Nov. 24, 1953 E. E. TURNER 2,659,999

CONTROL FOR MODEL AIRPLANES

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Fig. 1.

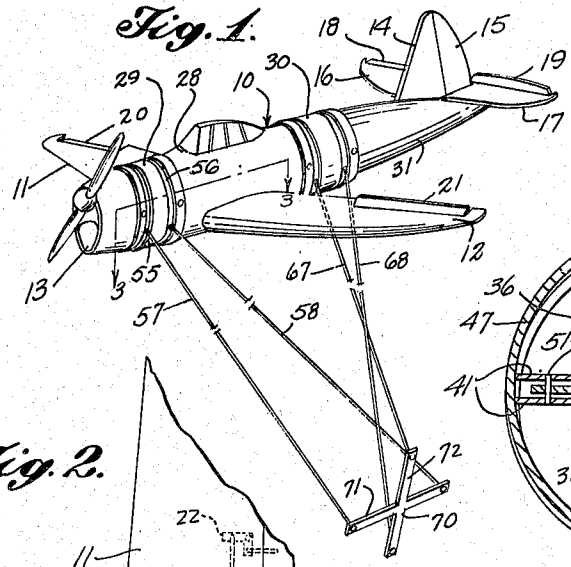



Fig. 4.

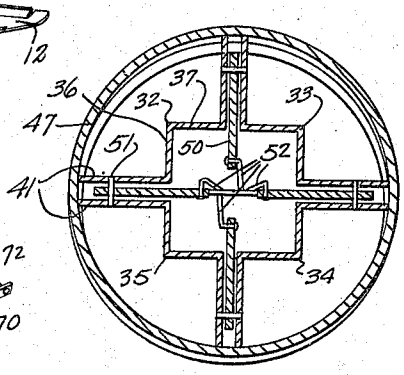



Fig. 2.

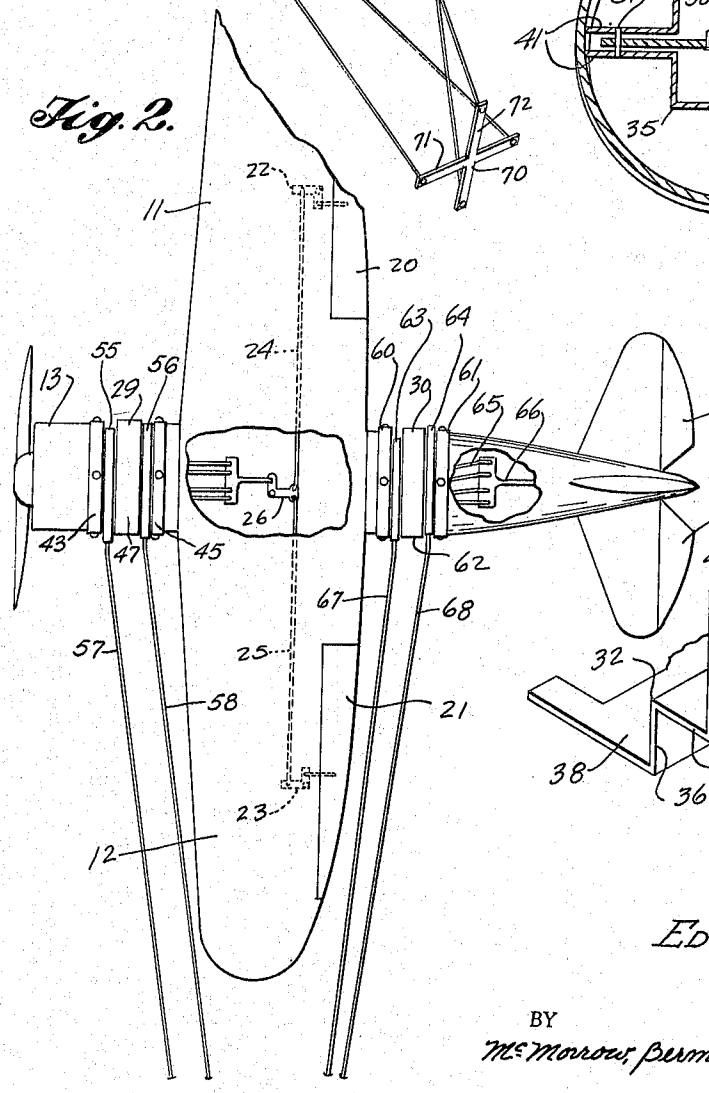
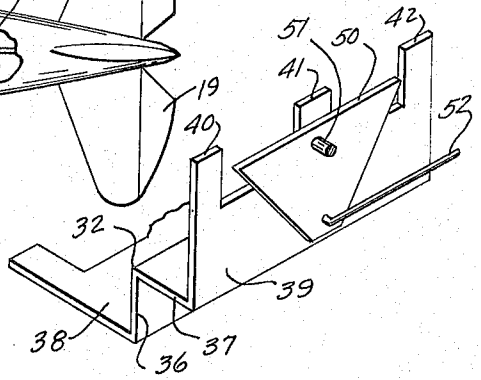



Fig. 6.




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Fig. 3.

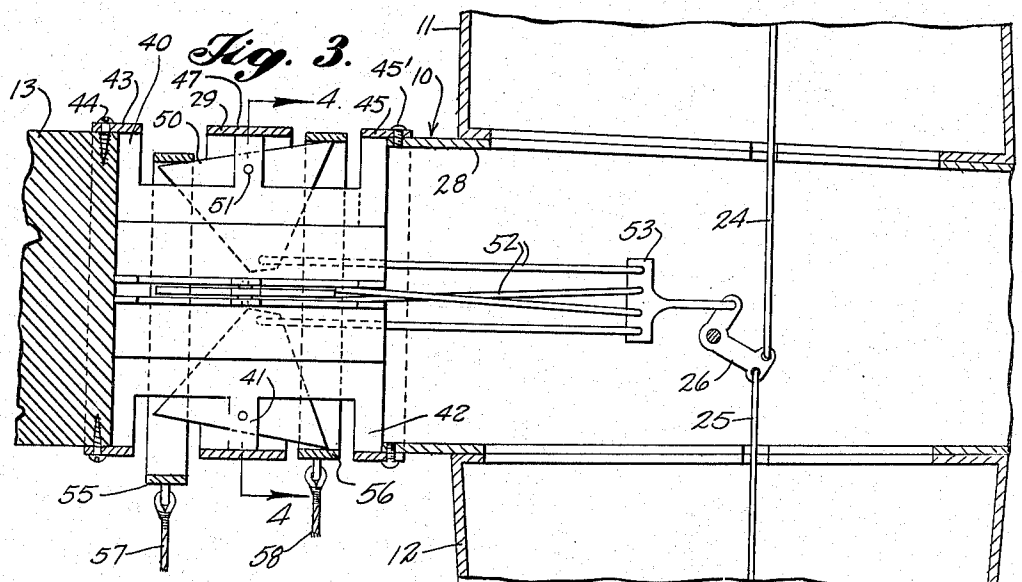
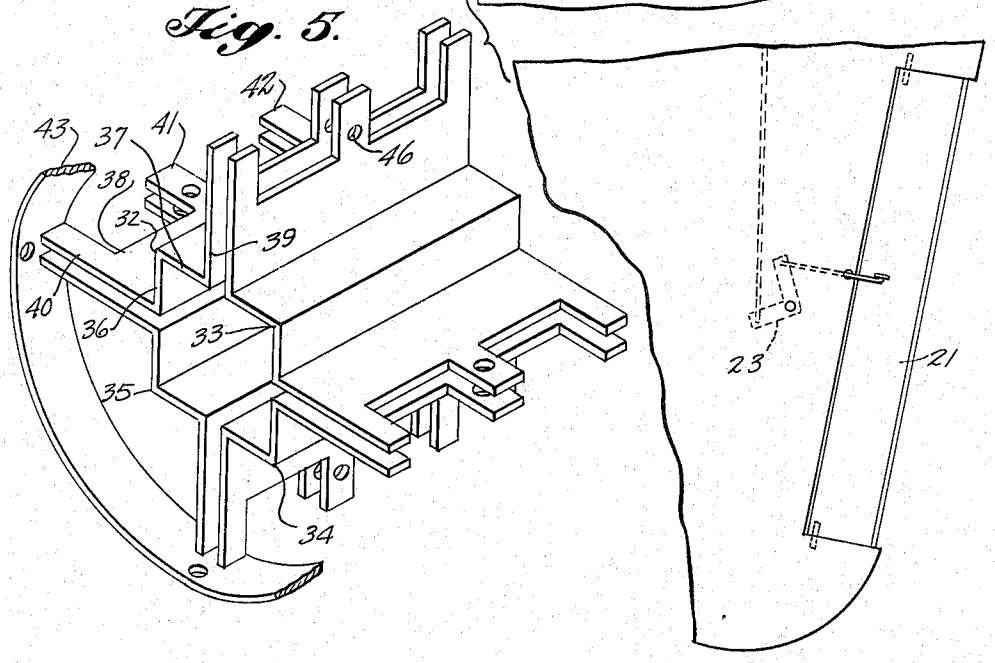



Fig. 5.




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Patented Nov. 24, 1953 2,659,999

# UNITED STATES PATENT OFFICE

2,659,999

## CONTROL FOR MODEL AIRPLANES

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Application May 2, 1952, Serial No. 285,588

6 Claims. (Cl. 46—77)

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This invention relates to controls for model airplanes and more particularly to a control assembly which extends from the model airplane to a person controlling the airplane so that the airplane can be caused to perform a controlled flight around a person standing on the ground and holding the corresponding end of the control assembly.

It is among the objects of the invention to provide an improved model airplane control system whereby an operator standing on the ground can control the action of a model airplane in circular flight around the operator; which permits the model airplane to roll freely about its longitudinal center line while in flight without loss of control; which independently controls the rolling and pitching action of the model airplane; which is tangle-proof and so arranged that the control strings will not wrap around the model airplane while the latter is in flight; and which is simple and durable in construction, and positive and sensitive in operation.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

Figure 1 is a perspective view of a model airplane and control assembly illustrative of the invention;

Figure 2 is a top plan view of the airplane and control assembly illustrated in Figure 1 with portions of the airplane broken away to better illustrate the control assembly;

Figure 3 is a fragmentary cross sectional view on an enlarged scale on the line 3—3 of Figure 1;

Figure 4 is a transverse cross sectional view on the line 4—4 of Figure 3;

Figure 5 is a fragmentary perspective view of the airplane frame; and

Figure 6 is a fragmentary perspective view of the frame and a portion of the control assembly mounted on the frame.

With continued reference to the drawings, the model airplane has a body or fuselage generally indicated at 10, wings 11 and 12 extending from respectively opposite sides of the fuselage intermediate the length of the latter, an engine and propeller assembly 13 mounted on the front end of the fuselage, and a tail assembly mounted on the rear end of the fuselage and including a vertical tail fin 14, a rudder 15, horizontal stabilizers 16 and 17 and elevators 18 and 19.

While a particular form of airplane has been illustrated for the purpose of disclosing the invention, it is to be understood that the invention may

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be applied to model airplanes of other forms such as those having two or more engines or two rudders, without in any way exceeding the scope of the invention.

Ailerons 20 and 21 are pivotally mounted on the wings 11 and 12 respectively at the trailing edges of the wings and near the outer ends thereof and these ailerons are interconnected by link and lever mechanism including bell cranks 22 and 23 pivotally mounted in the wings 11 and 12 respectively and connected each at one end one to the aileron 20 and one to the aileron 21 intermediate the lengths of the ailerons and links 24 and 25 extending from the bell cranks 22 and 23 respectively toward the longitudinal center line of the airplane and connected at the inner ends to one end of a bell crank 26 pivotally mounted in the fuselage 10 of the airplane. The connection between the ailerons 20 and 21 is such that when the links 24 and 25 are moved longitudinally in one direction one of the ailerons is tilted upwardly and the other downwardly and when the links 24 and 25 are moved longitudinally in the other direction the ailerons are reversely operated.

The airplane fuselage 10 has a frame including a tubular intermediate portion 28 which extends forwardly and rearwardly of the inner ends of the wings 11 and 12 and to which the wings are secured at their inner ends and lever carrying frame sections 29 and 30 disposed at the front and rear ends of the intermediate portion 28 and secured to the latter in end to end relationship thereto.

The engine and propeller assembly 13 is mounted on the front end of the frame section 29 and a tail section 31 of tubular construction is mounted at its front end to the rear end of the frame section 30 and carries the tail assembly on its rear end.

As the two frame sections 29 and 30 may be of identical construction, a detailed illustration and description of one only has been considered sufficient for the purposes of the present disclosure and the frame section 29 has been selected for such detailed illustration and description.

The frame section 29 includes four inner members 32, 33, 34 and 35 of substantially identical construction and each having two legs, as indicated at 36 and 37 for the member 32, of elongated, rectangular shape, joined along common edges and disposed perpendicular to each other, a flange 38 extending perpendicularly from the edge of the leg 36 remote from the leg 37 in a

direction opposite that in which the leg 37 extends from the leg 36 and a flange 39 extending perpendicularly from the edge of the leg 37 remote from the leg 36 in a direction opposite that in which the leg 36 extends from the leg 37. The flanges of the several frame members are provided with outwardly extending tongues at spaced apart locations therealong, as indicated at 40, 41 and 42 for the flange 38 of the member 32 and the members are coterminously arranged in side by side relationship so that the perpendicularly disposed legs of the several members constitute an inner box formation of substantially square cross sectional shape; the flanges extend two from each side of the rectangular box formation with each two adjacent flanges in parallel and spaced apart relationship to each other and the tongues projecting from the flanges are arranged in mutually opposed pairs of spaced apart and substantially parallel tongues, there being three pair of tongues spaced apart longitudinally of each side of the box formation and spaced outwardly from the corresponding sides of the box formation by the width of the corresponding flanges.

One group of tongues is disposed at the front end of the frame section 29 and arranged in pairs which are spaced apart at angular intervals of 90 degrees around the front end of the frame section and a circular band 43 extends around the outer ends of this group of tongues and receives the rear end of the engine and propeller section of the airplane to which the band is attached by suitable means, such as the screw fasteners 44 illustrated in Figure 3.

Another group of tongues including the tongue 42 is disposed at the rear end of the frame section and arranged in pairs of tongues with the pairs spaced apart at angular intervals of 90 degrees around the rear end of the frame section and an annular band or ring 45 surrounds the outer ends of this group of tongues and receives the front end of the intermediate frame section 28 to which the band 45 is secured by suitable means such as the screw fasteners 45', also illustrated in Figure 3.

The intermediate tongues are disposed substantially at the midlength location of the frame section 29 and are arranged in pairs spaced apart at angular intervals of 90 degrees around the frame section and these intermediate tongues are provided with apertures, as indicated at 46 so arranged that the apertures in each adjacent pair of tongues are in alignment with each other. An annular band or ring 47 surrounds the outer ends of the intermediate tongues and is spaced at its front and rear ends from the front and rear bands 43 and 45 respectively.

Rocker levers, as indicated at 50, of triangular or T-shape are disposed one between each pair of intermediate tongues 41 and have straight edges adjacent the outer ends of the tongues. These rocker levers are each provided with an aperture adjacent the midlength location of its outer straight edge and are pivotally connected to the corresponding intermediate tongues by pivot pins, as indicated at 51, extending through registering apertures in each rocker lever and in the associated pair of intermediate tongues. These rocker levers are pivotally movable about individual axes which lie substantially in a plane perpendicular to the longitudinal center line of the airplane fuselage 10 and are disposed radially of the annular ring or band 47. Rods, as indicated at 52, are connected at their forward ends one to each



of the rocker levers 50 adjacent the inner ends of these rocker levers and are connected at their rear ends to a plate 53 of triangular or T-shape at spaced apart locations transversely of the plate and adjacent one end of the latter. At its other end the plate is pivotally connected to the bell crank 26 at the end of this bell crank opposite that to which the links 24 and 25 are pivotally connected.

The plate 53 is movable in a fore and aft direction upon rocking movements of the rocking levers 50 and upon fore or aft movement thereof imparts longitudinal movement in a corresponding direction to the links 24 and 25 which in turn impart tilting movement to the ailerons 20 and 21, tilting one aileron upwardly and the other downwardly.

A flat ring 55 is disposed in the space between the annular ring 43 and the annular ring 47 and bears on the outer edges of the rocker levers 50 at the corresponding side of the plane of the pivotal axes of these rocker levers. A similar flat ring 56 is disposed in the space between the annular ring or band 47 and the annular ring 45 and bears upon the outer edges of the rocker plates 50 at the corresponding rear side of the plane of the pivotal axes of the rocker levers.

The rocker levers are connected together for simultaneous movement through the rods 52 and the plate 53 and when one of the rings is moved inwardly relative to the frame section 29 the rocker levers will be rocked in one direction and when the other ring is pulled inwardly the rocker levers will be rocked in the opposite direction. In the arrangement illustrated, when the ring 55 is pulled inwardly the rocker levers will be rocked in a direction to impart a rearward movement to the plate 53 and a consequent raising of the left aileron and lowering of the right aileron of the airplane whereas, when the rear ring 56 is pulled inwardly the rocker levers will be moved in a direction to impart a forward movement to the plate 53 with a consequent lowering of the left aileron and raising of the right aileron of the airplane.

A control string 57 is secured to the ring 55 and extends therefrom and a similar control string 58 is secured to the ring 56 and extends from the latter.

As stated above, the rear frame section 30 is similar in construction and arrangement to the front frame section 29 and this rear frame section has front and rear fixed rings or bands 60 and 61 and an intermediate fixed ring or band 62 and also has movable rings 63 and 64 riding on the outer straight edges of rocker levers corresponding to the rocker levers 50 in the front frame section 29. The rocker levers in the rear frame section are connected by rods 65 to the front end of a triangular or T-shaped plate 66 the rear end of which is connected to the elevators 18 and 19 of the model airplane so that alternative movement of the rings 63 and 64 inwardly of the frame section 30 causes the elevators to tilt upwardly or downwardly.

Control strings 67 and 68 are connected to the rings 63 and 64 respectively and extend therefrom. At their ends remote from the airplane the control strings are connected to a control stick 70 in the form of a cross having a normally horizontally disposed bar 71 and a normally vertically disposed bar 72. The control strings 57 and 58 are connected at their ends remote from the airplane to the respectively opposite ends of the horizontal bar 71 of the control stick while

the strings 67 and 68 are connected at their ends remote from the airplane to the respectively opposite ends of the vertically disposed bar 72 of the control stick, as illustrated in Figure 1.

With this arrangement, complete and sensitive control is maintained by the operator over the ailerons and elevators of the model airplane while the latter is in flight and the airplane can rotate freely in the control rings 55, 56, 60 and 61 to do barrel rolls and other aerobatics without fouling the control lines or causing them to wrap around the fuselage of the airplane.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A model airplane and control assembly comprising an elongated frame, wings extending to respectively opposite sides of said frame intermediate the length of the latter, ailerons pivotally mounted one on each of said wings at locations spaced from said frame, link means interconnecting said ailerons for movement of the ailerons in respectively opposite directions, elevators pivotally mounted on said frame at one end of the latter, a first set of rocking levers pivotally mounted on said frame at angular intervals around the latter for rocking movements about axes disposed in a plane perpendicular to the longitudinal center line of said frame, means connecting said rocking levers to said link means for movement of said link means in opposite directions upon rocking movement of said rocking levers in respectively opposite directions about the axes of their pivotal connections with said frame, rings surrounding said first set of rocking levers one at each opposite side of said plane, a second set of rocking levers pivotally mounted on said frame at angular intervals around the frame and at a location spaced longitudinally of said frame from said first set of rocking levers for rocking movement about axes disposed in a second plane perpendicular to the longitudinal center line of said frame, means connecting the rocking levers of said second set to said elevators for movement of said elevators in opposite directions upon respectively opposite movements of the rocking levers of said second set about the axes of their pivotal connections with said frame, rings surrounding said second set of rocking levers one at each side of said second plane, and control strings extending one from each of said rings, said frame and said sets of rocking levers being freely rotatable in said rings.

2. A model airplane and control assembly comprising an airplane frame including a tubular intermediate portion and frame sections disposed one at each end of said intermediate portion and each providing apertured ears disposed intermediate the length thereof and at substantially equal angular intervals therearound, rocking levers pivotally mounted on said ears and disposed at substantially equal angular intervals around the corresponding frame sections, each of said rocking levers extending radially of the corresponding frame section and having a substantially straight outer edge and said rocking



levers extending longitudinally of said frame and being pivotally connected to the corresponding ears adjacent the midlength locations of their outer edges, wings extending from respectively opposite sides of said intermediate frame portion, ailerons mounted one on each wing at locations spaced from said frame, link and lever means interconnecting said ailerons for tilting movements in respectively opposite directions relative to said wings, means connecting the inner ends of all of the rocking levers mounted on one of said frame sections to said link and lever means for movement of the latter in response to rocking movements of the associated rocking levers, elevators carried by said frame at a location spaced from said wings and pivotally movable relative to said frame, means connecting the inner ends of all of the rocking levers carried by the other frame section to said elevators for tilting movement of said elevators in response to rocking movements of the associated rocking levers, the pivotal connections between said rocking levers and said frame sections being disposed in corresponding planes perpendicular to the longitudinal center line of said frame, rings surrounding said frame sections and said rocking levers and disposed one at each side of each plane of the pivotal connections between said rocking levers and said frame sections, and control strings extending one from each of said rings for selectively moving said rings transversely of said frame and thereby imparting rocking movements to said rocking levers.

3. A model airplane and control assembly comprising an airplane frame including a tubular intermediate portion and frame sections disposed one at each end of said intermediate portion and each providing apertured ears disposed intermediate the length thereof and at substantially equal angular intervals therearound, rocking levers pivotally mounted on said ears and disposed at substantially equal angular intervals around the corresponding frame sections, each of said rocking levers extending radially of the corresponding frame section and having a substantially straight outer edge and said rocking levers extending longitudinally of said frame and being pivotally connected to the corresponding ears adjacent the midlength locations of their outer edges, wings extending from respectively opposite sides of said intermediate frame portion, ailerons mounted one on each wing at locations spaced from said frame, link and lever means interconnecting said ailerons for tilting movements in respectively opposite directions relative to said wings, means connecting the inner ends of all of the rocking levers mounted on one of said frame sections to said link and lever means for movement of the latter in response to rocking movements of the associated rocking levers, elevators carried by said frame at a location spaced from said wings and pivotally movable relative to said frame, means connecting the inner ends of all of the rocking levers carried by the other frame section to said elevators for tilting movement of said elevators in response to rocking movements of the associated rocking levers, the pivotal connections between said rocking levers and said frame sections being disposed in corresponding planes perpendicular to the longitudinal center line of said frame, rings surrounding said frame sections and said rocking levers and disposed one at each side of each plane of the pivotal connections between said rocking levers and said frame

sections, and control strings extending one from each of said rings for selectively moving said rings transversely of said frame and thereby imparting rocking movements to said rocking levers, said means connecting the corresponding rocking levers to said link and lever means comprising a bell crank lever pivotally mounted on said frame and connected at one end to said link and lever means, a plate pivotally connected at one end to said bell crank lever at the other end of the latter and extending from said bell crank lever toward said associated rocking levers, and rods pivotally connected one to each of said rocking levers at the inner ends of the rocking levers and at one end of each rod and connected at their other ends to said plate at the other end of the latter and at locations spaced apart transversely of the plate.

4. A model airplane and control assembly comprising an airplane frame including a tubular intermediate portion and frame sections disposed one at each end of said intermediate portion and each providing apertured ears disposed intermediate the length thereof and at substantially equal angular intervals therearound, rocking levers pivotally mounted on said ears and disposed at substantially equal angular intervals around the corresponding frame sections, each of said rocking levers extending radially of the corresponding frame section and having a substantially straight outer edge and said rocking levers extending longitudinally of said frame and being pivotally connected to the corresponding ears adjacent the midlength locations of their outer edges, wings extending from respectively opposite sides of said intermediate frame portion, ailerons mounted one on each wing at locations spaced from said frame, link and lever means interconnecting said ailerons for tilting movements in respectively opposite directions relative to said wings, means connecting the inner ends of all of the rocking levers mounted on one of said frame sections to said link and lever means for movement of the latter in response to rocking movements of the associated rocking levers, elevators carried by said frame at a location spaced from said wings and pivotally movable relative to said frame, means connecting the inner ends of all of the rocking levers carried by the other frame section to said elevators for tilting movement of said elevators in response to rocking movements of the associated rocking levers, the pivotal connections between said rocking levers and said frame sections being disposed in corresponding planes perpendicular to the longitudinal center line of said frame, rings surrounding said frame sections and said rocking levers and disposed one at each side of each plane of the pivotal connections between said rocking levers and said frame sections, and control strings extending one from each of said rings for selectively moving said rings transversely of said frame and thereby imparting rocking movements to said rocking levers, said means connecting the corresponding rocking levers to said elevators comprising a plate connected at one end to said elevators and extending from said elevators toward said associated rocking levers, and rods pivotally connected one to each of said associated rocking levers at the inner ends of the rocking levers and



at one end of each rod and connected at their other ends to said plate at the other end of the latter and at locations spaced apart transversely of the plate.

5. A model airplane and control assembly comprising an airplane frame including an intermediate portion and a frame section disposed at one end of said intermediate portion and providing apertured ears disposed intermediate the length thereof and at substantially equal angular intervals therearound, rocking levers pivotally mounted on said ears and disposed at substantially equal angular intervals around said frame sections, each of said rocking levers extending radially of the frame section and longitudinally of said frame and having a substantially straight outer edge and said rocking levers being pivotally connected to the corresponding ears adjacent the midlength locations of their outer edges, wings extending from respectively opposite sides of said intermediate frame portion, ailerons mounted one on each wing at locations spaced from said frame, link and lever means interconnecting said ailerons for tilting movements in respectively opposite directions relative to said wings, means connecting the inner ends of all of said rocking levers to said link and lever means for movement of the latter in response to rocking movements of said rocking levers, rings surrounding said frame section and said rocking levers one at each side of the plane of the pivotal connections between said rocking levers and said frame section, and control strings extending one from each of said rings for selectively moving said rings transversely of said frame and thereby imparting rocking movements to said rocking levers.

6. A model airplane and control assembly comprising an airplane frame, flight control members carried by said frame and movable relative thereto, and remote control means for moving said flight control members relative to said frame comprising rings surrounding said frame at locations spaced apart therealong and rotatable around said frame and movable transversely thereof, ring actuated mechanism mounted on said frame and connected to said flight control members for moving the latter in a predetermined manner in response to movement of said rings transversely of said frame, and control strings connected one to each of said rings and extending from said rings for use by an operator standing on the ground to control the airplane in flight, said ring actuated mechanism including rocking levers pivotally mounted on said frame for rocking movement about axes disposed substantially in a plane perpendicular to the longitudinal center line of said frame, said rocking levers extending to opposite sides of said plane, and said rings being disposed one at each side of said plane and engaging the corresponding portions of said rocking levers.

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