April 5, 1932. G. VLAHOV 1,852,340

TOY AEROPLANE

Filed July 2, 1926 2 Sheets-Sheet 1

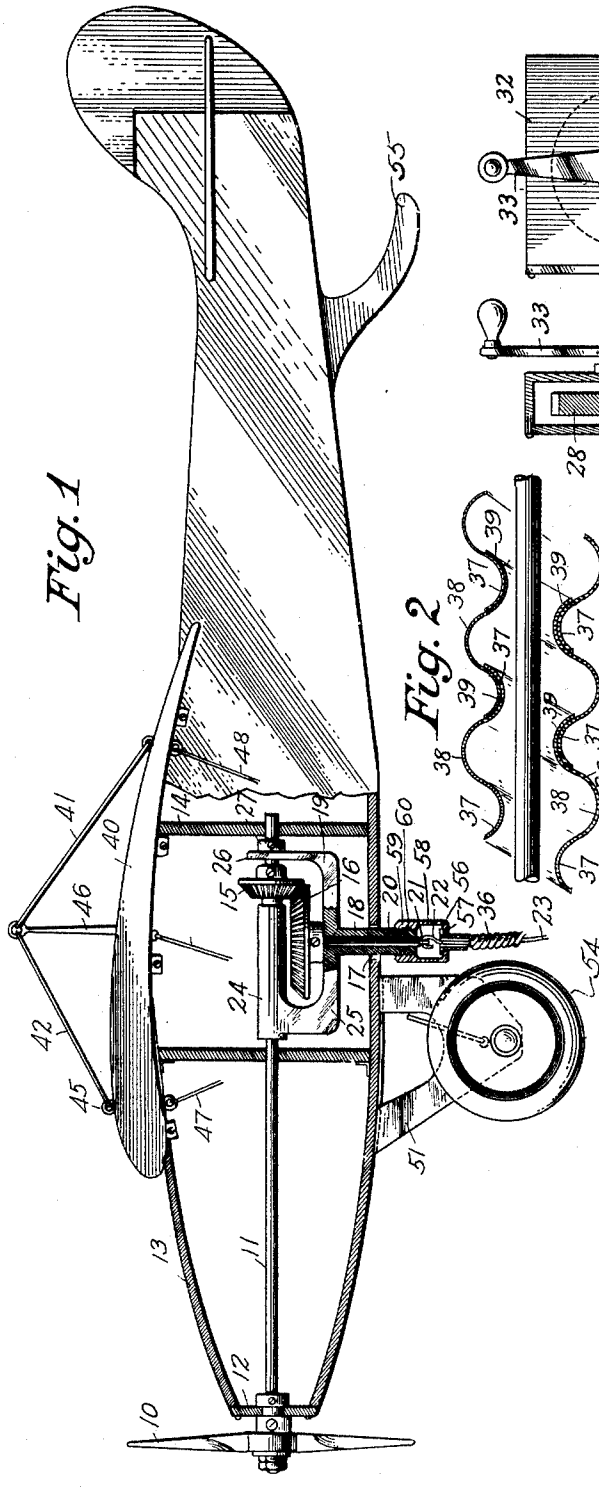

Fig. 1

Fig. 2

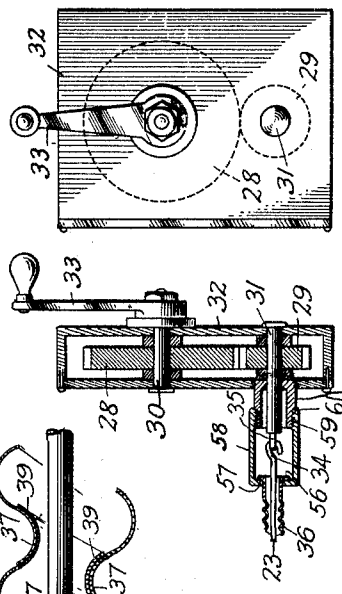

Fig. 5

Fig. 6

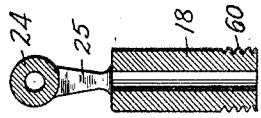

Fig. 4

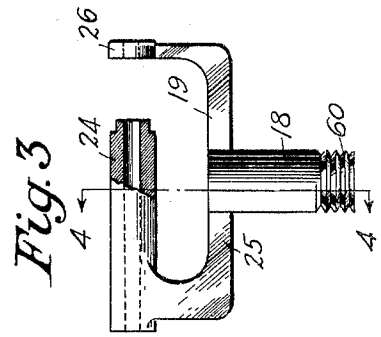

Fig. 3

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Fig. 7

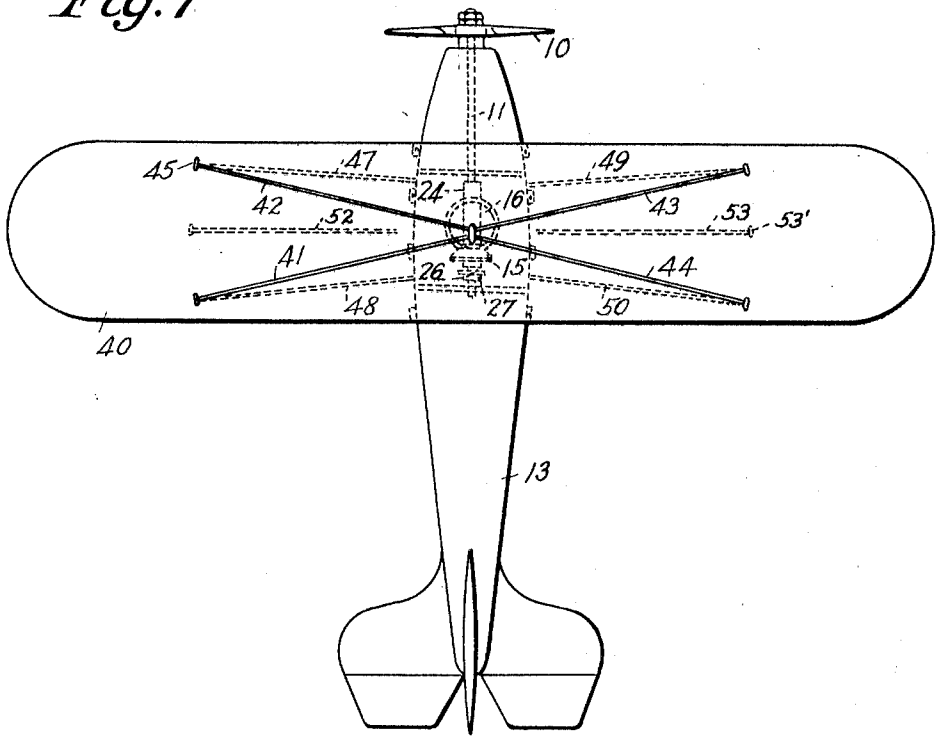
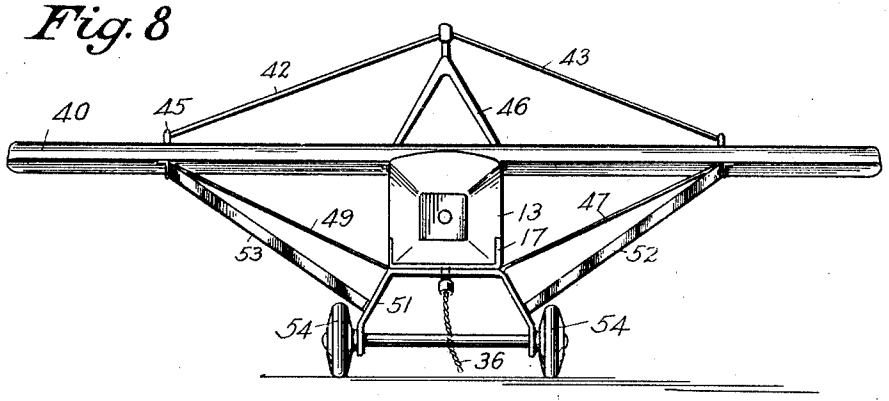


Fig. 8



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UNITED STATES PATENT OFFICE

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TOY AEROPLANE

Application filed July 2, 1926. Serial No. 119,997.

This invention relates to toy aeroplanes, particularly to the driving mechanism therefor, and contemplates among other things, the provision of a source of power entirely outside of the plane for rotating the propeller shaft.

In toys of the type referred to, the motor has heretofore been carried by the plane itself, and has taken the form of springs, rubber bands or the like adapted to be wound up and during the unwinding thereof to rotate the propeller and thereby to force the plane uncontrolledly through the air.

My invention includes the provision of a distant source of power not carried by the plane, but which is operatively connected to the propeller, and which is under the control of the operator at all times, while the plane is allowed to fly freely in all directions and at various controlled speeds within a definite range, and for an unlimited period of time.

The invention contemplates further improvements in the art of flying aeroplanes including controlling the plane from terra firma and flying the plane continuously for an unlimited period and at any desired speed.

A further improvement is the provision of means on the plane for simulating the sound made by a full sized plane in flight.

The various objects of my invention will be clear from the description which follows and from the drawings, in which

Fig. 1 is a side elevation and partial vertical section of my improved plane.

Fig. 2 is a section of the housing for the flexible shaft, on a greatly enlarged scale.

Fig. 3 is a side view and partial section of the frame carrying the swingable gear of the plane.

Fig. 4 is a vertical section of the same taken on the line 4—4 of Fig. 3.

Fig. 5 is a vertical section of the gear box embodying a proposed form of the source of the power.

Fig. 6 is a front view of the same.

Fig. 7 is a top plan view of a plane to which my invention has been applied, and

Fig. 8 is a front view of the same.

In one of the practical applications of my invention which will now be described, the propeller 10 is mounted on the propeller shaft 11 in the usual manner. The shaft 11 is suitably journalled near one end thereof in the head 12 of the fuselage 13, and near the other end thereof in the partition 14. On the propeller shaft 11 is fixed a suitable gear such as the bevel gear 15, and meshing with said gear is the preferably larger bevel gear 16. It will be seen that rotation of the gear 16 will cause rotation of the propeller, and that when a sufficient speed of rotation is attained, the plane is caused to fly through the air.

A suitable slot 17 is made in the under side of the fuselage 13 through which the cylindrical bearing member 18 of the frame 19 is passed. The shaft 20 on which the bevel gear 16 is mounted, is supported by the bearing 18 for rotation therein, the end of said shaft being provided with a suitable loop as 21, or drilled with a suitable hole, through which the hook end 22 of the flexible shaft 23 is passed in such a manner that rotation of said flexible shaft causes rotation of the bevel gear 16. For suitably supporting the frame 19 a horizontal bearing member as 24 is made a part of the frame and is loosely mounted on the propeller shaft 11. Said bearing 24 is connected to the bearing 18 as by means of the web 25, movement of the frame or any part thereof longitudinally of the shaft 11 being prevented by the cylinder 26 forming part of said frame and mounted loosely on the shaft 11 between the bevel gear 15 and the collar 27 so that the entire frame 19 and the gear 16 carried thereby are free to swing.

The source of power through which the flexible shaft 23 is driven is preferably located on terra firma and is at all times under the control of the operator. The range of flight of the plane is of course limited by the length of the flexible shaft. When the plane is in full flight, it is pulled by the flexible shaft toward the operator. The flexible shaft therefore tends to pull the gear 16 and the shaft 20 on which it is mounted together with the frame 19 to one side, and might exert an undesirable drag on the plane tending to reduce the speed or stop the flight.

It is for the purpose of minimizing the pull or drag of the flexible shaft on the gear 16 that the supporting frame 19 is swingably mounted on the propeller shaft. It will be seen that the gear 16 is so mounted and supported by the frame 19 that when the flexible shaft 23 is for any reason pulled out of the vertical as when the plane is flown in a circle about the operator, the frame 19 is swung about the shaft 11 carrying with it the gear 16 into a position wherein the least pull is exerted on the plane.

For rotating the flexible shaft 23 any suitable means distant from the plane may be provided whereby the plane is not weighted by the motor and the flight may be maintained indefinitely under complete control. For economy, simplicity and ease of construction however, I prefer to provide the gears 28 and 29 supported on the shafts 30 and 31 respectively in the gear box 32. A crank 33 is mounted on the shaft 30 and serves to rotate said shaft and the gear 28 thereon at the will of the operator and at any suitable speed desired. The gears 28 and 29 are so proportioned that the shaft 23 is rotated at the proper rate to turn the propeller 10 at the proper speed for propelling the plane. It will be understood that the speed of the plane may be controlled by the operator by rotating the crank 33 at a greater or at a lesser speed as desired and that the plane may be caused to take off, to alight, to dive, and to perform tricks by starting, stopping and varying the speed of rotation of the crank. The flexible shaft 23 is suitably connected to the shaft 31 as by means of the hook 34 and the projection 35, similar to the hook and the projection provided at the end of the bevel gear shaft 20, or by means merely of a suitable hole in the end of the shaft 31 through which the hook 34 is passed.

For preventing the kinking, knotting, or looping of the flexible shaft 23, and for keeping said shaft as straight as possible, a suitable flexible housing as 36 is provided therefor. Said housing consists of a narrow corrugated ribbon preferably of metal and preferably comprising the three loops 37, 38 and 39 made longitudinally throughout the entire length of the ribbon, said ribbon being wound in a number of turns in overlapping engagement to form a flexible tube. The loop 37 at one edge of the ribbon is engaged by and overlaps the loop 39 of the adjacent turn in such a manner that the housing encloses and protects the flexible shaft 23 throughout the length thereof, but adds little weight thereto. By reason of the overlapping of the adjacent loops 37 and 39 the various interengaged turns of the housing are free to slide relatively to each other and the turns are resistant to, but cannot pull apart even under considerable tension, while the flexibility of the housing is unimpaired. The plane is provided with the usual wing 40 which is braced by the wires 41, 42, 43 and 44 which are each attached at one of the ends thereof to suitable hooks as 45 on the wing 40 and at the other end engaging the upper end of the wire supporting post 46. Similar wires as 47, 48, 49 and 50 are secured to the underside of the wing at one end, and the other end to a suitable point on the fuselage or on the wheel frame 51.

To accentuate the sound produced by the propeller 10 as the plane travels through the air and to imitate the sound produced by a full-sized plane in flight, I arrange the flexible bands 52 and 53 preferably made of rubber, in such position that said bands will be caused to vibrate by the current of air produced during the flight of the plane. Said bands are attached at one end 53′ thereof preferably to the wing 40 and at the other end thereof to the wheel frame 51 or to any other suitable point and are stretched taut ready for vibration.

For suitably supporting the housing 36 in position the ends thereof are flanged as at 56 to engage the inner surface of the bottom 57 of a suitable coupling 58. One of said couplings is threaded internally at the upper end 59 thereof to engage the threads 60 of the bearing 18 while the other of said couplings is threaded similarly to engage the threads 61 of the bushing 62 surrounding the shaft 31 and secured to the gear box 32.

The operation of my improved device is as follows:

The plane is set up on the ground to rest on the wheels 54 and on the skid 55. Where the gear box 32 is used, said box may be held in the hands of the operator, who may stand on the ground or at an elevated point, and who rotates the crank 33, thereby rotating the flexible shaft 23 and therethrough the bevel gears 16 and 15 whereby the shaft 11 and the propeller 10 are rotated. When sufficient speed has been imparted to the propeller the plane will roll along the ground in the usual manner and then rise into the air to begin its flight. As will be obvious, the crank 33 may be replaced by an automatic source of power such as a motor provided with suitable controls, if desired. It will be understood that the range of flight is limited by the length of the shaft 23 and that the plane is under the control of the operator at all times. Should it be desired to make the plane fly higher, then the crank 33 is merely turned faster and should it be desired to cause the plane to perform the usual acrobatic tricks, rotation of the crank 33 is slowed or stopped thereby lessening or cutting off the power and sending the plane into a nose dive from which the plane may be righted into its normal flying position by again rotating the crank 33 and imparting forward movement to the plane, by the proper adjustment of the wings as will

be readily understood, the plane may be caused to perform other tricks not necessary to be explained herein in detail. The plane may be brought to the ground gradually and caused to alight in simulation of the action of a full sized plane by gradually reducing the speed of rotation of the propeller.

The flexible housing 36 prevents kinking or other distortion of the flexible shaft 23 protected thereby other than slight bending, while it is itself sufficiently light and flexible to prevent dragging on the plane. The housing is not likely to stretch or to become distorted by reason of the sliding engagement of the adjacent loops 37 and 39 thereof. If the operator's position is not directly underneath the plane, the pull on the plane due to the weight of the shaft 33 and the housing 36 is minimized by reason of the automatic adjustment of the frame 24, the bevel gear shaft 20 and the end of the flexible shaft carried thereby, to that angle which exerts the least drag upon the plane, so that the plane is held back to a minimum extent. The flight of the plane may be maintained for an unlimited period due to the independent arrangement of the source of power outside of, at a distance from and independently of the plane.

It will be understood that various changes may be made from the preferred structure shown and described such as the substitution of an electric motor or other source of power for the gear box and hand operated gears, changes in the construction and arrangement of the gears mounted in the plane for rotating the propeller shaft, changes in the form of the housing and other changes which are contemplated but which need not be here set forth in detail all of which changes, fall within the spirit of this invention and the scope of the appended claims.

I claim:

1. In a toy aeroplane, a revoluble propeller for actuating the plane, actuating means for the propeller, including a part movable bodily, independently of the movement of the plane, and adapted to have power supplied thereto continuously while the plane is in flight and a flexible shaft suspended from the plane and operatively connecting the actuating means with the propeller.

2. A toy aeroplane capable of flight in all directions within a predetermined range including a revoluble propeller for driving the aeroplane, a flexible rotatable shaft extending outside of said aeroplane, allowing substantially free movement of said aeroplane in all directions within a distance equal to the length of said shaft, and operatively connected to said propeller, and actuating means connected to the outside end of said shaft and controllable from the ground for continuously rotating said shaft to fly the aeroplane for as long a time as power continues to be supplied to the actuating means.

3. In a toy aeroplane, a propeller, a shaft, a gear on said shaft, a swingable gear meshing with the first gear, means for supporting the swingable gear and for allowing said swingable gear to adjust itself so that the axis thereof lies in the direction of the pull thereon, a flexible shaft connected to said swingable gear and extending outside of the aeroplane, and means for rotating the flexible shaft.

4. In a toy aeroplane, a propeller, a propeller shaft, a pair of intermeshing gears operatively connected to said shaft, means loosely mounted on said shaft for swingably supporting one of said gears, a flexible shaft connected at one end thereof to the swingably supported gear, and a source of power controllable from a point in spaced relation to the aeroplane connected to the other end of said flexible shaft.

5. In a toy aeroplane, means for causing free flight of the aeroplane including a propeller, a propeller shaft, gearing in the aeroplane operating said shaft, a flexible shaft operatively connected at one end thereof to said gearing and extending to a point in spaced relation to said aeroplane, and means at said point for rotating said flexible shaft at various speeds while the aeroplane is in flight whereby the aeroplane is caused to fly.

6. In a toy aeroplane, a propeller, a propeller shaft, a gear on said shaft, a second revoluble gear engaging the first mentioned gear, means loose on said shaft for supporting said second gear for movement about said shaft, and means mechanically connecting said second gear to a distant source of power.

7. In a toy aeroplane capable of substantially free flight, a revoluble propeller, a propeller shaft, a fear on said shaft, a second revoluble gear meshing with the first gear, means loose on said shaft for supporting said second gear for movement about said shaft, a distant source of power, a flexible shaft connecting said second gear to said source of power, a flexible non-stretchable metallic housing about and preventing distortion of the flexible shaft other than bending, and vibrating means on said aeroplane for producing sound on the flight of said aeroplane.

8. In a toy aeroplane, a hollow substantially closed fuselage, wings, and a flexible elastic band secured to said aeroplane near the fuselage and adapted to be vibrated on the flight of the aeroplane for simulating the sound of a full-sized aeroplane in flight, said fuselage acting as a sound box.

9. In a toy aeroplane, a propeller controlling the speed of flight of said aeroplane, a flexible rubber strip stretched taut and arranged to vibrate by the current of air thrown

by the propeller on the propulsion of the aeroplane by said propeller for producing a sound in simulation of the sound of a full-sized aeroplane in flight.

10. In a toy flying device, capable of self-sustaining flight within a given range, a propeller for driving said device, means at a distance from the device for operating said propeller, and a stretched rubber strip adapted to vibrate by the air stream from said propeller for simulating the sound of a full-sized aeroplane in flight.

11. In a toy flying device capable of substantially free flight and including a fuselage in the form of a sound box, means for driving the device, from a distant source mechanically connected to the device, and flexible vibratory sound producing means on said device near said fuselage, said fuselage vibrating on the vibration of said means.

12. In a flying device, a propeller, a propeller shaft, a swingable frame on said shaft, a shaft in said frame arranged angularly to said propeller shaft, a gear on each of said shafts meshing with each other, and means outside of said device for rotating the shaft in said frame.

13. In a flying device, a propeller shaft, a second shaft arranged angularly with respect to said propeller shaft, means hinged on the propeller shaft carrying said second shaft, intermeshing gearing on said shafts, a flexible shaft detachably connected to the second shaft, and non-flying actuating means for rotating the flexible shaft at speeds sufficient to cause the device to fly.

14. In a flying device, a propeller shaft, a drive shaft operatively connected to the propeller shaft, and means for swingably supporting the drive shaft, whereby the drive shaft may remain substantially vertical independently of the angular positions assumed by the device.

15. In an unsupported flying device, a propeller shaft, a propeller on said shaft for imparting motion to said device, actuating means outside and movable independently of said device for rotating said shaft during the flight of the device, and flexible, rotatable means for mechanically connecting said actuating means to said shaft, said actuating means being operable continuously for an unlimited period and adapted to be fully controlled by an operator while the device is in flight, said connecting means allowing bodily movement of said device relatively to said actuating means in any direction.

16. A toy aeroplane unsupported and self-sustaining in flight, including a revoluble propeller, a shaft operatively connected to said propeller, said shaft being flexible to allow a change in the distance between the ends thereof and thereby allowing substantially free movement of the aeroplane relatively to the lower end of said shaft during the flight of the aeroplane, said shaft extending below the aeroplane and adding to the gross weight thereof, and means controlled by an operator at said lower end of the shaft for continuously rotating said shaft at speeds sufficient to fly the aeroplane for an unlimited period without stopping.

17. In a toy aeroplane, means for operating the aeroplane for limited free movement in any direction, including gearing mounted in said aeroplane and rotatable means for driving said aeroplane operatively connected to said gearing and depending from the aeroplane, and non-flying actuating means outside of said aeroplane operatively connected to said rotatable means and operating only during the flight of the aeroplane to maintain the continuous flight of the plane indefinitely.

18. In a flying device, means for causing substantially free flight of the device including a propeller for the device, a rotatable flexible shaft suspended from the device and operatively connected to said propeller, and continuously rotatable means at the lower end of said shaft for rotating said shaft, and adapted to be operated while the device is in flight, to cause the device to fly continuously during the rotation of said means, and means for preventing undue distortion of said shaft.

19. In a flying device, propelling means therefor, a revoluble flexible shaft suspended from the device for transmitting power to said propelling means while the device is in flight, and a flexible housing for said shaft, and gearing independent of the device for one end of the shaft and continuously rotatable indefinitely, independently of the movement of the device.

20. In an aeroplane operated from a distant source of power during the flight thereof, propelling means for the plane, a flexible, rotatable shaft operatively connecting the propelling means to the source of power, a flexible housing for the shaft, and continuously rotatable means including the distant source of power and operated from the ground for rotating said shaft while the plane is in flight.

21. A toy aeroplane including a revoluble propeller, revoluble actuating means arranged in variable spaced relation to the aeroplane and adapted to be controlled at will by an operator outside of the aeroplane, revoluble means suspended from the aeroplane and operatively connected to said propeller and to said actuating means for rotating the propeller continuously and for an indefinitely long period at varying desired speeds whereby said aeroplane may be given limited movement in any direction relatively to said actuating means.

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