April 20, 1954 N. E. WALKER 2,676,013

AIR-POWERED MINIATURE AIRPLANE

Filed July 23, 1951 2 Sheets-Sheet 1

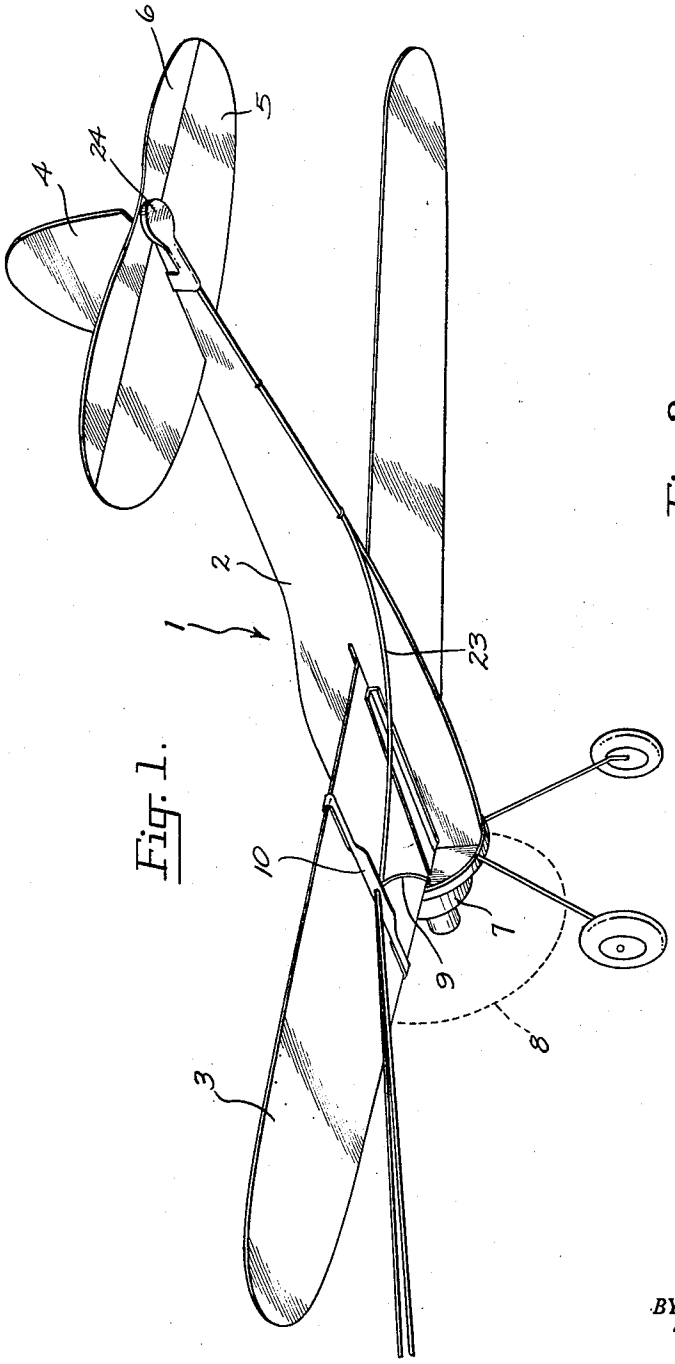


Fig. 1.

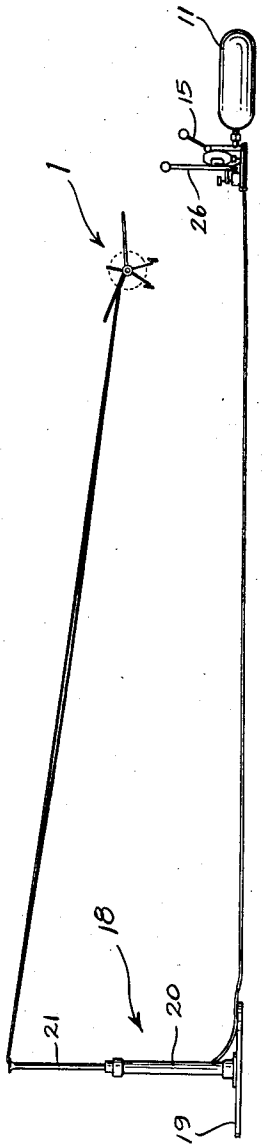


Fig. 2.

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2 Sheets-Sheet 2

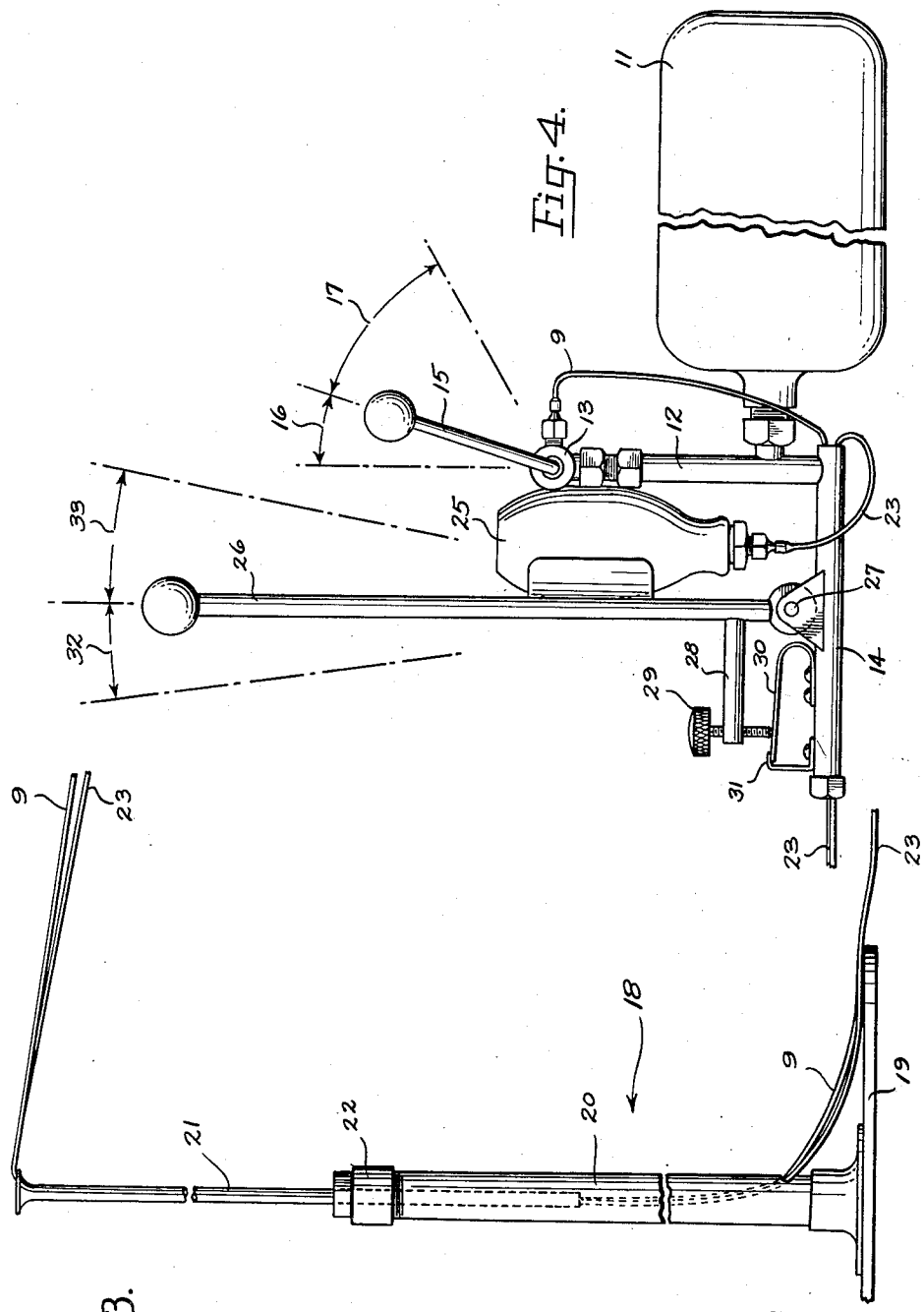


Fig. 4.

Fig. 3.

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2,676,013

UNITED STATES PATENT OFFICE

2,676,013

AIR-POWERED MINIATURE AIRPLANE

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Application July 23, 1951, Serial No. 238,117

6 Claims. (Cl. 272—31)

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This invention relates to a captive type miniature airplane having an air motor propelling mechanism which is joined, by means of an elongated hollow air tube, to a distantly located source of air supply, thereby to actuate the motor and to limit the flight path of the airplane from a distance with the same hollow air tube member.

One object of my invention is to provide a miniature airplane which is propelled by an air motor controllable from a distance thereby to decrease or obviate the necessity of an operator standing in the center of a circle and turning more or less rapidly as the airplane follows a circular path as well as to eliminate noise incident to the flight of internal combustion engines provided for self-propelled miniature toy airplanes hitherto known. These advantages, in summation, provide a miniature air plane of peculiar adaptation to the requirements of indoor flying.

In the marketing of toy or miniature aircraft, two main types of retail outlets are utilized. Firstly, hobby and toy shops and handicraft and sporting goods stores provide a year around outlet patronized principally by school age children and young adults. Secondly, department and variety stores sell a large volume of this merchandise, mainly to the parents of school age children, during the Christmas rush season. During the remainder of the season, of course, these latter outlets continue their sales but the volume is much larger at Christmas time.

In anticipation of the seasonal trend in hobby and toy sales, many department stores allot a floor space and a demonstration staff to these products during the latter part of November and during December. Furthermore, individual distributors and manufacturers are allotted floor space to install exhibits by which they may demonstrate their wares. This is an exceptionally satisfactory marketing method and increases the sales volume materially. However, this marketing method hitherto has been unavailable to the manufacturer or distributor of self-propelled miniature airplanes because of the nature of the product. Thus, such airplanes conventionally are powered by midget gasoline or diesel engines, relatively heavy in weight and very noisy in operation. In fact, the noise from a typical miniature airplane engine is deafening in a crowded department store and the fire hazard and danger of collision with customers, sales people, and articles on display hitherto have prevented the active indoor demonstration of captive airplanes. In obviation of these dangers and in improvement on the prior art captive airplanes, it is one object of my invention to provide a captive type miniature airplane which is safe, relatively silent, and easy to control. Thus, such an airplane safely can be demonstrated in a department store, armory, hotel lobby, pavilion, field house, or other indoor area all to the end of allowing more potential customers to witness an actual operation. Furthermore, certain specialty and department stores, which follow a rigid policy of never handling any toy or handicraft material which their clerks cannot personally demonstrate, will agree to sell the instant miniature airplane. Accordingly, the first prime advantage of my invention is one of increased commercial value or sales volume as bottomed upon the provision for indoor flight, especially in department stores and more particularly during the season of large volume sales.

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Progressing to the second prime advantage of this improved structure, a miniature airplane constructed in accord with my inventive concept includes an air motor having the first end of an elongated, hollow air tube connected therewith. Located distantly from the airplane, a fixed pylon member releasably holds an intermediate portion of the tube. Thus, that portion of the air tube carried intermediate the pylon and the airplane serves to limit the flight of the airplane to a circular path about the pylon as a center. Additionally, a second or terminal end of the hollow air tube is connected across a control or throttle valve with an air pressure supply, such as an air bottle, compressor, or hand pump accumulator. Two optional methods of flight control are possible with this combination pylon structure. Firstly, the air supply and the control valve may be placed outside the radius of the flight circle to allow a continuous visual observation of the airplane in flight. Secondly, the supply and control actuation mechanism may be located adjacent the base of the pylon, and the latter may extend vertically up above the head of the operator. This allows the operator to manipulate the control, which manipulation may simulate that of an actual airplane throttle, without having continuously to counteract the centrifugal force or outward pull of the miniature airplane. This force and pull are a disadvantage very much in evidence in the prior art.

To secure yet a third inventive advantage or objective, the aforementioned structure may be combined with a pneumatic mechanism, including a second, parallel hollow air tube to control the elevators, rudder, and/or ailerons of the miniature airplane at the same time the air motor is controlled. Optionally, this structural addition

may include a spring biased lever for actuating the pneumatic mechanism in simulation of the movements of the control stick of an actual airplane. Thus, the youthful operator may be given complete control of a miniature airplane which is safe to fly indoors, and which is responsive, in the manner of a full-scale airplane, to the manipulations of a miniature control stick and throttle.

Other advantages and inventive objects will appear in the following detailed description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view of a miniature airplane which is equipped both with an air motor and with a pneumatic control, the latter being shown as it is applied to the elevator;

Fig. 2 is a side view, somewhat schematic, indicating the manner in which an elongated hollow air tube may function as a flight limiting means to cause a miniature airplane to fly in a circle about a fixed pylon; said figure further indicating an optional location for the actuation mechanism, such location being shown outside the radius of the circular flight path for the miniature airplane;

Fig. 3 is an enlarged view, partially foreshortened, indicating the details of my vertically extensible, fixed pylon guide which may be utilized when the miniature airplane operator does not wish to turn and rotate as the airplane flies in a circular path; and

Fig. 4 is an enlarged side view, partially foreshortened, illustrating a preferred form of my actuation mechanism wherein a miniature control stick and throttle are operable to simulate the movements of the control stick and throttle in an actual airplane.

In the drawings accompanying this specification, I have shown my invention in combination with a miniature airplane 1. This particular airplane includes an elongated fuselage 2, an integral main wing 3, a fixed vertical rudder 4, a horizontal stabilizer 5, and an adjustable elevator 6. As will become apparent during the development of this specification, however, my invention is equally practical in combination with a miniature airplane having fixed elevators and/or an adjustable rudder and/or adjustable ailerons. That is to say, the particular details of the miniature airplane per se are relatively unimportant to the scope of the instant invention so long as an airborne structure is provided.

As is functionally illustrated in the perspective view of Fig. 1, the airplane 1 is provided with an air motor 7 operatively connected to a propeller 8 for powering the airplane in flight. This motor 7 may be of any conventional design, such as a piston and cylinder or turbine type, so long as it functions to rotate the propeller when air is supplied thereto. One end of an elongated, hollow air tube 9 is connected with the air motor 7 to supply air thereto. This tube 9 and the air motor 7 are best made of light weight materials to facilitate the flight of the airplane.

Progressing outwardly along the main wing 3, a guide clip 10 is detachably secured to the wing and this clip is adapted to receive an intermediate portion of the air tube 9 in an aperture formed therethrough. Preferably, the guide clip 10 is crimped to or frictionally slipped over the main wing 3 so it easily may be removed for reattachment to the opposite side of the wing. In general, such reattachment may be required periodically so the air tube 9 can be unwound by flying the airplane in an oppositely directed circular path.

In Fig. 4, I have shown an air supply mechanism in the form of an air bottle 11 which is utilized to supply air under pressure to the motor 7. If desired, an air pump (not shown) may be provided to recharge the bottle periodically. This bottle is connected, through a vertical pipe 12 and across a control valve 13, to the aforementioned air tube 9. The vertical pipe 12 stands upon a base 14 which is best fabricated from a section of hollow tubing to accommodate an intermediate portion of the air tube 9. Additionally, the control valve 13 is provided with a throttle lever 15 which is pivotally mounted for movement back and forth in simulation of the movements of the throttle of a full-scale airplane. That is to say, the throttle lever 15 is shown in an intermediate position, wherein a slight volume of air is allowed to flow from the air bottle 11, through the vertical pipe 12, across the valve 13, through the air tube 9, and out to the air motor 7. However, the lever 15 may be moved through the arc 16 to define a full open position for the control valve 13, or it may be moved through the arc 17 to define a closed position for the control valve 13. This latter position is equivalent to a shut off of the air supply through the tube 9 and the motor 7 thereby is stopped.

The operation of that portion of my invention above described will be set forth with reference to a demonstration flight in a department store. Thus, the control surfaces of the airplane 1 may be set to define a laterally and longitudinally stable flight of the airplane commensurate with the limitations imposed upon that flight by the length of the air tube 9. That is to say, the air tube 9, when under tension, acts as a flight limiting line to cause the airplane 1 to describe a circular flight pattern about the base member 14 and associated mechanism as a center. Initially, the operator grasps the base member 14 in one hand and, with the other hand, the throttle lever 15 is moved through the arc 17 to the position shown in Fig. 4. This movement opens the control valve 13 to supply air to the air motor from the air bottle 11. As the airplane takes off, it rises in altitude according to the speed of the motor 7 as controlled by the valve 13. As will be apparent to those familiar with air motors and with the conventional gasoline or diesel miniature airplane motor, all fire hazards are obviated by use of the instant invention. Furthermore, the operation of the air motor 7 is relatively silent as compared to the deafening noise made by an internal combustion engine. Still further, since the air motor 7 can be made lighter in weight than the conventional internal combustion engine, the airplane 1 is required to lift less weight, and there is less danger that articles about the department store will be broken should the airplane 1 come in contact therewith. As will now be apparent, that portion of my invention so far described may be fabricated at a low cost and the entire flight pattern is controlled by the manipulations of the throttle valve via the lever 15 per se.

As an optional method of flying the airplane 1 and as an optional structural feature, the pylon guide 18 of Fig. 3 may be employed. This pylon includes a fixed base 19 carrying an upstanding tubular member 20 into which is telescopically fitted a smaller tube 21. As Fig. 3 indicates, an intermediate portion of the elon-

gated, hollow air tube 9 is threaded through the tubular member 20 and 21. Furthermore, an adjustment member or cap 22 is provided to allow vertical adjustment of the height of the pylon 18. Thus, the pylon guide 18 releasably holds an intermediate portion of the air tube 9 so that portion of the air tube intermediate the airplane and pylon will limit the flight of the airplane to a circular path about the pylon as a center (see Fig. 2).

In operation with the pylon 18, two methods of flight control are possible. Firstly, the air bottle 11, control valve 13, and base member 14 may be disposed or located outside the radius of the flight circle, as is shown in Fig. 2. From this location, a continuous visual observation of the airplane in flight is possible. Secondly, the control and actuation mechanism may be located at the base of the pylon 18. If this is done, the pylon should be extended vertically above the head of the operator as by backing off the adjustment cap 22 and extending the small tube 2. During this second method of flying, the airplane 1 will fly a circular path about the pylon as a center and the operator must turn his head, at least, with the flight if he wishes to observe the airplane continuously. In a department store, either the first or second methods of flight will prove practical and each method is relatively safe and silent.

Turning now to Figs. 1 and 4, I have shown an additional structure which takes the form of a pneumatic control mechanism similar to that disclosed in my copending application Serial No. 238,116, filed July 23, 1951, and entitled Pressure Flight Control for Miniature Airplanes. The details of this pneumatic control are disclosed in the aforementioned application and they are not critical to the instant invention. Accordingly, it is sufficient to say that a second elongated, hollow air tube 23 is also slidably received by the guide clip 19 and is joined, at one end, to a pneumatic control mechanism 24 which bears upon the adjustable elevator 6. The opposite end of this air tube 23 leads, either directly or via the pylon 18, to a resilient and compressible hollow air bulb such as is shown at 25 in Fig. 4. Because the pneumatic control 24 and the adjustable elevator 6 are joined to move one with another, the compression and expansion of the hollow air bulb 25 will manipulate the elevator 6. Thus, a squeeze on the bulb 25 will impress an increased pressure upon the pneumatic control 24 to lift the elevator 6 and cause the airplane 1 to climb. Similarly, if the air bulb 25 is released, a decreased pressure will exist within the control 24 and the air tube 23 to lower the elevator 6 and cause the airplane to dive.

To allow the operator to simulate the movements and manipulations of the control stick in a full-scale airplane, I have provided a miniature control stick or lever 26 which is pivoted, as at 27, to the aforementioned base member 14. Additionally, a lateral arm 28 is provided with an adjustment screw 29 which bears upon a clip spring 30. The spring 30, in turn, is limited in movement by a lip 31 overhanging the spring and joined, at one end thereof, to the base 14. The spring 30 serves as a bias for the control stick 26 to move it to an intermediate position against the compressive and resilient force of the air bulb 25. Before the airplane 1 is flown, the adjustment screw 29 is turned until the elevator 6 is at an intermediate position for straight and level flight while the control stick 26 defines the position of Fig. 4. Thereafter, if the control stick

26 is moved through the arc 32, the spring 30 is compressed, the air bulb 25 is allowed to expand, and the pneumatic control 24 lowers the elevator 6 to place the airplane in a dive. Similarly, if the control stick 26 is moved through the arc 32, the air bulb 25 is squeezed or compressed to force air pressure through the air tube 23 and cause the pneumatic control 24 to raise the elevator 6 and define a climb position.

In the more complex speed and direction control embodiment of my invention shown in Fig. 4, the operator again may utilize the pylon 18 or not, as he desires. In either event, the operator possesses complete control over the miniature airplane 1 to allow safe operation indoors. Furthermore, the response of the throttle lever 15 and control stick 26 is similar to the response of an actual throttle and an actual stick in a full size airplane. That is to say, a manipulation of the control stick 26 about the pivot 27 will cause the airplane to climb or dive in flight while a manipulation of throttle lever 15 will slow or speed the motor as desired. Accordingly, I have termed the combined throttle and control stick structure an actuation mechanism. After some experience, the average school age child or young adult will be able to maneuver and manipulate the miniature airplane 1 to perform various acrobatics of a type similar to those possible with the wire and reel controls of my prior Patents 2,292,416 and 2,406,874.

In better service of my inventive objects, the two elongated pressure tubes 9 and 23 are formed from a light plastic material so the weight thereof and the air drag thereupon will not tend to hold the airplane back or pull it inwardly during flight. This light tubing, in combination with the light weight air motor 7, serve materially to reduce the hazard of flying the airplane 1 in a crowded department store. Furthermore, as previously mentioned, these features provide a captive type miniature airplane which is safe, relatively silent, and easy to control. These safety features, in combination, allow my miniature airplane to be flown in a department store for purposes of demonstration, thereby materially to increase the sales volume and to provide a less expensive hobby for school age children.

I claim:

1. In combination with a captive miniature airplane capable of sustained flight, air driven motor means for powering said airplane in flight, pneumatic control means for varying the flight pattern of said airplane, and a pair of mated elongated hollow air tubes arranged side by side each having a first and a second end, said air tube first ends being secured at a common point upon said airplane to limit the flight path thereof and being joined, respectively, one to said air driven motor and one to said pneumatic control means.

2. In combination with a captive miniature airplane capable of sustained flight, air driven motor means for powering said airplane in flight, pneumatic control means for varying the flight pattern of said airplane, a pair of mated elongated hollow air tubes arranged side by side each having a first and a second end, said air tube first ends being secured at a common point upon said airplane to limit the flight path thereof and being joined, respectively, one to said air driven motor and one to said pneumatic control means, and air actuation means joined to said air tube second ends, respectively, to actuate said motor and to impress a preselected air pressure upon said pneumatic control means, said air actu-

ation means including a lever means biased to an intermediate position and movable to two control positions in simulation of the movements of the control stick of a full size airplane.

3. The combination with a captive miniature airplane adapted to traverse a circular flight path, said airplane having an elongated fuselage, flight sustaining surfaces including a lateral wing element, and control surfaces including an adjustable elevator, an air driven motor for powering the plane in flight, said motor being carried by said fuselage, and a fluid operated control for said adjustable elevator, said airplane being capable of self-sustained flight, of a flight limiting flexible tube joined at a first end to said fluid operated control and leading to a supply of fluid under pressure at a second end of said tube, and a manual control device including a handle and pressure varying means actuated by said handle arranged adjacent the second end of said tube for actuating the fluid operated control in said airplane by the variance in pressure within said tube.

4. The combination with a captive miniature airplane adapted to traverse a circular flight path, said airplane having an elongated fuselage, flight sustaining surfaces including a lateral wing element, and control surfaces including an adjustable elevator, an air driven motor for powering the plane in flight, said motor being carried by said fuselage, and a fluid operated control for said adjustable elevator, said airplane being capable of self-sustained flight, of a flight limiting flexible tube joined at a first end to said fluid operated control and leading to a supply of fluid under pressure at a second end of said tube, and a clip detachably mounted on said wing element and spaced laterally from the fuselage, gripping an intermediate portion of said tube thereby.

5. The combination with a captive miniature airplane adapted to traverse a circular flight path, said airplane having an elongated fuselage, flight sustaining surfaces including a lateral wing element, and control surfaces including an adjustable elevator, an air driven motor for powering the plane in flight, said motor being carried by said fuselage, and a fluid operated control for said adjustable elevator, said airplane being capable of self-sustained flight, of a flight limiting flexible tube joined at a first end to said fluid operated control and leading to a supply of fluid under pressure at a second end of said tube, and a securing device mounted on said wing element and spaced laterally from the fuselage, gripping an intermediate portion of said tube thereby.

6. The combination with a captive miniature airplane adapted to traverse a circular flight path, said airplane having an elongated fuselage, flight sustaining surfaces including a lateral wing element, and control surfaces including an adjustable elevator, a motor and a fluid operated control for said adjustable elevator, said airplane being capable of self-sustained flight, of a flight limiting flexible tube joined at a first end to said fluid operated control and leading to a supply of fluid under pressure at a second end of said tube, a securing device mounted on said wing element and spaced laterally from the fuselage, gripping an intermediate portion of said tube thereby, a manual control device including pressure varying means arranged adjacent the second end of said tube for actuating the fluid operated control in said airplane by the variance in pressure within said tube, a vertically disposed elongated stiff fixed tubular pylon encircling said tube at a point intermediate said manual control device and the first end of said tube to define a center of radius for the circular path of flight of said airplane, said motor being fluid driven, a second flexible tube joined at a first end to said motor and leading to a supply of fluid at a second end of said tube, a manually actuated valve for regulating flow of fluid through said second flexible tube, said manually actuated valve for said second tube and the manual control device being arranged immediately adjacent each other, said second flexible tube lying alongside the flight limiting flexible tube, being coextensive therewith and passing successively from said second end thereof through said pylon and said securing device on the wing of the airplane.

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