

H. E. DUNN

WIND DRIVEN HELICOPTER KITE

5 Sheets-Sheet 1



June 8, 1948.

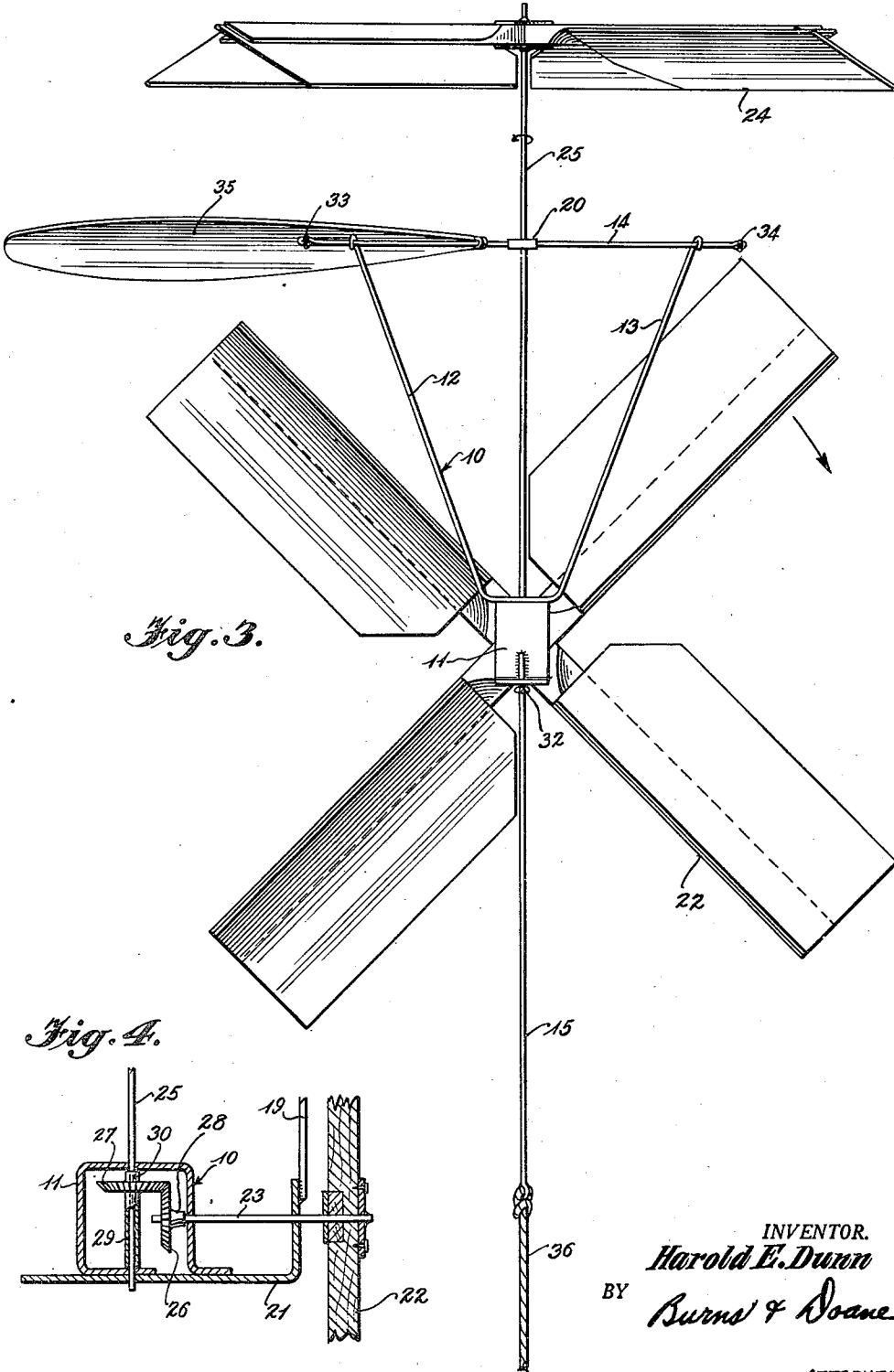
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2,442,846

WIND DRIVEN HELICOPTER KITE

Filed Nov. 15, 1945

5 Sheets-Sheet 2



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5 Sheets-Sheet 3

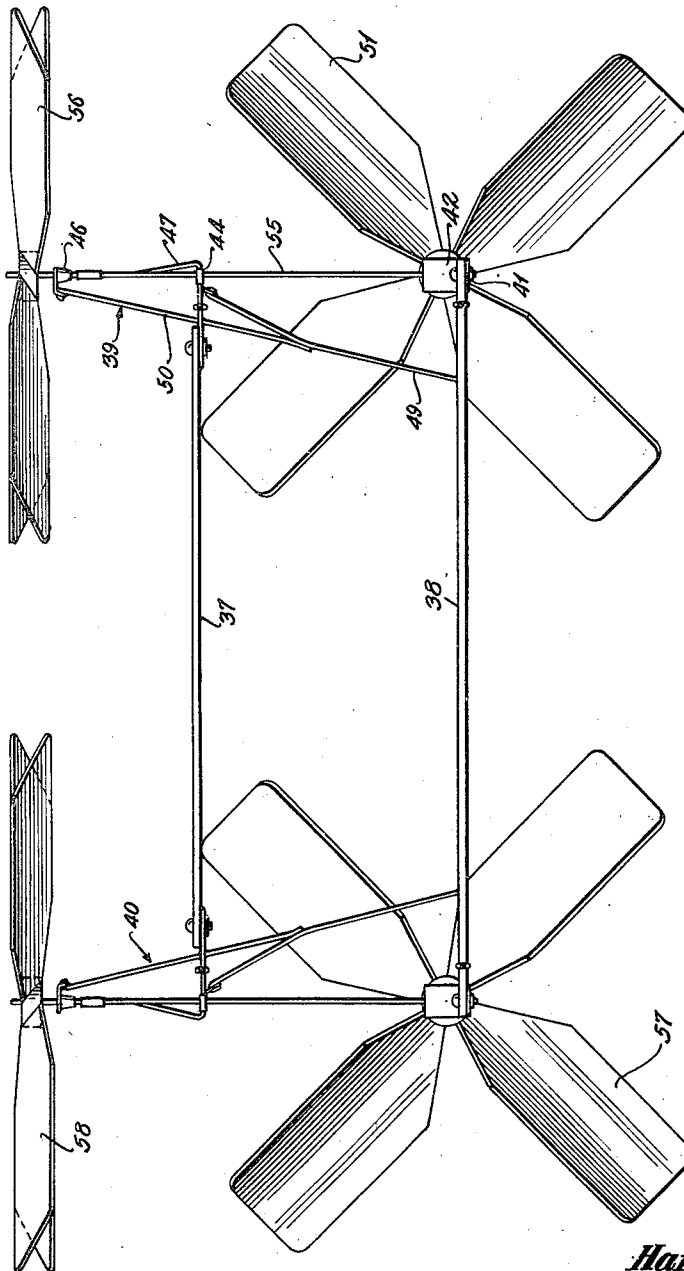


Fig. 5.

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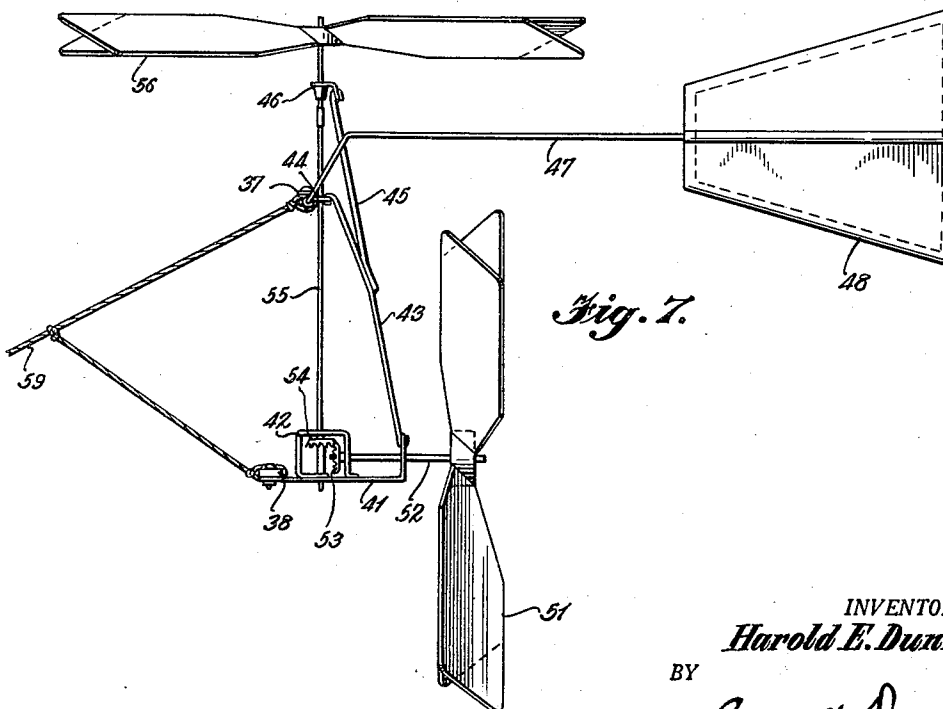
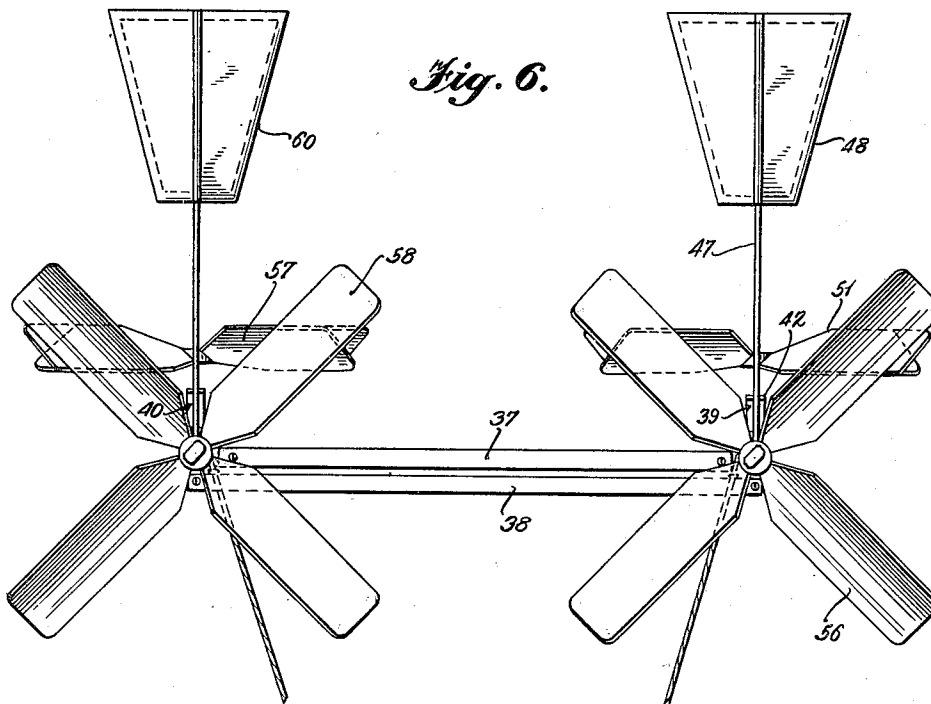
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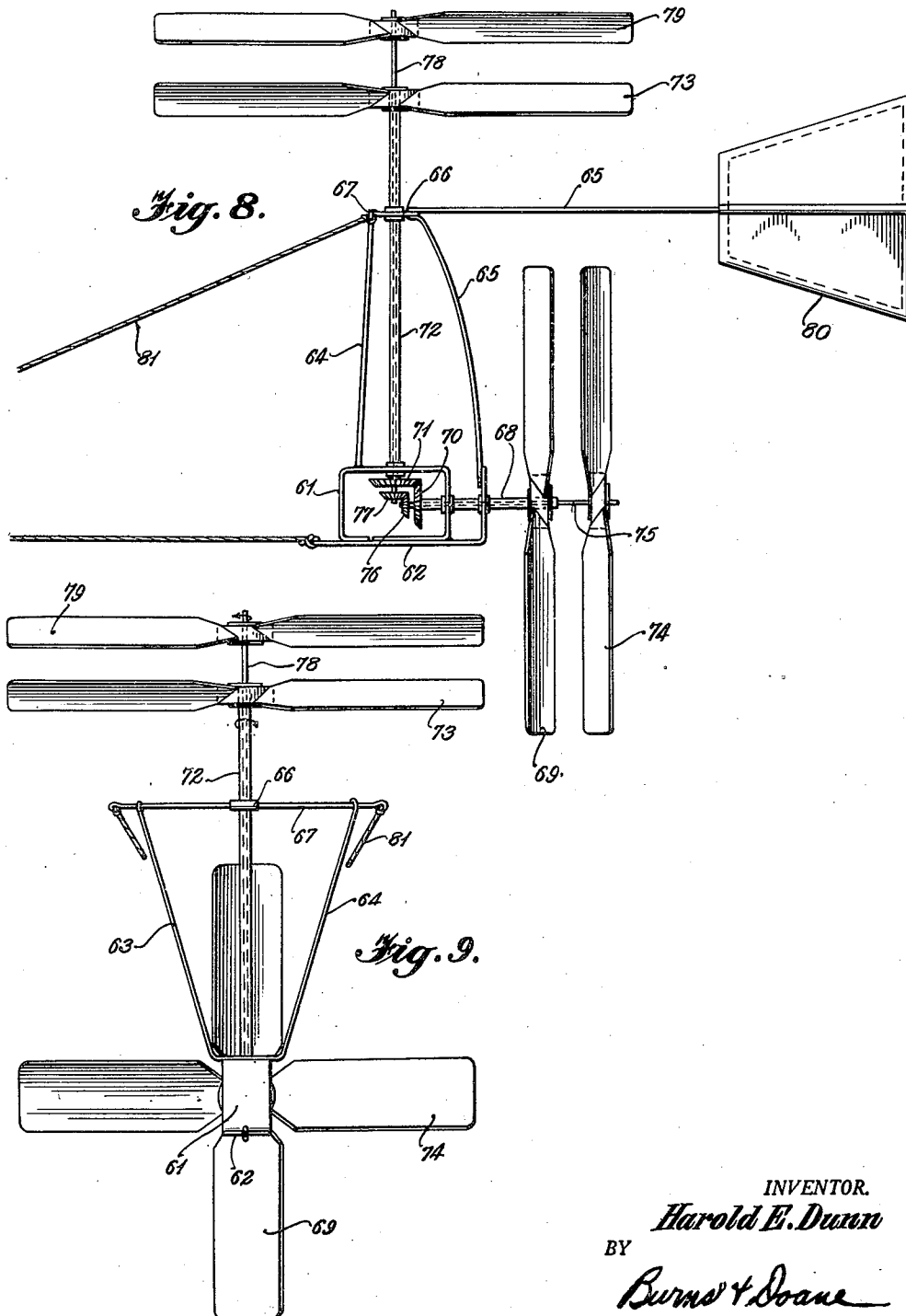
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WIND DRIVEN HELICOPTER KITE

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5 Sheets-Sheet 5



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WIND-DRIVEN HELICOPTER KITE

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Application November 15, 1945, Serial No. 628,817

7 Claims. (Cl. 244-153)

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This invention relates to a flying toy, which is intended to be flown in wind at the end of a string in a manner somewhat similar to the flying of familiar toy kites.

More specifically, the invention relates to a flying toy embodying at least two propellers which are arranged to rotate in planes at a right angle to each other. One of the propellers, which may be termed the drive propeller, is arranged to be rotated in a vertical plane by the passage of wind through its blades. The second propeller, which may be termed the lift propeller, is arranged to be rotated in a horizontal plane by power derived from the first or drive propeller. The second or lift propeller furnishes the lift which sustains the toy in flight. In one form of my invention only one drive propeller and one lift propeller are used, while in other forms two drive propellers and two lift propellers are used. It will be obvious that a greater number of drive or lift propellers could be used.

For a better understanding of my invention I call attention to the following detailed description and the accompanying drawings which illustrate exemplary forms of the invention.

In the drawings:

Figure 1 is a side elevation view of one form of the invention, which embodies a single drive propeller and a single lift propeller;

Figure 2 is a top plan view of the device shown in Figure 1;

Figure 3 is a front elevation view of the same device;

Figure 4 is a fragmentary sectional view showing the power transmission gearing used in the form of the invention illustrated in Figures 1 to 3;

Figure 5 is a front elevation view of a modified form of the invention, which embodies two drive propellers and two lift propellers;

Figure 6 is a top plan view of the form of the invention illustrated in Figure 5;

Figure 7 is a side elevation view of the form of my invention illustrated in Figure 5;

Figure 8 is a side elevation view of a further modification of my invention; and

Figure 9 is a front elevation view of the form of my invention illustrated in Figure 8.

Referring first to the form of the invention illustrated in Figures 1 to 4, the toy comprises a frame, which is designated generally by the reference numeral 10, and which consists of a box-like gear frame 11, upwardly and outwardly extending struts 12 and 13, an upper cross member 14, and a depending tail support 15. A

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stabilizing rudder assembly 16, consisting of vertical fins 17 and horizontal fins 18, is secured to the frame by means of a rudder supporting member 19. The member 19 extends forwardly to a clip 20 secured to the cross member 14 and thence downwardly and rearwardly to a bearing support 21, which extends rearwardly from the gear frame 11.

A drive propeller 22 is fixed on a horizontal shaft 23 which is journaled for rotation in bearings in the gear frame 11 and the bearing support 21. A lift propeller 24 is fixed on a vertical shaft 25 which is journaled for rotation in bearings in the clip 20 and the upper portion of the gear frame 11.

As is best illustrated in Figure 4, the horizontal shaft 23 is provided with a miter gear 26 while the vertical shaft 25 is provided with a somewhat similar miter gear 27. These miter gears are held in operative engagement by means of a collar 28 on the gear 26 and collars 29 and 30 on the gear 27.

The propellers 22 and 24 are here illustrated as of the four-blade type, but it will be obvious that a greater or lesser number of blades may be used.

A three-string bridle arrangement for attaching a tether string 31 to the toy is best illustrated in Figures 1 and 2. A lower bridle string 32 is secured to the upper end of the tail support 15, while upper bridle strings 33 and 34 are attached to the cross member 14 near opposite ends thereof.

The foregoing explanation is sufficient for an understanding of the principle of operation of my toy. When the tether string 31 is secured and the toy is released in a wind, it will ascend in a manner similar to the flying of a familiar toy kite. It will be apparent that wind passing through the drive propeller 22 will cause rotation thereof which, in turn, will drive the lift propeller 24 through the shaft 23, the gear 26, the gear 27, and the shaft 25. I have found, however, that when using a single drive propeller and a single lift propeller, forces are set up during the operation of the toy which render it inherently unstable. One reason for this instability is due to the fact that during any instant of operation the lift propeller has one or more blades which are moving into the wind and also has one or more blades which are moving with the wind. Those blades which are moving into the wind have greater lift than those blades which are moving with the wind and this greater lift on one side of the shaft 25 would tend to cause the entire toy to rotate bodily with respect

to the tether string 31. To provide this, I provide a compensating wing 35, which is designed to provide additional lift on that side of the toy which is deficient in lift due to the fact that the blades of the lift propeller are moving with the wind. This compensating wing 35 brings the entire assembly into very near balance. Any slight unbalanced condition of the toy is compensated for by the flexible tail member 36, which depends from the tail support 15. The rudder assembly 16 maintains the toy in proper position for the drive propeller 22 to utilize the full force of the wind.

The form of the invention disclosed in Figures 5, 6 and 7 consists essentially of a pair of drive propellers and a pair of lift propellers. The drive propellers are designed to rotate in opposite directions and to drive the lift propellers in opposite directions. This arrangement eliminates the necessity for a compensating wing and a tail member since the opposite rotation of the propellers makes the device automatically compensating.

A pair of transverse struts 37 and 38 support at their opposite ends frame members which are designated generally by the reference numerals 39 and 40. Since these frame members are of similar construction, it is necessary to describe only the member 39. A bearing support 41 is secured to the end of the strut 38 and supports a gear frame 42 secured thereto. A supporting member 43 extends upwardly from the rear end of the bearing support 41 and is secured to a clip 44. Another supporting member 45 extends from intermediate the ends of the supporting member 43 to a bearing member 46. A rudder-supporting member 47 is secured to the end of the transverse strut 37, passes through the clip 44, thence upwardly and backwardly to a point of attachment to the supporting member 45 and rearwardly to the rudder assembly 48.

As best shown in Figure 5, a supporting member 49 extends from a point adjacent one end of the transverse strut 38 to the clip 44. Secured intermediate the ends of the supporting member 49 is a supporting member 50 which extends to the bearing member 46.

The frame member 40 is similar to the frame member 39, which has just been described.

A drive propeller 51 is fixed on a horizontal shaft 52 which is mounted in bearings in the bearing support 41 and the gear frame 42. Secured to the shaft 52 is a gear 53, which is arranged to engage and drive a gear 54 attached to a vertical shaft 55 which is mounted in bearings in gear frame 42, the clip 44 and the bearing member 46. A lift propeller 56 is fixed at the upper end of the shaft 55. The blades of the drive propeller 51 and the lift propeller 56 are so disposed as to cause rotation of the lift propeller 56 in a direction to cause lift when wind passes through the drive propeller. Mounted in the frame member 40 is a second drive propeller 57 and a second lift propeller 58. The lift propeller also furnishes lift upon passage of wind through the drive propeller 57, but it should be noted that the drive propeller 57 rotates in a direction opposite to that of the rotation of the drive propeller 51 and the lift propeller 58 rotates in a direction opposite to that of the lift propeller 56. This opposite rotation automatically compensates for reduced lift from those propeller blades traveling with the wind and thus eliminates the need for a compensating wing, such as wing 35 disclosed in Figures 1 to 3. The

opposite rotation of the propellers also automatically compensates for any torque reactions and eliminates the necessity for a tail member.

A tether string 59 is provided as well as bridle strings extending from the tether string to each end of each of the transverse struts 37 and 38. A stabilizing rudder assembly 60, similar to the assembly 48, is provided at the rear of the frame member 40.

A further modification of my invention is illustrated in Figures 8 and 9. This form of the invention embodies a pair of drive propellers rotating in opposite directions and a pair of lift propellers also rotating in opposite directions. In this case, however, the drive propellers rotate on coincident axes and the same is true of the lift propellers.

In this case, a gear frame 61 supports a bearing support 62 upwardly and outwardly diverging struts 63 and 64, a rudder support 65 and a bearing member 66, which is secured on a transverse strut 67 extending between the upper ends of the struts 63 and 64 to form the frame of the toy. A tubular shaft 68 is mounted in bearings in the gear frame 61 and the bearing support 62 and has fixed on its rearward end a drive propeller 69. Fixed to the forward end of the tubular shaft 68 is a gear 70 which engages a gear 71 on the lower end of a tubular shaft 72, which is mounted for rotation in the bearing member 66 and in a bearing in the gear frame 61. At its upper end, the tubular shaft 72 carries a lift propeller 73. A second drive propeller 74, which has blades causing it to rotate in a direction opposite to that of the drive propeller 69, is mounted on a shaft 75 which passes through the tubular shaft 68 and carries at its forward end a gear 76. The gear 77 is fixed on a shaft 78 which extends through the tubular shaft 72 and carries at its upper end a second lift propeller 79. It will be apparent from the foregoing description that the lift propellers 73 and 79 also rotate in opposite directions. This form of the invention is also self-balancing and there is no need for a compensating wing or a tail member.

A stabilizing rudder assembly 80, consisting of vertical and horizontal fins, is carried at the rear end of the rudder-supporting member 65. A three-string bridle is secured at opposite ends of the transverse strut 67 and at the forward end of the bearing support 62. This bridle assembly is designated generally by the reference numeral 81 and extends forwardly to a tether string, not shown.

The foregoing description will enable those skilled in the art to clearly understand my invention. In all its various forms, the toy should be constructed of materials of the lightest weight possible consistent with requisite strength and rigidity.

The foregoing specific description relates to what are now considered to be the preferred forms of my invention, but it will be obvious that various modifications may be resorted to without departing from the fundamental concept of the invention as defined by the following claims.

Having thus described my invention, I claim:

1. A tethered toy for sustained flight in wind comprising a drive propeller arranged to rotate in a vertical plane upon passage of wind there-through, a lift propeller arranged to be rotated in a horizontal plane by power derived from said drive propeller, and means for stabilizing and retaining said propellers in their respective planes of rotation.

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2. A tethered toy for sustained flight in wind comprising a frame, a tether secured to said frame, a stabilizing rudder disposed rearwardly of said frame, a driving shaft extending rearwardly from said frame, a drive propeller fixed on said driving shaft to rotate said shaft when wind imparts rotation to said drive propeller, a driven shaft extending upwardly from said frame, a lift propeller fixed on said driven shaft upwardly of said frame, and means operative to rotate said driven shaft and said lift propeller on rotation of said driving shaft whereby said toy is sustained in flight.

3. A tethered toy for sustained flight in wind comprising a frame, a stabilizing rudder disposed rearwardly of said frame, a drive propeller arranged to rotate in a vertical plane upon passage of wind therethrough, a lift propeller arranged to be rotated in a horizontal plane above said frame by power derived from said drive propeller, a compensating wing secured to said frame and extending laterally therefrom in a direction to compensate for reduced lift on that side of the toy on which the blades of said lift propeller are traveling rearwardly with the wind, and a tail member depending from said frame.

4. A tethered toy for sustained flight in wind comprising a frame, stabilizing rudder means extending rearwardly from said frame, a pair of drive propellers located rearwardly of said frame and arranged to rotate in opposite directions on horizontal axes upon passage of wind therethrough, and a pair of lift propellers located upwardly of said frame and arranged to be rotated in opposite directions on vertical axes by power derived from said drive propellers.

5. A tethered toy for sustained flight in wind comprising a frame, stabilizing rudder means extending rearwardly from said frame, a pair of drive propellers arranged to rotate in opposite directions in a vertical plane upon passage of wind therethrough, and a pair of lift propellers arranged to be rotated in opposite directions in a

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horizontal plane above said frame by power derived from said drive propellers.

6. A tethered toy for sustained flight in wind comprising a frame, stabilizing rudder means on said frame, a pair of drive propellers located rearwardly of said frame and arranged to rotate in opposite directions on coincident horizontal axes upon passage of wind therethrough, and a pair of lift propellers located upwardly of said frame and arranged to be rotated in opposite directions on coincident vertical axes by power derived from said drive propellers.

7. A tethered toy for sustained flight in wind comprising a frame, a tether secured to said frame by means of a bridle attached at vertically spaced points on said frame to maintain said frame in approximately vertical position, a rudder supporting member extending rearwardly from the upper portion of said frame, vertical and horizontal fins carried by said rudder supporting member, a horizontal shaft mounted for rotation in the lower portion of said frame, a wind driven propeller secured to said horizontal shaft for rotation in a vertical plane to the rear of said frame, a vertical shaft mounted for rotation in said frame, a lift propeller secured to said vertical shaft for rotation in a horizontal plane above said frame, and means for rotating said vertical shaft and said lift propeller upon rotation of said wind driven propeller and said horizontal shaft.

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