

Feb. 26, 1946.

W. L. BARR

2,395,530

MODEL AIRPLANE CONTROL

Filed Oct. 15, 1943

2 Sheets-Sheet 1

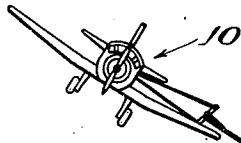


Fig. 1.

Fig. 4.

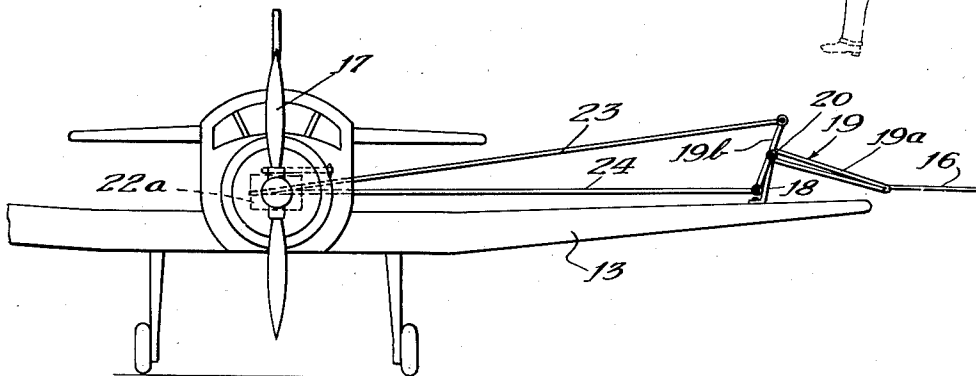


Fig. 5.

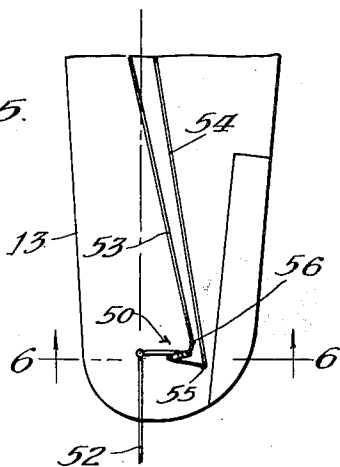
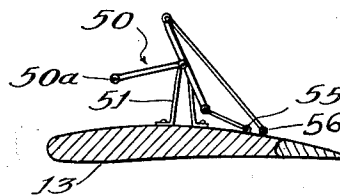


Fig. 6.



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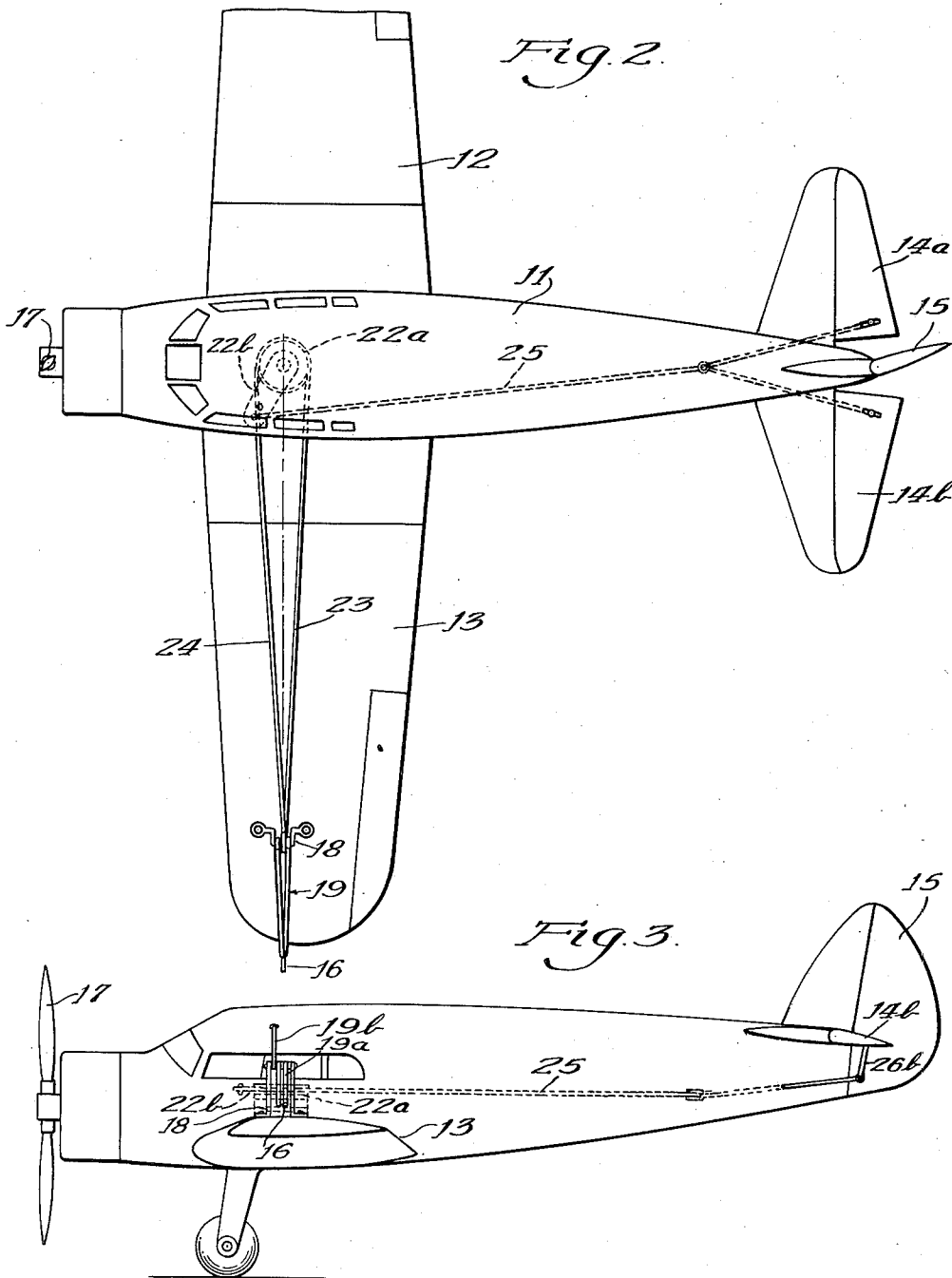
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MODEL AIRPLANE CONTROL

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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MODEL AIRPLANE CONTROL

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11 Claims. (Cl. 46—77)

This invention relates to a model airplane control, and more particularly to means for maintaining a model plane in circular flight and for causing desired vertical movements of the plane in such flight.

One feature of this invention is that it provides means whereby a model plane may be kept in circular flight and controlled as to vertical position by a single line or cord, without the necessity of different cords for the different functions; another feature of this invention is that, even though only a single line is used, all of the controllability of double line control arrangements is retained with a greater inherent stability of the plane than is common with double line control arrangements; still another feature of this invention is that the single line may be reeled in or let out readily to control the size of the circle of flight; yet another feature of this invention is that the arrangement is adapted to be used with any self-powered model plane, as one having a gasoline or rubber band drive, or with a plane which is merely swung; a further feature of this invention is that it provides a control arrangement particularly adapted to flying a model plane from a low pylon; and yet a further feature is that the model can be flown without turning around to follow it with the eyes as this identical system keeps the model in proper flight while it is behind the operator. Other features and advantages of this invention will be apparent from the following specification and the drawings, in which:

Figure 1 is a front elevational view of the plane in flight; Figure 2 is a plan view of the plane with one wing partially broken away; Figure 3 is a side elevational view of the plane shown in Figure 2; Figure 4 is a front elevational view of the plane shown in Figures 2 and 3; Figure 5 is a fragmentary plan view of one wing with a modified form of control arrangement; and Figure 6 is a transverse sectional view along the line 6—6 of Figure 5.

Model airplanes are frequently flown in a large circular course, with the person handling the plane standing at an operating point in the center of the circle. These circles may be up to about 60 feet in diameter in the case of model planes which have no motive power of their own, but are swung at the end of a rod or pole; and a hundred or two hundred feet in diameter in the case of planes powered by gasoline or rubber band motors. Flight in a circular course causes the plane to sometimes be heading into the wind, sometimes fly with the wind behind, and sometimes fly across the wind, resulting in somewhat different flight characteristics. This makes it desirable to have the plane controllable, at least in so far as movement of its elevators is concerned. Moreover, it is desirable to be able to make the

plane rise or descend while in flight, to bring it in to a landing at the end of the period of flight, and the like.

Control arrangements have heretofore been used which perform the double function of controlling the line of flight of the plane by holding it in a circular course and provided the ability to cause the plane to rise or descend vertically, so that no claim is made that this basic idea, per se, is novel. One such control arrangement, for example, is shown in Willard Patent 2,323,506, which issued July 6, 1943.

The present control arrangement has certain advantages over any of the control arrangements previously used, particularly in that full and complete control is effected with only a single line or holding cord, and with much greater stability than has heretofore been possible. In my invention, a single line or cord extends from the operating point to one wing of the plane, where it connects to the base end of a T-shaped control member mounted on the wing. From the ends of the cross arms of the T-shaped member, two control cables extend to translating means mounted at the center of gravity, this means converting the lateral movement of the control cables into fore and aft movement of a connecting rod actuating the elevators or vertical control surfaces in the tail assembly of the plane.

Referring now more particularly to the embodiment of this invention shown in Figures 1—4, the model plane is indicated in general as 10. It has a fuselage or body portion 11, main wings 12 and 13, and a tail assembly including conventional horizontal and vertical stabilizers, movable control surfaces or elevators 14 for controlling the vertical position of the plane, and a rudder 15. When the control arrangement is rigged on the left wing, as illustrated, the rudder would be turned slightly, as may be best seen in Figure 2, to give the plane a normal tendency to pull out against the holding force of the cord 16. The plane illustrated is provided with a propeller 17 powered by a gasoline motor, not illustrated in detail since it forms no part of the present invention.

On the left wing is mounted a bracket or supporting member 18 adapted to provide a pivotal mounting for a T-shaped control member 19. This control member is so mounted that the junction of the base and cross arm are pivoted together about a horizontal axis at the point 20 (see Figure 4), the axis in this case being parallel to the longitudinal axis of the plane. The supporting member and control member are so located that the point of pivotal mounting lies on a line extending through the center of gravity of the plane and perpendicular to the longitudinal axis of the fuselage thereof, near the tip of the wing and preferably on the upper surface

thereof where the plane is a low-wing monoplane, as shown.

The control cord 16 is fastened to the outer end of the control member (the base of the T), as may be best seen in Figure 4.

Within the fuselage of the plane and at its center of gravity is mounted translating means for translating movement of the control member into a movement in the direction operative upon the elevators, the control surfaces 14a and 14b. This is here shown as comprising a spool 22a pivotally mounted in the fuselage to be rotatable about a vertical axis at the center of gravity of the plane, this spool being provided with an outwardly extending arm 22b. Control cables 23 and 24 extend from the spool 22a to the opposite ends of the cross bar of the T-shaped member. It will be seen that the control cables 23 and 24 thus connect to points on the control member which lie on opposite sides of the point 20 of pivotal mounting, so that movement of the control member effects rotation of the spool or translating means 22, and thus fore and aft movement of the outer end of the arm 22b. This arm is provided with at least one and preferably two or three holes near its outer end, and one of these holes is pivotally connected to a control rod, wire, or the like here identified as 25. This is here shown as forking at its back end to connect to two horns, controlling movement of the elevators 14, as the horn 26b connected to the elevator 14b.

While the element 16 extending from the control member to the operating point is spoken of as a "cord," the elements 23 and 24 as "cables," and the element 25 as a "rod," it will be understood that these terms are used merely for convenience of differentiating these elements, and that no limitations are to be understood therefrom. Elements 16, 23 and 24 would normally be of fish line, heavy thread or other similarly relatively flexible material; and the element 25 would normally be of wire sufficiently thick to be relatively rigid, of bamboo or balsa or the like. Also description of the axes of pivotal movements of the member and translating means as "horizontal" and "vertical" are to be understood as merely relative to the position of the plane, in no sense to be construed as absolute. When the plane is in flight as illustrated in Figure 1, the various axes might not be vertical or horizontal in the absolute sense, these descriptive words being used only in connection with the position of the plane as shown in Figures 2, 3 and 4.

By connecting the cord 16 to the outer end of the base 19a of the T-shaped control member, great stability is secured, since under normal conditions the outward pull of the plane holds the cord taut and keeps the elevators in a level position. The cord 16 would normally be connected to the outer end of a pole or rod 27, preferably three or four feet long, and if this outer end is flipped down or flipped up the movement will be transmitted through the cord to the control member. The parts are shown in Figures 3 and 4, for example, as they would be if the cord had just been flipped down slightly, causing the control member to turn slightly from its normal position and thus to depress the elevators, as may be best seen in Figure 3. This would cause the plane to descend to the level desired, whereupon the stabilizing effect of the outward pull of the plane would cause the elevators to assume a horizontal position; and if the plane is pointing downwardly at this time, a slight upward move-

ment of the outer end of the rod could be used to correct this angle and level the plane off again at a lower altitude. Despite its great stability, the control is so effective that the plane, at least if being flown in relatively small circles in the neighborhood of 30 to 50 feet in diameter, can be caused to completely loop the loop. Moreover, because of the stability of the control arrangement, the operator can swing the pole over his head and back around without continuously turning to follow the plane, something which cannot successfully be done with two-cord control arrangements.

If the plane is of the motor driven type it can be started from the ground with the radius of action relatively small, say 10 or 12 feet, then the cord can be gradually let out to the desired flying limit. A short casting rod with a reel is very satisfactory for use as the rod 27, since with such a rod the plane can be started in a small circle, continue well up into the air and gradually be worked out to the desired maximum circle of flight, then reeled into a smaller circle when it is desired to land it or to perform acrobatics.

If the plane is not self-powered, it would usually be started by letting it hang down by three or four feet of cord from the end of the rod. The rod would then be swung around and around the head with some upward inclination and starting rather slowly. Regardless of the initial position in which the plane was hanging, it will straighten itself out and work into flight position, whereupon the cord can be gradually let out as the plane is swung. I have found that about thirty feet of cord (about a sixty foot circle) is the maximum distance at which the plane can be properly swung and yet effectively controlled, particularly if there is any appreciable wind.

In the modified form of the invention shown in Figures 5 and 6, the control member is again T-shaped, but in this case the mounting bracket 51 is so arranged that the axis of pivotal mounting of the control member, still horizontal, is transverse to the longitudinal axis of the airplane. Moreover, it is displaced from the center of lift of the wing sufficiently that the end 50a connected to the cord 52 is directly above the center of lift, on a line extending through the center of gravity of the plane and perpendicular to the longitudinal axis of the fuselage thereof. In this modified form of the invention the control cables 53 and 54 extending back to the translating means first pass through eyelets 55 and 56 to change the direction of pull. To relieve the strain on the pivot, the point 50a to which the cord 52 is connected may be stressed in toward the body of the plane by a spring, rubber cord or other appropriate means. This arrangement provides a control which does not tend to always return itself to neutral, so that loops and the like are more readily performed.

The stability and self-controlling characteristics of this control arrangement make it particularly adapted for use where it is desired to fly a plane in a circular course with the cord connected to a stationary point, as a central pylon. A post of any convenient height can be used as the attachment point for the control cord where the plane is of the self-powered type, and the plane will fly in smooth circles around this control point until its power is exhausted. If the plane starts either up or down from the level of the point of attachment of the cord to the pylon, the change in angle of the cord will cause the

desired corrective movement of the control surfaces and bring the plane back to the proper level. I have flown a model plane with a control arrangement of this type from a pylon only 18 inches high, with complete success, the control action 5 keeping the plane from touching or bumping into the ground during flight even though its flight level was only 18 inches above the ground.

While I have shown and described certain embodiments of my invention, it is to be understood 10 that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. Apparatus of the character described for controlling the flight of a model plane having wings and a movable control surface, including: a control member pivotally mounted on one wing; 20 two control cables for effecting movement of said control surface, these cables being connected to said member at points on opposite sides of its point of pivotal mounting; and a single control cord connected to another point on said member 25 and adapted to extend from said plane to an operating point.

2. Apparatus of the character described for controlling the flight of a model plane having wings and a movable control surface, including: a control member pivotally mounted on one wing; 30 two control cables for effecting movement of said control surface, these cables being connected to said member at points on opposite sides of its point of pivotal mounting; and a single control cord 35 connected to another point on said member and adapted to extend from said plane to an operating point, the mounting of the control member being such that the point of connection of the cord is on a line perpendicular to the longitudinal 40 axis of the plane and passing through the center of gravity thereof.

3. Apparatus of the character described for controlling the flight of a model plane having wings and a movable control surface, including: a control member pivotally mounted on one wing; 45 translating means near the center of gravity of the plane; means connecting said means and the control surface; two control cables connected to the translating means and to the control member, the connection to the member being at points on opposite sides of its point of pivotal mounting; and a single control cord connected 50 to another point on said member and adapted to extend from said plane to an operating point.

4. Apparatus of the character claimed in claim 3, wherein the mounting of the control member is such that the point of connection of the cord is on a line perpendicular to the longitudinal axis 55 of the plane and passing through the center of gravity thereof.

5. Apparatus of the character described for controlling the flight of a model plane having wings and a movable control surface, including: a control member pivotally mounted on one wing; 60 translating means near the center of gravity of the plane and rotatable about a vertical axis; means connecting said translating means and the control surface; two control cables connected to the translating means and to the control member, the connection to the member being at points on opposite sides of its point of pivotal mounting; and a single control cord connected 65 to another point on said member and adapted to extend from said plane to an operating point, the

mounting of the control member being such that the point of connection of the cord is on a line perpendicular to the longitudinal axis of the plane and passing through the center of gravity thereof.

6. Apparatus of the character described for controlling the flight of a model plane having wings and a movable control surface, including: a control member pivotally mounted on one wing and rotatable about a horizontal axis; translating means near the center of gravity of the plane and rotatable about a vertical axis; means connecting said translating means and the control surface; two control cables connected to the 70 translating means and to the control member, the connection to the member being at points on the opposite sides of its point of pivotal mounting; and a single control cord connected to another point on said member and adapted to extend from said plane to an operating point, the mounting of the control member being such that the point of connection of the cord is on a line perpendicular to the longitudinal axis of the plane and passing through the center of gravity thereof.

7. Apparatus of the character claimed in claim 3, wherein the axis of pivotal mounting of the control member lies horizontally and transversely of the plane.

8. Apparatus of the character claimed in claim 6, wherein the axis of pivotal mounting of the control member lies horizontally and transversely of the plane.

9. Apparatus of the character described for controlling the flight of a model plane having a fuselage, wings, and at least one movable control surface, including: a control member pivotally mounted on one wing for movement about an axis extending horizontally and transversely of the plane; translating means in the fuselage; 40 means connecting said translating means and the control surface, whereby movement of the translating means effects movement of the control surface; means connecting said control member and the translating means, whereby movement of the control member effects movement of the translating means; and a single control cord adapted to extend from said plane to an operating point, said cord lying along a line perpendicular to the longitudinal axis of the plane and passing through the center of gravity thereof and being operatively connected to said control member to effect movement thereof.

10. Apparatus of the character described for controlling the flight of a model plane having a fuselage, wings, and at least one movable control surface, including: a control member pivotally mounted on one wing; translating means; means connecting said translating means and the control surface, whereby movement of the translating means effects movement of the control surface; means connecting said control member and the translating means, whereby movement of the control member effects movement of the translating means; and a single control cord adapted to extend from said plane to an operating point, said cord being operatively connected to said control member to effect movement thereof.

11. Apparatus of the character claimed in claim 3, wherein the control member is T-shaped, comprising a base portion having one end connected to the center of the other portion, and said cord is connected to the other end of said first mentioned portion.

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