

United States Patent [19]

Mabuchi

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[45] Aug. 6, 1974

[54] ELECTRICALLY DRIVEN MODEL AIRPLANE

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[73] Assignee: Mabuchi Motor Co., Ltd., Tokyo, Japan

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Mar. 24, 1972 Japan 47-34019[U]

[52] U.S. Cl. 46/243 AV

[51] Int. Cl. A63h 33/26

[58] Field of Search 46/243 AV, 243 P, 243 LV, 46/76 R, 243 MV, 77, 78

[56]

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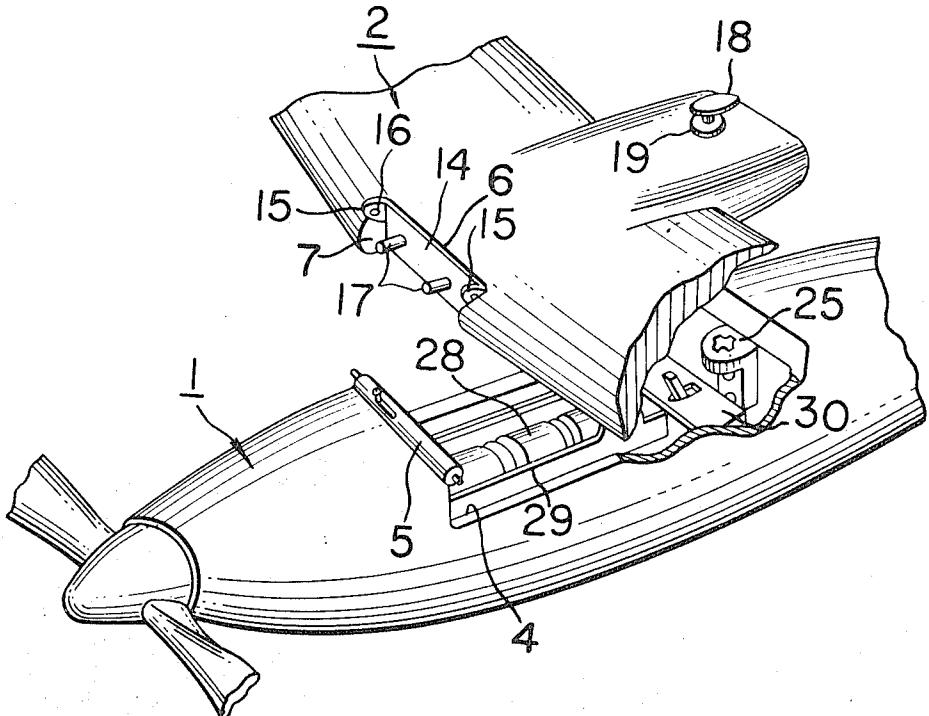
Primary Examiner—Louis G. Mancene
Assistant Examiner—J. Q. Lever

[57]

ABSTRACT

An electrically driven model airplane is disclosed in which a battery cassette holder is provided in an opening formed in the fuselage of the model airplane, and a battery cassette is removably held in said cassette holder by means of movable terminals attached to said cassette holder.

11 Claims, 18 Drawing Figures



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FIG. 1

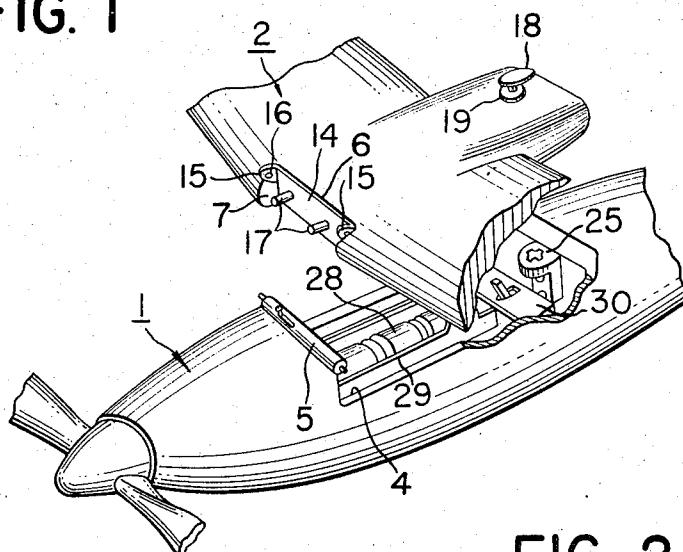


FIG. 2

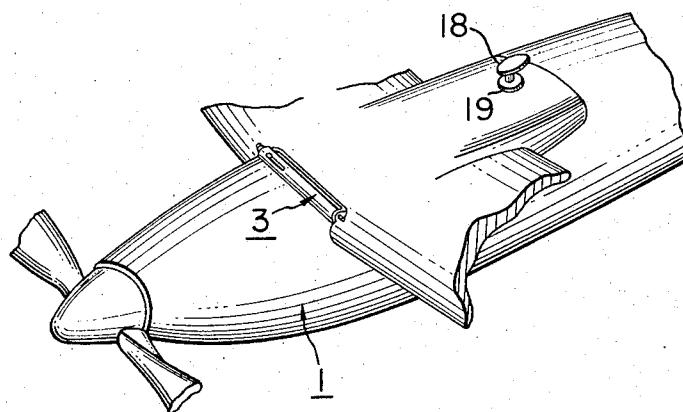
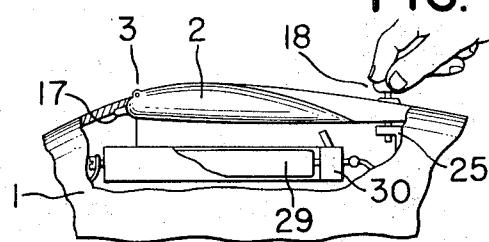


FIG. 3



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FIG. 4

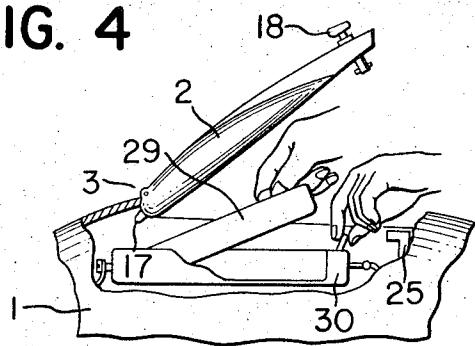


FIG. 5

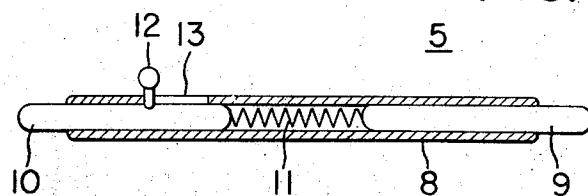


FIG. 6

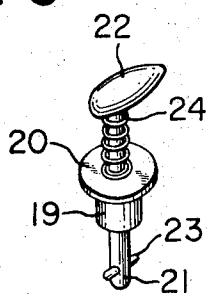


FIG. 7

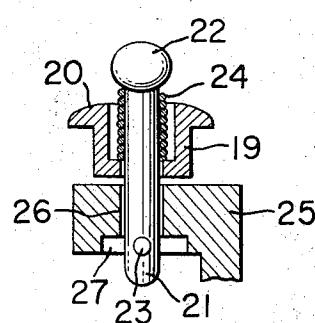


FIG. 8

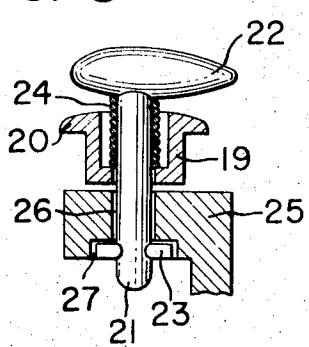
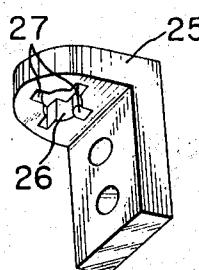


FIG. 9



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FIG. 10

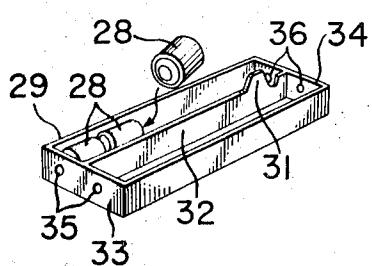


FIG. 11

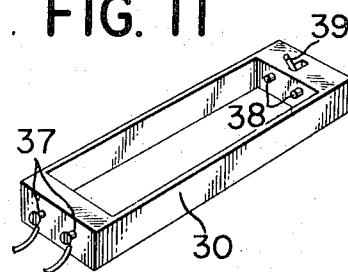


FIG. 12

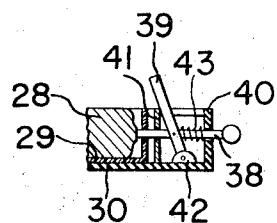


FIG. 13

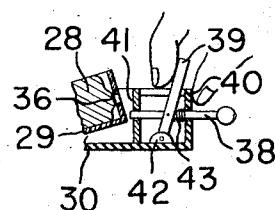
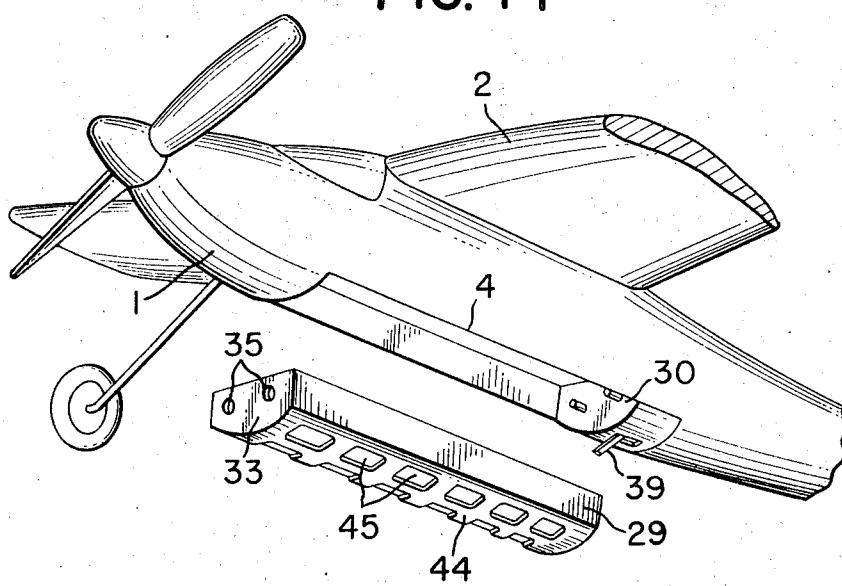


FIG. 14



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FIG. 15

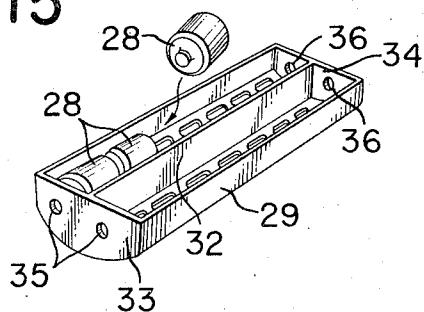


FIG. 16

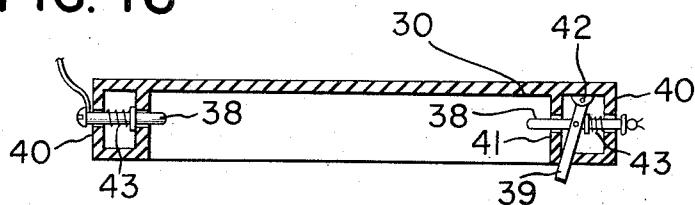


FIG. 17

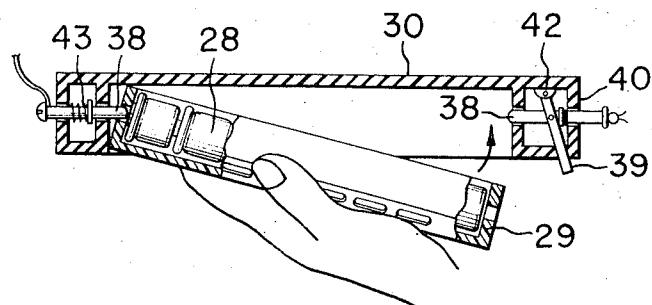
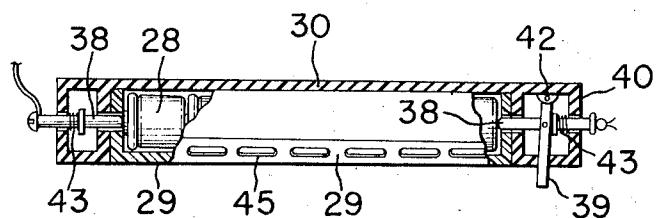


FIG. 18



ELECTRICALLY DRIVEN MODEL AIRPLANE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to model airplanes and, more particularly, to a model airplane which is equipped with a battery cassette holder inside an opening formed in the fuselage of the plane for removably holding a battery cassette therein.

2. Description of the Prior Art

Recently there has been developed a nickel-cadmium battery having a relief valve for discharging gases when the battery is overcharged. This kind of battery is of such little internal resistance that it is easy to obtain a discharge current of ten amperes or more, and also has the advantage of being rechargeable in a few minutes.

Accordingly, by using such batteries, it becomes possible to fly a radio-controlled model plane and, when necessary, to remove the discharged batteries and recharge them for reuse.

In such an electrically driven model airplane it is desirable to provide a battery cassette, which has also interchangeability of use of other electrical appliances, and which, when used in the fuselage of the airplane permits easy removal and replacement. It is also desirable in such a model plane to afford easy maintenance, inspection, repair, replacement, etc. of the components mounted in the fuselage, such as the electric motor, the radio receiver, the control devices, etc. Moreover, it is found to be necessary to arrange for an effective cooling of the aforementioned quick charging type nickel-cadmium battery, since the temperature of the battery tends to rise due to its large discharge current.

SUMMARY OF THE INVENTION

An object of the present invention is to provide for an easy mounting and replacement of a battery cassette having batteries therein in an electrically driven model airplane and also to provide, for such purposes, an electrically driven model plane equipped with a battery cassette holder for removably holding the battery cassette.

Another object of the invention is to provide a model airplane having an opening in its fuselage at the position where the wings are attached onto the fuselage for ease of inside inspection, the wings serving also as closure for the said opening.

Another object of the invention is to provide a wing structure which presents sufficient mechanical strength for attaching the wings to the fuselage while maintaining ease of internal inspection.

Still another object of the invention is to provide an electrically driven model airplane equipped with a battery cassette holder and concurrently achieve an effective cooling of the batteries.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will become more apparent from the following detailed description thereof and from the accompanying drawings, in which:

FIG. 1 is a perspective and fragmentary view of a model airplane with its wings removed from the fuselage;

FIG. 2 is a similar view of the airplane with its wings attached to the fuselage;

FIGS. 3 and 4 are sectional partly cross-sectional views of a battery cassette in position and removed respectively;

FIG. 5 is a cross-sectional view of a hinge for attaching the wings;

FIGS. 6 through 9 are detailed views of the locking mechanism for locking the wings;

10 FIG. 10 is a perspective view of the battery cassette;

FIG. 11 is a perspective view of the battery cassette holder;

15 FIGS. 12 and 13 are detailed cross-sectional views of the battery cassette in position and removed from the battery cassette holder, respectively;

FIG. 14 shows in perspective an arrangement of the battery cassette for enhancement of the cooling of the batteries;

20 FIG. 15 is a perspective view of the structure of the battery cassette of FIG. 14; and

FIGS. 16 through 18 are detailed cross-sectional views showing how to fit the battery cassette in the battery cassette holder of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As stated before, and with special reference to a model airplane using quick charging type nickel-cadmium batteries, it is desirable to removably and replaceably mount the battery cassette for the purpose of re-charging the batteries and it is also desirable to obtain easy inspection of the inside of the fuselage.

In FIGS. 1 and 2, one can readily identify the fuselage 1 of the model airplane, the wings 2 and the connecting hinge 3. There is provided in the upper portion of the fuselage 1 and opening 4 at the position where the wings 2 are attached to the fuselage 1. This opening 4 is recessed so as to fit properly the wings 2. The wings 2 are connectable to the hinge 3 at their fore edge for supporting the wings swingably with respect to the fuselage. Thus the wings 2 will also serve as closure for the opening 4.

In the preferred embodiment illustrated, the hinge 3 has two separable members, one member 5 being fixed to the fuselage at opening 4 and the other member 6 being fixed to a groove 7 formed in the fore edge of the wings 2. As shown clearly in FIG. 5, the member 5 comprises a sheath 8, a stationary shaft 9, a movable shaft 10 and a coil spring 11. The stationary shaft 9 is fitted and fixed inside one end of the sheath 8, but has its outer end projecting from the sheath. The movable shaft 10 is slidably fitted inside the other end of the sheath 8, and also has its outer end projecting from the sheath 8 and retractable therefrom by means of a handle or knob 12. A coil spring 11 is positioned intermediate the two shafts. The knob 12 extends out through a guide slot 13 in the sheath and is slidable therealong.

55 The member 6 of the hinge 3 comprises, as shown in FIG. 1, a plate 14 and right and left hand side bent portions 15 extending from the plate 14. Both bent portions 15 are provided with shaft holes 16 through which the shafts 9 and 10, shown in FIG. 5, are to be inserted.

60 The member 6 of the hinge 3 comprises, as shown in FIG. 1, a plate 14 and right and left hand side bent portions 15 extending from the plate 14. Both bent portions 15 are provided with shaft holes 16 through which the shafts 9 and 10, shown in FIG. 5, are to be inserted.

65 Fixed to the plate 14 and protruding forwardly therefrom are two studs 17. As shown in FIG. 3, when the

wings are placed so as to close the opening 4, the studs 17 are brought against the inside of the fore edge of the opening 4 and thereby serve to hold the wings 2 firmly secured to the fuselage.

The rear end of the wings 2 is locked onto the fuselage 1 by means of locking means 18. The locking means 18 is clearly shown in FIGS. 6 to 9, and comprises a bearing 19 with a flange 20, a rotatable shaft 21 with a knob 22 at the top and a stopper 23 at the bottom, a coil spring 24 and a fixed frame 25 with a shaft hole 26 and a recess 27 at the lower surface thereof.

The bearing 19 is fixedly attached to the rear end portion of the wings 2 as shown in FIGS. 1 and 2 and the fixed frame 25 is attached to the rear part of the opening 4 in the fuselage 1 as shown in FIG. 1.

The rotatable shaft 21 is passed through the bearing 19 and the hole 26 of the fixed frame 25 for rotation and vertical movement, and the coil spring 24 is positioned between the knob 22 and the bearing 19 to urge the rotatable shaft 21 upwardly.

As shown in FIG. 3, when the rear end portion of the wings 2 is pressed down by holding the knob 22 and the rotatable shaft 21 is inserted through the hole 26 of the fixed frame 25, rotation of the knob 22 will cause the stoppers 23 to engage the stopper recess 27. Thus, the rear end of the wings 2 is held by the fixed frame 25 to the fuselage 1 so that the wings 2 can be firmly supported by the fuselage in cooperation with the studs 17 attached to the fore end of the wings 2.

In the opening 4, there is provided a battery cassette holder 30 for removably holding the battery cassette 29 and the batteries set therein. Though not shown, there are also provided in the opening 4 a radio receiver and various other control devices, the repair and inspection of which is readily obtained by removing the wings 2 from the fuselage 1. Furthermore, if it is merely desired to remove the battery cassette 29, it is sufficient to unlock the locking means 18 and to swing the wings 2 about the hinge 3.

As shown in FIG. 10, the battery cassette 29 has a partition 32 with a pick-up lug 31.

On either side of the partition 32 are to be inserted the several batteries 28, respectively. The front and rear plates 33, 34 of the cassette are provided with holes 35, 36 for the usual electrical battery connections.

As shown in FIG. 11, the battery cassette holder 30 is provided with fixed terminals 37 and with movable terminals 38 serving also as stopper rods for the battery cassette 29. The arrangement is such that when the battery cassette is fitted in the cassette holder 30, the ends of the fixed terminals 37 are inserted into the holes 35, while the ends of the movable terminals 38 are inserted into the holes 36 by simply operating a lever 39. More specifically, as clearly shown in FIGS. 12 and 13, the movable terminals 38 are inserted into the holes 36 after the ends of the fixed terminals 37 have been inserted into the holes 35. In these figures, the movable terminals 38 extend slidably through openings formed in the rear plate 40 and the intermediate plate 41 of the cassette holder 30 and are pivoted to a lever 39. The lever 39 is supported on the battery cassette holder 30 at point 42 and coil springs 43 are provided around the movable terminals 38 between the lever 39 and the rear plate 40 so as to force the lever 39 to the left, as clearly shown.

With such an arrangement, it is possible to remove the battery cassette 29 from the cassette holder 30 simply by pulling the lever 39 to the right and, conversely, it is possible to insert the battery cassette in the cassette holder by merely releasing the lever 39 after having placed the battery cassette in the cassette holder. It is also possible, at the same time, to connect the batteries 28 to external electrical circuits by means of the fixed terminals 37 and the movable terminals 38. Although not shown, it is to be noted that the terminals 37, 38 are connected to an electric motor for driving the propeller as well as to the supply terminals of the components necessary for radio control. The driving of the movable terminals 38 by means of the lever 39, as shown in FIGS. 12 and 13, may be alternatively be replaced by the driving of the spring biased movable terminals by means of a rotatable knob having a cam mechanism.

Although not shown in FIGS. 1 and 2, an air inlet is provided, for instance in the lower surface of the front 20 of the fuselage 1 to cool the batteries 28 during flight.

FIG. 14 shows a battery cassette mounting structure to enhance the cooling of the batteries. The reference symbols in FIGS. 14 through 18 correspond to those in FIGS. 1 through 13. As shown, an opening 4 is provided in the belly of the fuselage and in this opening there is a battery cassette holder 30 to hold a battery cassette 29 having many cooling openings 45 in the bottom plate 44 thereof.

30 In this embodiment, the bottom plate 44 of the battery cassette 29 is of arcuate shape to conform with the shape of the fuselage 1 and acts to cool the batteries 28 held therein during flight by means of the cooling openings 45. Other features of the cassette 29 shown in FIG. 35 15 are essentially the same as those shown in FIG. 10.

FIGS. 16 through 18 show the structure of the battery cassette holder 30 and the manner of holding a battery cassette therein. Also in this case, the only difference from FIGS. 11-13 is that the battery cassette holder 30 is open downwardly and that the battery cassette holder 30 has movable terminals at both its ends for ease of mounting the battery cassette 29 therein. No detailed description will be necessary since no essential differences exist from the foregoing embodiments.

It should be understood from the foregoing description that the invention makes it possible, in an electrically driven model airplane, to remove readily the battery cassette 29 as a unit for the purpose of re-charging the batteries or of using them as a power source for other electrical appliances. The invention also makes the replacement of the batteries or the inspection of various components very convenient especially in cases where the battery cassette holder 30 or the radio receiver, etc. are accommodated in the fuselage under the wings, because the wings may be swung about the hinge 3 or may be removed as a unit.

In addition, it is possible to obtain a very effective cooling, where quick charging type nickel-cadmium batteries are used.

Numerous variances may be made to the above described device and to the embodiments of the invention without departing however from the spirit thereof; therefore, it is understood that all matter contained in the foregoing description and in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. An electrically driven model airplane comprising a fuselage, a pair of wings having fore and rear edges thereon, an opening provided in the surface of the fuselage of the airplane, a battery cassette holder with axially movable terminal pins inside said opening and a battery cassette in said cassette holder; said battery cassette being removably held in said battery cassette holder by said movable terminal pins through battery connecting apertures provided in said battery cassette.

2. The electrically driven model airplane as claimed in claim 1, wherein said openings in the surface of said fuselage is located where said wings are attached to said fuselage, said wings serving also as closure for said opening, and wherein said fore edge of said wings is swingably secured to said fuselage by means of a hinge.

3. The electrically driven model airplane as claimed in claim 1, wherein said rear edge of said wings is locked onto said fuselage by means of a locking means.

4. The electrically driven model airplane as claimed in claim 3, wherein studs are provided on said fore edge of said wings so that when said rear edge of said wings is locked onto said fuselage by said locking means, said studs bring themselves against the inside of the fore edges of said opening.

5. The electrically driven model airplane as claimed in claim 1, wherein said movable terminal pins are located on at least one end of said battery cassette holder and are biased in one direction by coil springs, said movable terminal pins being further adapted to be moved by a lever in the direction opposite to said biasing direction.

6. The electrically driven model airplane as claimed in claim 1, wherein said battery cassette has front and rear plates of a dielectric material and has a partition intermediate said front and rear plates, said battery connecting apertures being located in said front and rear plates.

7. The electrically driven model airplane as claimed in claim 1, wherein the bottom of said battery cassette constitutes a part of said fuselage of the model airplane.

8. The electrically driven model airplane as claimed

in claim 7, wherein said bottom of said battery cassette has cooling means therein.

9. An electrically driven model airplane comprising a fuselage, a pair of wings having fore and rear edges thereon, an opening provided in the surface of the fuselage of the airplane, a battery cassette holder with movable terminals inside said opening and a battery cassette in said cassette holder; said battery cassette being removably held in said battery cassette holder by said movable terminals through battery connecting apertures provided in said battery cassette, said opening in the surface of said fuselage being located where said wings are attached to said fuselage, said wings serving also as closure for said opening, and wherein said fore edge of said wings is swingably secured to said fuselage by means of a hinge.

10. An electrically driven model airplane comprising a fuselage, a pair of wings having fore and rear edges thereon, an opening provided in the surface of the fuselage of the airplane, a battery cassette holder with movable terminals inside said opening and a battery cassette in said cassette holder; said battery cassette being removably held in said battery cassette holder by said movable terminals through battery connecting apertures provided in said battery cassette, said rear edge of said wings being locked onto said fuselage by means of a locking means and wherein studs are provided on said fore edge of said wings so that when said rear edge of said wings is locked onto said fuselage by said locking means, said studs bring themselves against the inside of the fore edges of said opening.

11. An electrically driven model airplane comprising a fuselage, a pair of wings having fore and rear edges thereon, an opening provided in the surface of the fuselage of the airplane, a battery cassette holder with movable terminals inside said opening and a battery cassette in said cassette holder; said battery cassette having front and rear plates of a dielectric material and a partition intermediate said front and rear plates, said battery connecting apertures being located in said front and rear plates, said battery cassette being removably held in said battery cassette holder by said movable terminals through battery connecting apertures provided in said battery cassette.

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