United States Patent [19]

Mabuchi

[11] **3,757,462**

[45] **Sept. 11, 1973**

[54] **SYSTEM FOR SAFELY LOWERING AN ELECTRIC MODEL PLANE**

[75] Inventor: **Kenichi Mabuchi,** Matsudo, Japan

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

[22] Filed: **July 14, 1972**

[21] Appl. No.: **271,647**

[30] **Foreign Application Priority Data**

July 14, 1971 Japan 46/52312

[52] **U.S. Cl.** ..... **46/243 AV,** 46/76

[51] **Int. Cl.** **A63h 33/26,** A63h 27/00

[58] **Field of Search** ..... 46/76, 243 AV

[56] **References Cited**

UNITED STATES PATENTS

2,805,349	9/1957	Friedman	46/243 AV
3,699,708	10/1972	Mabuchi	46/243 AV

Primary Examiner—Louis G. Mancene
Assistant Examiner—Robert F. Cutting
Attorney—James E. Armstrong et al.

[57] **ABSTRACT**

A system for safely lowering an electric model plane of the free flight type which comprises a connecting means for connecting a propeller shaft with a tail assembly pivotally mounted on the tail portion of the plane and a spring means associated with said tail assembly. While the plane keeps flying, the connecting means is pulled forward by the propeller shaft due to a propelling movement against a spring force of said spring means thereby to hold the tail assembly in the normal horizontal flight position. When the propeller ceases to rotate through an exhaustion of a battery etc., the propeller is pushed back by a wind pressure accompanied by retraction of the connecting means thereby to urge the tail assembly to turn into an upwardly slanting position by the force of the spring means. Thus, the plane can go down in a vertical direction maintaining a substantially horizontal position thereof. Therefore, it is possible to enjoy a flight of the plane in a limited space and to prevent the plane from being lost in an ascending air current or bump.

Further, the present system requires no setting mechanism nor remote control and can perform the operation automatically and securely.

5 Claims, 7 Drawing Figures

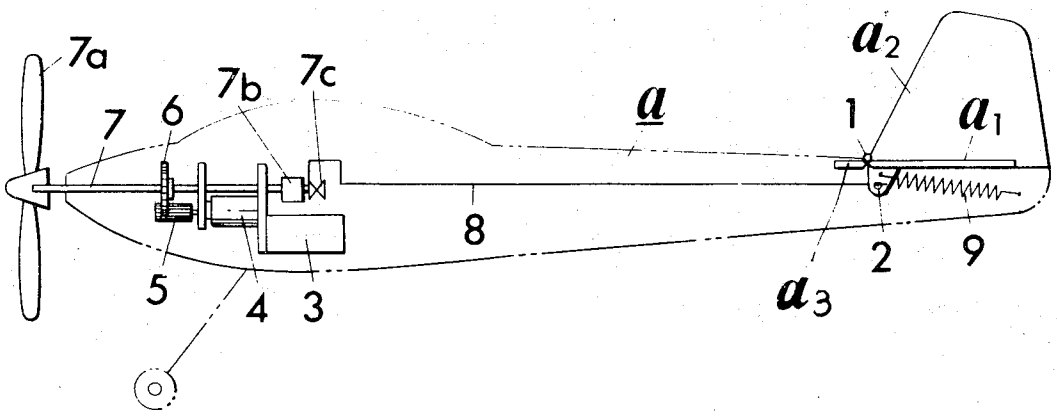


FIG. 1

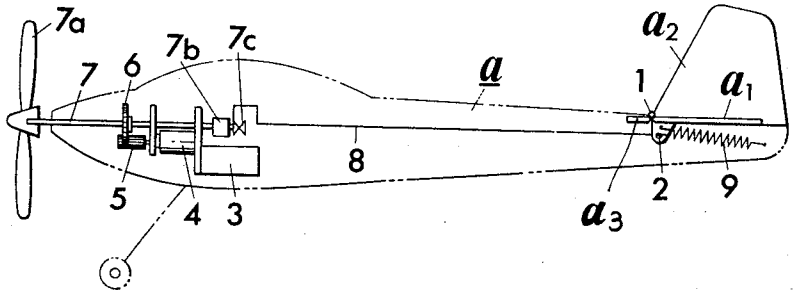


FIG. 2

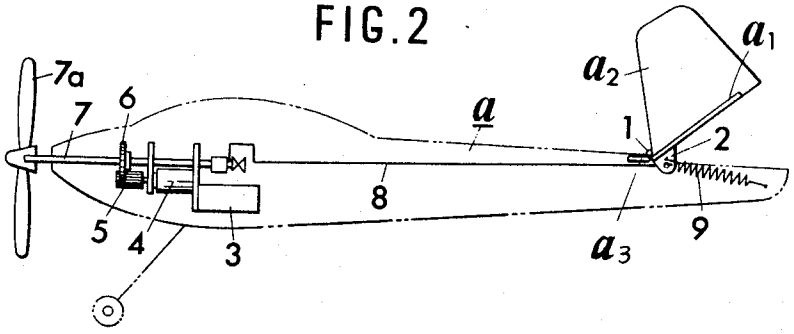


FIG. 3

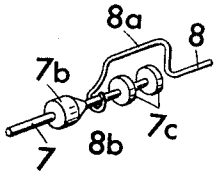


FIG. 4

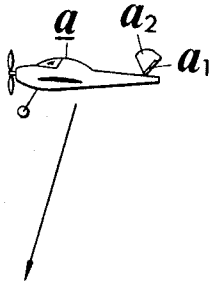


FIG. 5

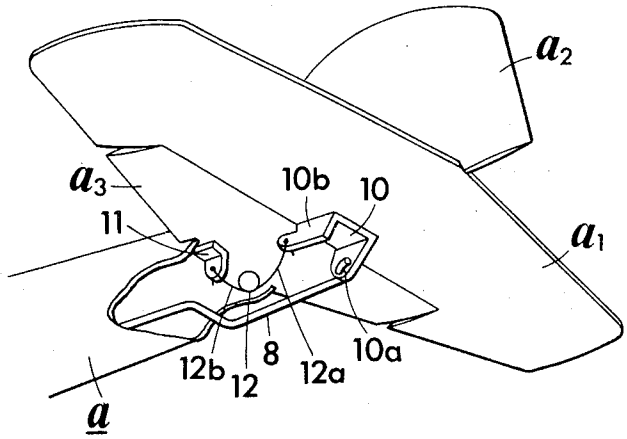


FIG. 6

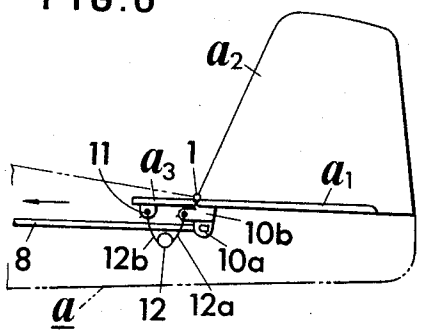
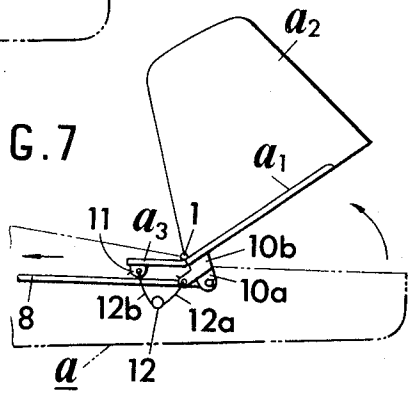


FIG. 7



SYSTEM FOR SAFELY LOWERING AN ELECTRIC MODEL PLANE

This invention relates generally to an electric model plane, and more particularly to a system for lowering an electric model plane of the free flight type safely onto the ground when the motor is stopped during flight of the plane.

The primary object of the present invention is to provide a system for lowering an electric model plane of the free flight type, whereby the plane may be lowered safely onto the ground when the motor of the plane comes to a stop due to, for example, exhaustion of the battery while the plane is still travelling in the air.

Another object of the present invention is to provide a system for lowering an electric model plane of the type mentioned above safely onto the ground substantially in a vertical direction while maintaining the plane body in a horizontal posture.

Still another object of the present invention is to provide a system of the nature described above, whereby it is possible to enjoy a flight of the plane in a limited space and whereby the plane can be prevented from being lost in an ascending air current or bump.

A further object of the present invention is to provide a system for safely lowering an electric model plane of the type mentioned above, which does not require provision of any setting mechanism nor remote control and which is capable of performing the above mentioned operation automatically and securely.

A still further object of the present invention is to provide a system for safely lowering the plane of the type mentioned above, which is provided with a lock mechanism for rendering the lowering system inoperative when it is required to use the plane as a conventional electric plane without each system.

In accordance with the objects noted above, there is provided a system for safely lowering an electric model plane of the free flight type having a plane body including a tail assembly pivotally mounted on the tail of said plane body and consisting of a horizontal tail and a vertical tail formed integrally therewith, a battery mounted on said plane body, a motor mounted on said plane body and supplied with power from said battery, a propeller driven by said motor through a propeller shaft for propelling the plane; which comprises a connecting means for connecting said propeller shaft with said tail assembly; and a spring means associated with said tail assembly, said connecting means holding said horizontal tail in a normal horizontal position agent a spring action of said spring means while the propeller is rotated by said motor, said spring means shifting said horizontal tail of said plane into a slantingly raised position under the influence of said spring action when said motor comes to a stop due to exhaustion of said battery, thereby to prevent further flight of said plane and at the same time to lower the plane substantially in the vertical direction while maintaining the plane body in a horizontal posture.

These together with other objects and advantages which will subsequently become apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a diagramatic side view showing in vertical section a system in an electric model plane embodying the present invention;

FIG. 2 is a view similar to FIG. 1 but showing the tail assembly in an actuated or raised position;

FIG. 3 is a perspective view showing the connection between the propeller shaft and the connecting rod member;

FIG. 4 is a side elevation showing the approximate direction in which the plane body is lowered;

FIG. 5 is a fragmental perspective view of another embodiment of the present invention, showing on an enlarged scale the tail portion of the plane incorporating the system of the invention; and

FIGS. 6 and 7 are side elevations on an enlarged scale of the second embodiment shown in FIG. 5.

The present invention will now be discussed in detail with reference to the accompanying drawings showing preferred embodiments. Referring first to FIGS. 1 to 3 showing the first embodiment of the invention, there is designated at *a* a plane body having a tail assembly consisting of horizontal tails *a*1 and a vertical tail *a*2. These horizontal and vertical tails *a*1 and *a*2 are formed integrally with each other and are pivotally mounted on a tail assembly mounting plate *a*3 at the tail portion of the plane body *a* by means of a hinge 1 for upward pivotting movement thereabout. Furthermore, the horizontal tails have a support plate 2 attached securely to the underface close to the front edge thereof.

There is shown at 3 a battery for a motor 4 of the plane. A pinion gear 5 is securely mounted on the output shaft of the motor 4. This pinion gear 5 is engaged with a gear 6 securely mounted on the propeller shaft 7 which is movable back and forth along the axis thereof as will be explained in more detail hereinafter. The propeller shaft supports at the front end thereof a propeller member 7*a* and at the rear end a connecting member 7*b* and stop and bearing members 7*c*.

A connecting rod member 8 is provided for connection said propeller shaft 7 and the horizontal and vertical tail assembly. The connecting rod member 8 is provided with an angularly turned portion 8*a* and a looped portion 8*b* in the front end portion thereof. The looped portion 8*b* is loosely fitted over the propeller shaft 7 at a position between said connecting member 7*b* and the stop and bearing members 7*c*. The looped portion 8*b* is movable back and forth over and along the propeller shaft 7 without obstructing the rotational movement thereof. The forward movement of the looped portion 8*b* of the connecting rod member 8 is limited by the connecting member 7*b* while the rearward or retracting movement is limited by the stop and bearing members 7*c*. The aforementioned angularly turned portion 8*a* is positioned to pass over said stop and bearing members 7*c*.

The rear end portion of the connecting rod member 8 is connected to the rear lower portion of the supporting plate member 2 mentioned above. Shown at 9 is a tension spring with one end thereof secured to the plane body *a* and the other end to the forward upper portion of the supporting plate member 2 to urge the tail assembly to turn around the hinge 1 into the actuated or raised position.

With the above described construction, the battery 3 supplies power to the motor 4 for rotating the same. The rotating movement of the motor 4 is transmitted to the propeller 7*a* via pinion gear 5 and the gear 6. In the

well-known manner, the propeller pushes air and a propelling movement is imparted to the plane body through the propeller shaft 7. The propeller shaft 7 is movable back and forth and is normally rotated in the forward position with its front end spaced a short distance from the nose of the plane (see the distance between the nose of the plane body and the boss of the propeller 7*a*).

Therefore, when the propeller 7*a* and the propeller shaft 7 are shifted to their forward position with the start of the motor 4, the connecting rod member 8 is pulled forward by way of the member 7*c* against the action of the spring 9, holding the horizontal tails *a*1 in the normal horizontal position shown in FIG. 1 to maintain the plane in normal flight condition.

When the battery 3 becomes exhausted or discharged, the motor 4 and the propeller cease to rotate and the propeller 7*a* is pushed back by a wind pressure, with the result that the connecting rod member 8 is retracted allowing the horizontal tails *a*1 to rotate around the hinge 1 into the upwardly slanted position shown in FIG. 2 by the action of the coil spring 9. Thus, the plane body is maintained substantially in a horizontal position as it glides down in the vertical direction indicated by an arrow in FIG. 4.

Referring to FIGS. 5 to 7 showing another embodiment of the invention, there is shown at *a* a plane body having horizontal tails *a*1 and a vertical tail *a*2 formed integrally therewith. The horizontal tail plane *a*1 is pivotally mounted on a tail assembly mounting plate *a*3 by a hinge 1 provided on both sides of the vertical tail plane *a*2 for upward pivotting movement around the hinge 1.

The support plate 10 is secured to the underface of the horizontal tail plane *a*1 centrally and adjacent to the front edge thereof and is provided with a connecting portion 10*a* and a bracket portion 10*b*. The tail assembly mounting plate *a*3 has a bracket 11 securely attached to the lower face thereof for fixedly receiving one leg 12*b* of a rod spring 12 the other leg 12*a* of which spring is secured to said bracket portion 10*b* of the support plate member 10. There is shown at 8 a connecting rod member having a front end thereof connected to the propeller shaft 7 in the similar manner as in the embodiment shown in FIGS. 1 to 3 and its rear end connected to the connecting portion 10*a* of the support plate member 10. Therefore, while the propeller 7*a* is rotated, the horizontal tail plane *a*1 is held in the normal horizontal position by the pulling force of the connecting rod member 8 as shown in FIG. 6. If the propeller 7*a* stops due to, for example, exhaustion of the battery, the propeller is forced back by the wind pressure acting thereon, causing the horizontal tail plane to rotate around the hinge 1 upwardly by the action of the rod spring 12*a* as shown in FIG. 7. The plane can therefore go down as shown in FIG. 4 in the same manner as in the case of the embodiment shown in FIGS. 1 to 3.

Though not shown in the accompanying drawings, the plane may be provided with a lock means for preventing the upward rotation of the horizontal tail plane *a*1, i.e., for enabling the plane to be used like a conventional model plane. Such lock means may be of any construction and may be, for example, a screw or a hook adapted to fix the horizontal tail plane *a*1 to the plane body, or may be a means for retaining the connecting rod member 8 in the forward position.

It will be understood from the foregoing that, according to the present invention, the horizontal tail plane may be held in its normal horizontal position against action of a spring while the rotation of the propeller is maintained by the motor, and the horizontal tail plane is actuated into a raised position for preventing further flight of the plane and at the same time for lowering the plane substantially in a vertical direction keeping the plane body in a horizontal posture. Furthermore, the plane may be provided with a lock mechanism for rendering the lowering system inoperative when so desired to use the plane in the same manner as a conventional electric plane without such lowering system.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. A system for safely lowering an electric model plane of the free flight type having a plane body including a tail assembly pivotally mounted on the tail of said plane body and comprising a horizontal tail and a vertical tail formed integrally therewith, a battery mounted on said plane body, a motor mounted on said plane body and supplied with power from said battery, and a propeller driven by said motor through a propeller shaft for propelling the plane; said system comprising a connecting means for connecting said propeller shaft with said tail assembly; and a spring means associated with said tail assembly, said connecting means holding said horizontal tail in a normal horizontal position against a spring action of said spring means while the propeller is rotated by said motor, said spring means shifting said horizontal tail of said plane into a slantingly raised position under the influence of said spring action when said motor comes to a stop due to exhaustion of said battery, thereby to prevent further flight of said plane and at the same time to lower the plane substantially in the vertical direction while maintaining the plane body in a horizontal posture.

2. A system as defined in claim 1, which includes a plate member secured to the lower surface of said horizontal tail plane in the forward center portion thereof, a connecting rod member movable back and forth and having the front end thereof connected to a propeller shaft and the rear end to split plate member in the rear lower portion thereof, wherein said spring means includes a spring member having one end thereof connected to the plane body and the other end secured to said plate member in the forward upper potion thereof for urging said horizontal tail plane into said raised position when said connecting rod member is moved backwardly.

3. A system as defined in claim 2, wherein said connecting rod member is provided at the digital front end thereof with a looped portion loosely fitted over the propeller shaft at a position between a connecting member and stop and bearing members mounted on said propeller shaft and with an angularly turned portion disposed to stride over said stop and bearing members.

4. A system as defined in claim 1, which includes a plate member having a connecting portion and a

bracket portion secured to the lower surface of said horizontal tail plane; a connecting rod member movable back and forth and having one end thereof connected to a propeller shaft and the other end to said connecting portion of said support plate member; a bracket member secured to the lower face of the tail assembly mounting plate; wherein said spring means includes a rod spring having one end thereof secured to said bracket member and the other end to said bracket portion of said support plate member for urging said horizontal tail plane into said raised position when said connecting rod member is moved backwardly.

5. A system as defined in claim 1, further including means for rendering said system inoperative thereby enabling the plane to be used as an ordinary electric model plane without such system.

* * * * *