG. 3;

FIG. 7 is a sectional view taken along line 7–7 of FIG. 3, showing the end of the battery pack opposite that shown in FIG. 6; and

FIG. 8 is a sectional illustration of the upper holding and release mechanism for the battery pack, taken along line 8–8 of FIG. 7.

DESCRIPTION OF THE INVENTION

Referring now to the drawings and more particularly to FIGS. 1 and 2, there is shown a flyable toy aircraft 11 having a fuselage assembly, generally designated 13, and a wing assembly 15. The toy 11 is propelled by a conventional propeller 17 rotatably mounted at the forward end 19 of the fuselage 13 and mechanically coupled through a coupling and gearing arrangement 21, including a motor pinion gear 23 and a driven gear 25, to a small light-weight but relatively powerful conventional electric motor 27. Extending from the fuselage's lower surface 29 are a pair of landing gear rods 31 (only one shown), the gear being anchored at its bent upper portion 33 in a housing 34 fixed within the fuselage assembly 13.

Also mounted within the assembly 13 is an elongated frame structure 35, best viewed in FIGS. 1 and 3–7, that includes an upper truss portion 36, an upper wall 37 and a pair of side walls 39. The structure 35 does not have a lower wall and so defines a cavity space 41, which space communicates with an opening 42 in the lower surface 29 of the fuselage assembly 13. The cavity 41 serves in this presently preferred embodiment as a housing for a battery pack, generally identified by reference 43. The fuselage assembly, the structure 35, and the framework 45 of the battery pack 43 are preferably fabricated from a light wood or plastic material, and any conventional fabricating process, such as molding, for example, may be utilized.
The battery pack 43, as seen in FIGS. 2 and 3, consists basically of mating first and second side sections 47 and 49, the first section being provided with a plurality of spaced upper and lower female sockets 51 into and through which second section barbed-headed tabs 53 extend to hold the two sections together. Mountable within the battery pack framework 45, are in this embodiment, six conventional rechargeable NiCd cells 55. Three such cells 55 are arranged in tandem (end-to-end) in each section 47 and 49 and all electrically connected in series with a conventional clip-type fuse holder 57 disposed electrically between the two side-by-side strings of cells 55 (also see FIG. 7). It will be thus noted that conventional tubular fuse 59 is disposed between two resilient clip arms 61 and 63 of the fuse holder 57 to complete the electrical circuit between a positive terminal 65 of a first (A) of the cells 55 and a negative terminal 67 of the sixth such cell (55 F).

The framework 45 further includes a positive resilient type clip terminal 69 and a similar negative clip terminal 71, both insulator mounted adjacent the end of the pack opposite the fuse holder 57. Proper installation of the cells 55 provides that the positive and negative cell terminals 65 and 67 are respectively in electrical contact with the positive and negative battery pack clip terminals 69 and 71. These clip terminals serve as a releasable attachment arrangement in conjunction with a transverse cylindrical rod 73 mounted adjacent the rearward end of the fuselage cavity 41 between the side walls 39 of the structure 35. The releasable attachment arrangement further includes a T-shaped structure 75 comprised of two similar inverted L-shaped brackets 77 and 79, back-to-back, extending upwardly from the joined battery pack framework sections 47 and 49. The structure 75 thus includes a vertical stem portion 81 and a horizontal top portion 83.

FIG. 4 illustrates that to attach the battery pack 43 to the fuselage assembly 13, the clip terminals 69 and 71 are forced over the transverse rod 73, while at the same time, the top portion 83 of the structure 75 is moved through an opening 85 in the upper wall 37 of the elongated frame structure 35. The opening 85 communicates with the relatively narrower, rearwardly extending, slot 87 and is so positioned with respect to the rod or dowel 73 that when the clips 69 and 71 fully engage the rod 73, the vertical stem portion 81 is at least partially deposed in the slot 87. At this time, the horizontal top portion 83 extends at least partially beyond the opening 85 so that the framework 45 cannot swing downwardly and out of the cavity 41.

The clip terminals 69 and 71 further function as an electrical coupling mechanism in that these electrical current conductive elements come into electrical current conductive contact with respective insulative conductive sleeves 89 and 91 fixedly mounted on the rod 73. The rod is preferably fabricated from an electrically non-conducting material, such as wood and most plastics, for example, the attachment relationship being clearly illustrated in FIGS. 6. Attached to each of these sleeves 89 and 91 are separate insulated wires or conductors 93 and 95, respectively. These conductors are electrically connected directly to or through appropriate switches and/or radio frequency interference preventing chokes, for example, to the electric motor 27 in order to provide energizing current thereto from the battery pack 43.

It can be seen from the drawings that the resilient battery terminals 69 and 71 include facing concave portions 97 and 99 biased toward each other so that when the clips are forced over the rod 73, the battery pack will remain in a fixed position in the cavity 41 to supply electrical current to the motor 27. However, in order to lessen the mass of the toy 11 upon severe impact with the ground or other obstructions and thereby lessen the chance of considerable structural damage to the fuselage and wing assemblies, the releasable attachment arrangement is designed so that impact forces incident on the forward end of the toy 11 of a predetermined magnitude will cause the relatively high mass battery pack 43 to be essentially instantaneously jettisoned from the craft.

This action is most clearly illustrated in FIGS. 5-8. It will be seen that the momentum of the toy 11 in flight in a forward direction will act both on the craft's air frame and on the pack 43, and that because of the relative massiveness of the battery pack 43, the pack will tend to still move in a forward direction after the fuselage is quickly or suddenly decelerated by an impact force at its forward end. It should be evident that a severe deceleration of the toy 11 will cause the clip 69 and 71 to disengage from the rod 73, breaking electrical contact with the sleeves 89 and 91, and move in the direction indicated by arrow 101.

To assure that the T-shaped structure 75 drops through the opening 85 without encountering the leading edge 103 thereof, the frame structure 35 is also provided with a sloping forward wall 105 so that the upper forward edge 107 of the battery pack framework 45 will be deflected as it moves forward and thereby cause the structure 75 to essentially follow the path indicated by arrows 109 and 111. Of course, the battery pack may be manually removed from the fuselage assembly in order to replace the pack with another and for recharging and the like by merely pulling the forward end of the pack forward and in a downwardly direction.

From the foregoing, it should be evident that the invention provides a new and improved flyable toy aircraft that is capable of significantly reducing the mass of the craft essentially instantaneously upon impact by automatically jettisoning its battery pack assembly when a relatively severe impact force is indenct on the forward end of the toy. It should also be understood that the materials specifically described herein are not critical and any materials possessing the required characteristic may be substituted for those specifically identified.

Although a presently preferred embodiment of the invention has been herein described in detail, it should be understood that the invention is susceptible to modifications and embodiments incorporating the inventive features taught herein. Accordingly, it is intended that the foregoing disclosure and drawings shall be considered only as illustrations of the principles of this invention.

What is claimed is:
1. In a flyable toy aircraft having an electric motor driven propeller and an electric motor power source carried by said toy, the improvement comprising: flyable toy aircraft fuselage and wing assemblies, said fuselage assembly having a forward end; an electric motor mounted in said fuselage assembly and receiving energizing current through electric conductors connected thereto;
a battery pack detachably carried by said fuselage assembly, said battery pack including battery terminals to supply electrical current; and electrical coupling and release means associated with said fuselage and said battery pack for detachably holding said battery pack and simultaneously disengagably electrically connecting said battery terminals to said electric conductors, and for jettisoning said battery pack upon the incidence of a crash-induced impact force at said forward end of said fuselage assembly.

2. The improvement according to claim 1, wherein said fuselage assembly includes cavity structure defining a cavity in an outer surface thereof, and wherein said battery pack is detachably held by said electrical coupling and release means in said cavity.

3. The improvement according to claim 1, wherein said battery pack includes a plurality of battery cells electrically interconnected to provide a potential having a positive polarity at one of said battery terminals and a negative polarity at the other of said battery terminals.

4. The improvement according to claim 3, wherein said cells are electrically connected in series, and wherein an electrical fuse is electrically connected in series with said cells.

5. The improvement according to claim 2, wherein said electrical coupling and release means includes a transverse rod disposed within and adjacent the rearward end of said cavity orthogonal to the longitudinal axis of said fuselage assembly, said means also including a pair of insulated spring clip terminals having facing concave portions adapted to releasably attach to said transverse rod, said concave portions registering with said rod.

6. The improvement according to claim 5, wherein said rod is essentially electrically non-conductive and is provided with a pair of electric current conductive sleeves mounted side-by-side thereon, said sleeves being spaced and electrically insulated from each other and electrically connected to said conductors.

7. The improvement according to claim 6, wherein said electrical coupling and release means further includes an opening with a rearwardly extending narrower slot in an upper wall of said cavity structure, said means also including a T-shaped structure extending upwardly from said battery pack and registerable in said opening, said T-shaped structure being captured in said slot only when said concave portions of said spring clips are registered over said rod.

8. The improvement according to claim 7, wherein said cavity structure includes a forwardly disposed sloping end wall, the forward end of said battery pack being disposed adjacent said sloping end wall and being deflected downwardly thereby when said clips disengage from said rod and said battery pack moves forward relative to said fuselage assembly.

9. The improvement according to claim 3, wherein said battery pack includes a pair of elongated interlockable battery cell enclosing halves, each of said halves carrying one of said terminal clips and a portion of said T-shaped structure.

10. The improvement according to claim 9, wherein each of said cell enclosing halves includes a plurality of spaced interlocking barbed tabs and matching sockets adapted to allow said halves to be separated for access to said battery cells housed therein.

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