Nov. 4, 1952 D. J. HYDRICK 2,616,214

TOY GROUND-CONTROLLED LANDING GEAR

Filed March 7, 1947 2 SHEETS—SHEET 1

FIG. 1.

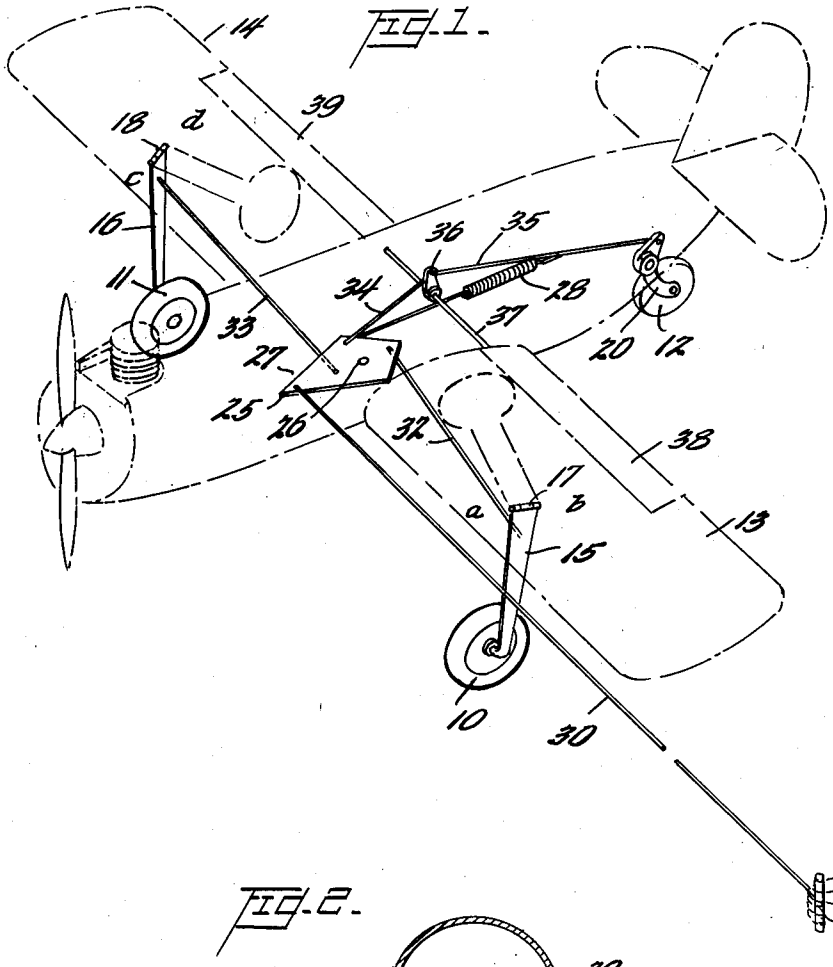
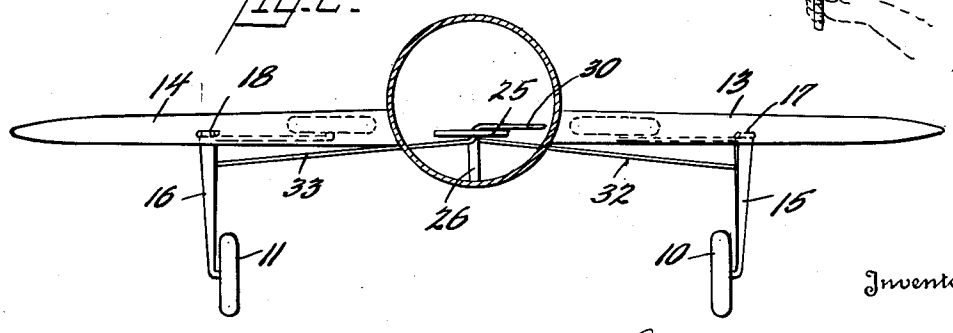


FIG. 2.



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FIG. 3.

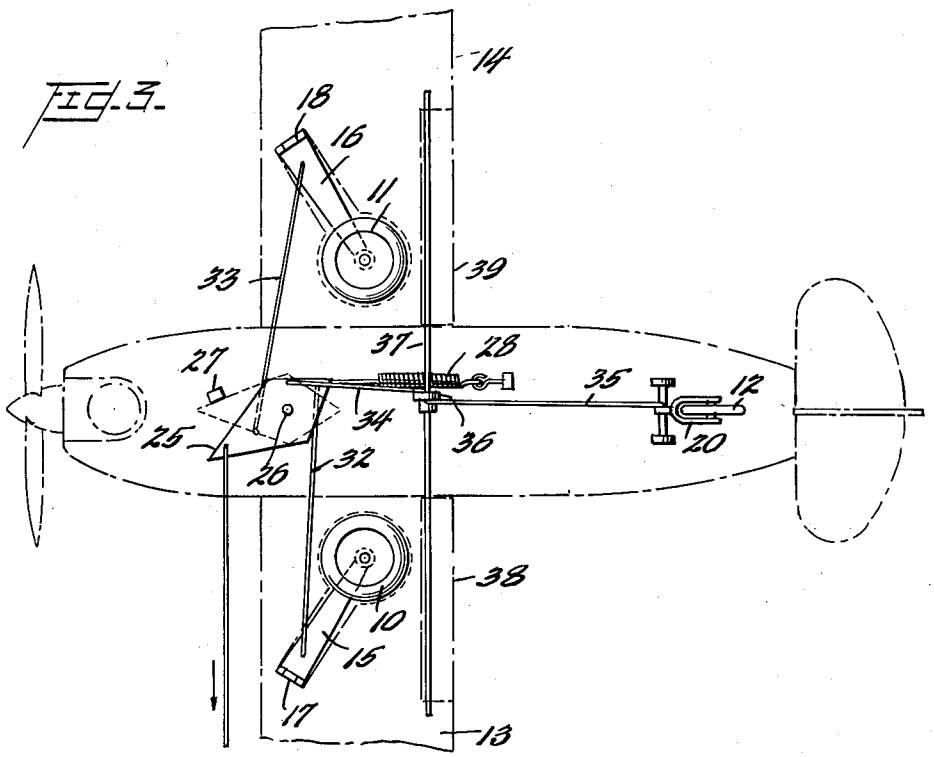
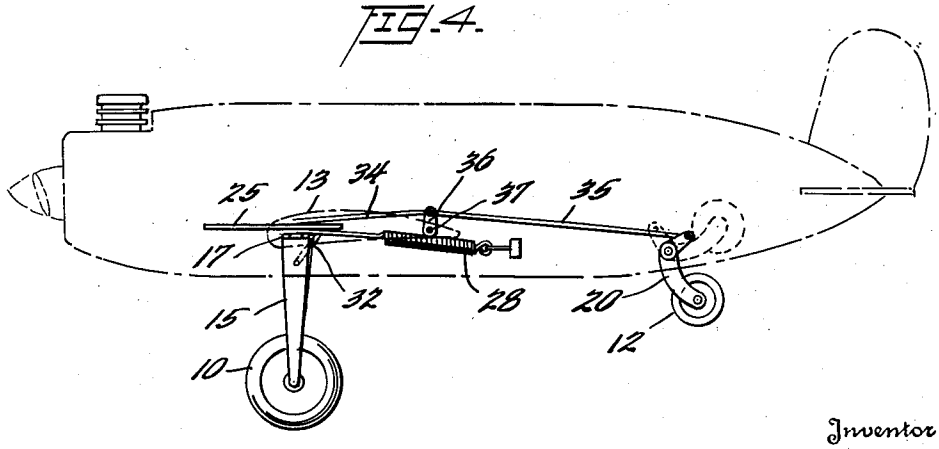


FIG. 4.



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TOY GROUND-CONTROLLED LANDING GEAR

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Application March 7, 1947, Serial No. 733,095

1 Claim. (Cl. 46—77)

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The present invention relates to toy airplanes and particularly to toy airplanes of the self-propelled type adapted to fly in circular paths while restrained by a tethering cord or cable.

The self-propelled toy airplane has now become widely known. Airplanes of this class fly at rather high speeds and are adapted to land, after flights, upon landing gear carried by the plane and which resembles in large part the landing gear of passenger carrying planes. While the passenger carrying plane, however, normally includes means for retracting its landing gear while the plane is in mid-flight, no satisfactory method of or apparatus for effecting the retraction of the landing gear of a self-propelled toy airplane has so far been provided. The purpose of the present invention is to provide a landing gear control mechanism for toy self-propelled airplanes which will operate without failure and in an entirely satisfactory manner, while at the same time is of simple nature, light weight and low cost.

The improved landing gear operating mechanism which comprises the subject matter of the invention is of automatically operating character, functioning to automatically retract the ground engaging wheels when the airplane is in full flight, thus reducing the air resistance and permitting the airplane to progress more rapidly, and automatically preparing the plane for landing, when its speed decreases, by extending its landing gear to ground engaging position. Advantage is taken of the fact that, as the airplane circles around the point at which the tethering cable is held during flight, it develops a very substantial centrifugal force which would, were it not for the tethering cable, cause the airplane to depart from its circular and assume a rectilineal path of movement. During all the time that the plane is in flight the tethering cable is subjected to a considerable amount of tension but the amount of tension will vary, being relatively small, in the first instance or until the plane reaches full flying speed, and again falling toward the end of the flight, as the plane decreases in speed due to the fact that its engine is running out of gas, or for any other reason. During the initial and final periods of flight the landing gear should be extended but during the major portion of the flight it should be retracted and, by taking advantage of the variations in centrifugal force developed during the flight, automatic extension and retraction of the landing gear may be effected. The invention is not limited to an automatically operating mechanism for extending or retracting landing gear but may be utilized to operate the wing flaps of the

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airplane, or to automatically operate landing lights or other instrumentalities associated with the plane.

By way of example one embodiment of the invention, in which the landing gear and wing flaps are automatically actuated, is disclosed but it will be understood that the mechanism may be considerably modified insofar as details and arrangement of its component elements are concerned, in adapting the same to toy airplanes of different types and for the automatic operations of different instrumentalities.

In the drawings:

Figure 1 is a perspective view of a toy airplane of the self-propelled type, being illustrated diagrammatically and largely by dotted lines in order that the various elements of the automatic landing gear operating mechanism may be more clearly perceived;

Figure 2 is a transverse section through the forward end of the fuselage of the airplane;

Figure 3 is a top plan view, showing the operating elements of the mechanisms in different positions from those which the same elements occupy in Figures 1 and 2; and

Figure 4 is a longitudinal vertical section through the fuselage of the airplane, with landing gear extended, the plane being in flight.

The invention contemplates the utilization of any known type of landing gear and the combination with that gear of the novel means for automatically operating it. The mechanism which has been illustrated, rather diagrammatically, has been found to be suitable for use in the fabrication of toy self-propelled airplanes, being inexpensive, very simple and of durable nature. It includes landing wheels 10, 11 and 12, wheels 10 and 11 being the forward wheels and, in the embodiment shown, being hingedly connected to the undersurfaces of the wings 13 and 14, or otherwise to the structure of said wings, in any suitable manner. Wheels 10 and 11 are mounted upon stub axles which extend transversely from the foldable wheel carrying arms 15 and 16, these arms being connected, respectively, to the wings by hinge devices 17 and 18 for swinging movements about axes *a—b* and *c—d*, respectively, which are inclined to the longitudinal axis of the airplane so that, when the landing gear is retracted, the wheels 10 and 11 respectively will not only be swung upwardly and inwardly but also slightly rearwardly, to occupy the ultimate positions in which they are shown in Figure 3.

The tail wheel 12 is mounted upon the lower end of a lever 20 pivotally attached to the frame

of the airplane and is adapted to be rocked from the position in which it is shown in full lines in Figures 1 and 4 to the position in which it is indicated in dotted lines in Figure 4. The landing wheels may thus all be retracted and the means for effecting such retraction, and effecting extension to operative position, automatically, will now be described.

This means includes an element **25** disposed in a horizontal plane and mounted upon a supporting member **26** for rotation about a vertical axis. Movement in one direction, i. e. in the clockwise direction, as element **25** is seen in Figures 1 and 3, is limited by means of a stop affixed to the frame of the airplane, such a stop being diagrammatically indicated at **27** and normally member **25** is held against stop **27** by the action of a resilient element **28**, which may be a helical spring or a strong rubber band, one end of element **28** being connected to member **25** laterally of the pivotal axis of that member, as clearly shown in Figures 1 and 3, and its opposite end being connected to a rigid portion of the frame of the airplane. Movement of member **25** in a counterclockwise direction (Figures 1 and 3) may be effected by the tethering cable **30**, one end of the tethering cable being connected to the forward end of member **25** and its opposite end being adapted to be held by the operator of the airplane.

It is clear from the description which has so far been made that, when the airplane is in flight, the position of member **25** will be dependent upon the relative magnitudes of the forces exerted upon that member by the tethering cable, which tends to rotate it in a counterclockwise direction, and the pull of the spring member **28**, which tends to rotate it in the opposite direction. The action of the spring member **28** is relatively constant, whereas the tension in the tethering cable **30** will vary widely, being great when the speed of the airplane is high and decreasing as the airplane loses speed. The arrangement is such that, when the airplane has attained relatively high speed the tension in the tethering cable is sufficient to pull member **25** into the position in which it is shown in full lines in Figure 3 and, when the tension in cable **30** falls below a predetermined amount, depending upon the strength of the spring **28**, member **25** is pulled by the spring in a clockwise direction until it comes to rest against stop **27**.

The landing gear and wing flaps are operatively connected to member **25** in such manner that the airplane is automatically prepared for landing as the tension in tethering cable **30** falls, links **32** and **33** communicating the rotary movements of member **25** to the arms **15** and **16** and links **34** and **35** operatively connecting member **25** to

the rocking lever **29**. It will be observed that the adjacent ends of links **34** and **35** are connected to the end of a lever **36** which is fixed upon a rotary shaft **37** extending transversely of the airplane, the ends of this shaft extending into and being secured to the wing flaps **38** and **39** respectively. Hence the landing gear is not only actuated when member **25** revolves upon its vertical axis but the wing flaps **38** and **39** will likewise be actuated and, when the landing gear is extended or rendered operative, the wing flaps will be lowered and the airplane prepared for contact with the ground in the usual manner.

It will be appreciated by those familiar with the construction and operation of toy airplanes that the drawings are rather diagrammatic and that the mechanism provided for automatically operating the landing gear and wing flaps may be widely varied in adapting the invention to toy airplanes of different types, the mechanism illustrated and described being set forth by way of example only. Also that other instrumentalities may be connected to, and operated by, the rotatable member **25**.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

In a toy airplane, in combination, a frame, wings rigidly secured to said frame, a member movably mounted on said frame, resilient means normally maintaining said member in a predetermined position with respect to said frame and resisting movement away from said position, a control cable connected to said member in such manner as to move said member against the action of said resilient means when the tension in the cable reaches a predetermined amount, a stop limiting the movement of said member under the action of said resilient means landing gear comprising an arm pivotally connected to each wing, a wheel mounted on the free end of each arm, and links connecting each of said arms to said member, whereby the landing gear is retracted when the cable tension exceeds a predetermined amount and said member is actuated.

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