Sept. 2, 1941. J. E. BARDWELL ET AL 2,254,767

MODEL AIRPLANE

Filed Feb. 17, 1941

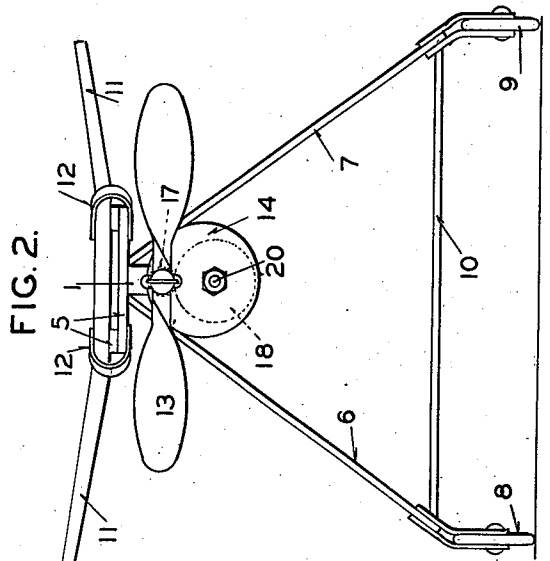


FIG. 2.

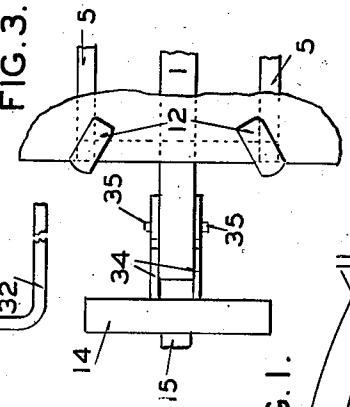


FIG. 3.

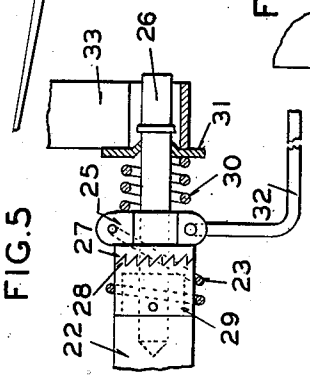


FIG. 5

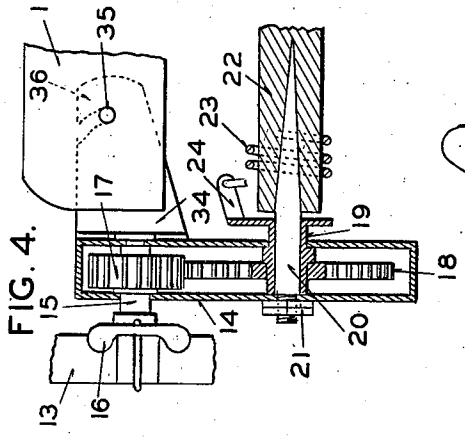


FIG. 4.

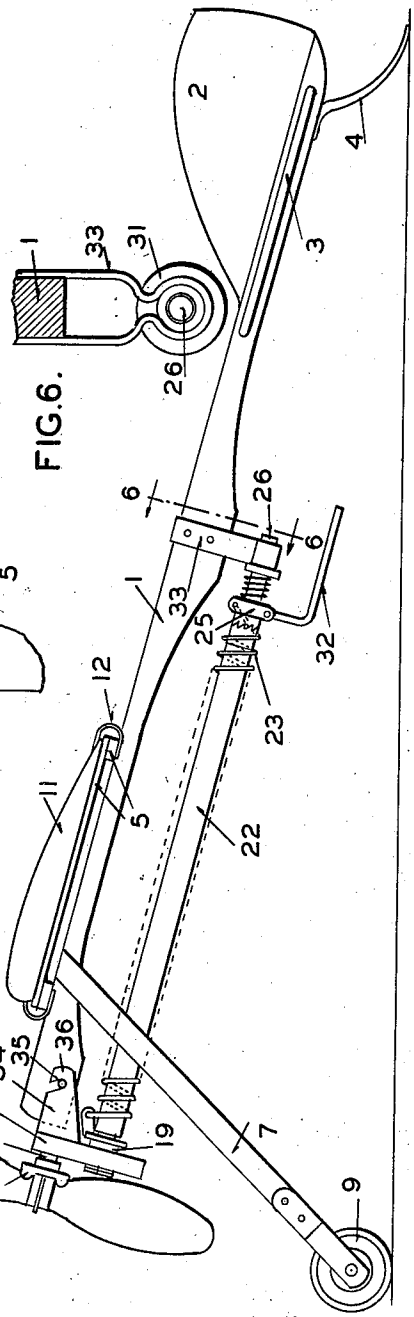


FIG. 6.

FIG. 1.

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MODEL AIRPLANE

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8 Claims. (Cl. 46—78)

Our invention relates to model airplanes and more particularly to improved construction features and means for driving the propeller thereof.

One of the objects of our invention is to produce a spring motor which can be employed to drive the propeller of a model airplane.

Another object of our invention is to so construct a spring motor and so mount it on an airplane that the airplane will not be unbalanced for proper flight nor will the motor produce any twisting forces which will cause the wings, fuselage, and tail to be moved relatively to each other and from their properly related positions.

Still another object of our invention is to provide improved spring motor mounting means for a model airplane which will permit the motor to readily become detached and prevent injury to the airplane in the event the airplane should not land properly and also a detachable mounting means which will permit the spring motor to be removed for winding the spring.

A still further object of our invention is to produce a spring motor for a model airplane which will have a minimum of weight and yet create sufficient torque to drive a propeller for such a period of time that satisfactory flight can be obtained.

Another object of our invention is to so construct a model airplane that certain parts, such as the wings and fuselage, can be held together by clips for flight purposes yet permit the said parts to become detached from each other and prevent injury if an obstacle were encountered.

Other objects will become apparent from the following description taken in connection with the accompanying drawing in which Figure 1 is a side view of our improved model airplane; Figure 2 is a front end view of the airplane; Figure 3 is a top view of a portion of the wings and the front end of the fuselage; Figure 4 is a sectional view through the drive gearing; Figure 5 is an enlarged view of the rear end of the spring and associated parts; and Figure 6 is a view on the line 6—6 of Figure 1.

Referring to the drawing in detail, numeral 1 indicates the fuselage of a model airplane which may be constructed of light material as, for example, balsa wood or the like. The rear end of the fuselage has secured thereto the usual tail construction comprising a fin 2 and stabilizers 3. The tail also carries a tail skid 4. The top of the forward part of the fuselage has secured thereto a square platform 5 built from four pieces of light material which also is preferably wood. Extending downwardly and outwardly from the forward end of the fuselage are two landing gear struts 6 and 7 secured at the upper ends to the fuselage and having mounted on their lower ends landing wheels 8 and 9. A brace 10 is secured between the lower ends of the struts in order to strengthen the landing gear.

The wings 11 are made in one unit and may comprise any usual construction such as a frame made of light material over which is stretched a thin light cover of paper, silk, or the like. The wings rest on top of the platform 5 and are fastened thereto by U-shaped clips 12. These clips are such as to hold the wings to the fuselage with sufficient firmness that the wings cannot be torn from the fuselage under normal flying conditions. However, the holding action of the clips is such that if the airplane wings should strike an obstacle during its flight or in landing, the wings will become detached from the fuselage without damage thereto. The clips may be made of some easily deformable material as aluminum so that they can be clamped into a holding position by the fingers.

The driving means for the propeller blade 13 of the airplane comprises a casing 14 into which is journaled a propeller shaft 15 to which said propeller is secured by suitable means 16. The portion of the shaft within the casing has fixed thereon a small gear 17 constantly meshing with a large gear 18 fixed to a sleeve 19 which extends out of the casing on the side opposite the propeller shaft 15. This sleeve is journaled on a short shaft 20 which extends through the casing and is fixed against rotation to the front side of the casing by means of nuts 21. The rear end of the shaft 20 is secured to the end of a long rod 22 extending rearwardly beneath the fuselage and substantially parallel to the axis of said fuselage and also parallel to the axis of rotation of the propeller. This rod is preferably made of wood for the purpose of lightness but it can also be made of a very light metal which may be tubular in form.

In the particular airplane shown the rod 22 is of such length as to extend substantially halfway the length of the fuselage although it may have a different length relationship with the fuselage. Positioned on this rod is a substantially cylindrical coil spring 23 of a length approximating that of the rod with the forward end of said spring being connected to an arm 24 carried on the outer end of the sleeve 19. The rod is of smaller diameter than the normal inside diameter of the coil spring when not wound up (see Figure 4). The coils of the spring are closely adjacent

each other as shown in Figures 4 and 5. The rear end of the coil spring is secured to a member 25 rotatably mounted upon a pin 26 secured to and extending from the end of the rod 22. The member 25 is provided with ratchet teeth 27 which cooperate with similar ratchet teeth 28 carried by a cap 29 secured to the end of the rod 22. A small coil spring 30 is interposed between the member 25 and a washer 31 and acts on the member 25 to bias the ratchet teeth into cooperative engagement. The member 25 carries a removable crank 32 whereby said member can be rotated on the pin 26 and thus wind up the long coil spring 23 carried on the rod. When the spring is fully wound, it will be snug on the rod 22. Any undesirable buckling of the spring is prevented by the rod. Since the ratchet teeth 28 are fixed, the member 25, after being rotated to wind up the spring, will be held from reverse rotation. The rear end of rod 22 is supported from the fuselage by a U-shaped hanger member 33 freely receiving the pin 26 in the eye portion thereof. The hanger 33 does not in any way prevent the rod from having any slight twisting movement.

The casing 14 for the gearing is provided with two parallel arms 34 by which the casing, propeller, rod 22 and spring 23 can be detachably supported on the front end of the fuselage. The particular attaching means shown comprises pins 35 carried by the fuselage and hooks 36 formed on the arms 34. The spring 30 previously referred to also aids in holding the hooks engaged with the pins. When the gear casing is detached from the fuselage, the pin 26 can be slid out from the eye of the hanger 33. This permits the entire driving mechanism to be held in the hand whereby the coil driving spring 23 can be wound by the handle 32. Also, the detachable connection between the casing 14 and the fuselage permits said casing to become detached in the event the plane should nose-dive and strike the ground head first or should strike head first against an object during flight. The force of the impact when the propeller hits the ground or other object will cause the casing to become detached from the fuselage and thus injury to the airplane will be prevented.

From the above description of our model plane, it is seen that the construction thereof is very simple and there is provided sufficient motive power for so driving the propeller that satisfactory flight can be obtained. When it is desired to wind up the driving spring prior to flight, the propeller, casing and spring are removed from the fuselage and with one hand holding the propeller against rotation, the spring is wound up by means of the handle 32. The propeller and driving means are then again attached to the fuselage and the plane is ready for flight. It is to be noted also that the spring can be wound by the propeller without removing it from the airplane, if desired. When the propeller is released, the spring 23 will begin to unwind and by means of the gears drive the propeller. The use of the cylindrical coil driving spring 23 is a very important feature of the invention since by means of it sufficient torque is obtained for driving the propeller at a high rate of speed and during such a considerable period of time that satisfactory flight is obtained. When the spring is completely unwound, the propeller can still "free wheel" because of the ratchet teeth. The handle is removed after the spring is wound so that such will not interfere with the "free wheeling."

The particular coil spring and the manner in which it is connected to the propeller to drive said propeller does not add an undesirable amount of weight to the airplane and the weight which is added is properly distributed on the fuselage so that the airplane remains properly balanced. If a spiral type of clock spring were employed, such spring would have to be considerably heavier than the cylindrical coil spring to drive the propeller, and, furthermore, the weight of such a spring would be concentrated at a single point, thereby making the airplane almost impossible to properly balance. Many experiments have shown that a spiral spring of the clock type is highly unsatisfactory and does not lend itself to the proper driving of the propeller of a model airplane. The use of the substantially cylindrical coil spring and the manner in which it is attached to the fuselage also produces no twisting strain on the fuselage which would cause the wings and the tail to be improperly related to each other. Because the airplane does not have to withstand any twisting force, it can be made lighter. Any twisting of the rod 22 caused by the wound spring cannot be transmitted to the fuselage through the rear hanger member 33 since the pin 26 only freely projects into this hanger member. If the pin were secured to the hanger, the twisting force imparted to rod 22 when the spring is wound up could easily be transmitted to and twist the fuselage.

The detachable means for mounting the propeller and driving means therefor on the fuselage results in a more durable model airplane since if the plane should come down in a nose dive, the propeller and driving means will immediately become detached from the fuselage at the time of impact, thus permitting the airplane to fall away from the motor or vice versa. Also, by having the wings held to the fuselage by clips, the wings are permitted to become detached from the fuselage when they strike an object. This also is an aid in preventing injury to the airplane.

The use of the coil spring for driving the propeller of the airplane also increases the strength and rigidity of the airplane in addition to providing a durable motor. In prior model airplanes rubber bands have been employed as a driving means. These bands, of course, readily deteriorate and must be replaced from time to time which is expensive. Furthermore, the rubber bands, when wound to obtain driving power, place a longitudinal strain on the fuselage which sometimes collapses the light structure. Furthermore, the twisting up of the rubber bands results in a twisting force being imparted to the fuselage and alters the proper relationship between the wings and the tail. All of these undesirable features of the rubber band models of prior constructions are eliminated by our coil spring driving means. Furthermore, the construction is simple and cheap to manufacture.

Although we have shown a particular structure embodying our invention, it is to be understood that the relationship between the propeller, the driving means, and the cylindrical coil spring may be varied if desirable, it being essential, however, that the coil spring be of such length and produce such power for a sufficient time

that the propeller will be so driven as to maintain substantial flight of the airplane.

Being aware of the possibility of modifications in the particular structure herein described without departing from the fundamental principles of our invention, we do not intend that its scope be limited except as set forth by the appended claims.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with a model airplane provided with a fuselage, of a propeller, driving means for the propeller comprising gearing adjacent the propeller and a cylindrical coil spring connected at one end to the gearing and having a supporting rod to which the other end is held from turning, said propeller, gearing, spring and rod being assembled as a unit, means for detachably mounting the propeller and gearing to the forward end of the fuselage, and means for removably supporting the remote end of the spring and rod to the bottom of the fuselage at a point rearward of the front end, said coil spring and rod when in mounted position being below the fuselage and said detachable mounting means and the supporting means being so related that said propeller and driving means will be permitted to become separated from the fuselage if the propeller should strike the ground first during landing of the airplane or should strike an object during flight.

2. In a model airplane, a fuselage, a tail including a fin and stabilizers, wings constructed as a unit, and means for securing the wings to the fuselage including deformable clips which when pressed into cooperative position with respect to parts of the wings and fuselage will secure said wings in operative position for flying purposes but will permit the wings to become detached if a wing should strike an object.

3. In apparatus of the class described, a driving means for a propeller, said means comprising a support having spaced walls, a propeller carrying shaft journaled in the spaced walls, a rod positioned parallel to the propeller shaft and having one end non-rotatably secured to one wall and extending out beyond the other wall, a sleeve rotatably journaled on the rod, driving means between the sleeve and the propeller shaft and positioned between the two walls, a cylindrical coil spring of considerable length axially aligned with the sleeve having one end attached to said sleeve exterior of the wall, and means for preventing the other end of the coil from rotating and comprising a member extending through the coils of the spring and forming an extension of the rod.

4. In driving means for a propeller, said means comprising a casing having spaced walls, a propeller carrying shaft extending through the casing and journaled in the spaced walls, a rod positioned parallel to the propeller shaft and non-rotatably secured to one wall of the casing and extending out of the casing through the other wall, a sleeve rotatably journaled on the rod and of a length to extend out of the casing such distance as to give the sleeve substantial bearing support on the rod, driving means in the casing between the sleeve and the propeller shaft comprising a gear on the propeller shaft and a gear secured to the sleeve intermediate its ends, a cylindrical coil spring of considerable length having one end attached to the sleeve, a second rod non-rotatably secured to the extended part of the first named rod and positioned within the coils of the spring, and means for connecting the other end of the spring to the second rod to thereby hold said end of the spring from rotation.

5. A propeller and propeller driving means constructed to be attached to and detached from a toy as an assembled unit, said assembled unit comprising a supporting member having spaced walls, a propeller shaft journaled in the walls, a propeller secured to the outer end of the propeller shaft, a driving shaft journaled on the support in parallel relation with the propeller shaft, means for driving the propeller shaft from the driving shaft, a cylindrical coil spring of substantial length having one end attached to the driving shaft and extending beyond the spaced walls in a direction aligned with the driving shaft, a member non-rotatably secured to the support and extending through the coils of the spring, means cooperating with the other end of the spring and the adjacent end of the member for preventing rotation of the end of the spring, and means carried by the supporting member for detachably mounting the unitary propeller and propeller driving means to the toy so that said supporting member will be prevented from relative rotation, said non-rotatable member at its end remote from the supporting member being constructed to be detachably supported on the toy at a point spaced longitudinally rearwardly of the forward end of said toy and in such manner that the twisting force applied to the member by the spring when in wound condition will not be transmitted to the body of the toy.

6. In combination with a model airplane, a propeller and propeller driving means constructed to be attached to and detached from the airplane as an assembled unit, said assembled unit comprising a supporting member having spaced walls, a propeller shaft journaled in the walls, a propeller secured to the outer end of the propeller shaft, a driving shaft journaled on the support in parallel relation to the propeller shaft, means for driving the propeller shaft from the driving shaft, a cylindrical coil spring of substantial length having one end attached to the driving shaft and extending away from the spaced walls in a direction aligned with the driving shaft, a member non-rotatably secured to the support and positioned coextensive with the spring, and means for attaching said other end of the spring to the adjacent end of the member and means for detachably mounting the unitary propeller and propeller driving means to the airplane and comprising means for attaching the supporting member to the forward end of the airplane and other means for supporting the remote ends of the spring and member on the airplane at a point spaced longitudinally rearwardly of the forward end of said airplane and in such a manner that any twisting force applied to the member by the spring when in wound condition will not be transmitted to the airplane through said last named supporting means.

7. In combination with a model airplane provided with a fuselage, wings, and a tail structure, a propeller and propeller driving means constructed to be attached to and detached from the airplane as an assembled unit, said assembled unit comprising a casing, a propeller shaft journaled in the casing, a driving shaft also journaled in the casing, gearing between the driving shaft and propeller shaft, a propeller fixed to the propeller shaft, a cylindrical coil spring of substantial length aligned with the driving shaft and ex-

tending away from the casing, means for securing one end of the spring to the driving shaft, a rod for the spring fixed to the casing at one end and extending to the other end of the spring, means for attaching said other end of the spring to the other end of the rod, and means for detachably mounting the unitary propeller and propeller driving means to the airplane and comprising means for attaching the casing to the forward end of the fuselage and other means for supporting the other end of the spring and rod on the fuselage at a point spaced longitudinally rearwardly of the forward end of the fuselage and in such a manner that any twisting force applied to the rod by the spring when wound will not be transmitted to the airplane through the supporting means.

8. In a model airplane, a fuselage, wings constructed as a single unit, and means for detachably securing the central portion of said unitary wings to the top of the fuselage in order to maintain said wings in operative position for flying purposes but permitting the wings to become detached as a unit if either wing should strike an obstacle, said means comprising separable metal clips which when placed in position will apply such pressure as to clamp the unitary wings to the fuselage.

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