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R. J. STEPHAN

2,548,748

FLYING TOY

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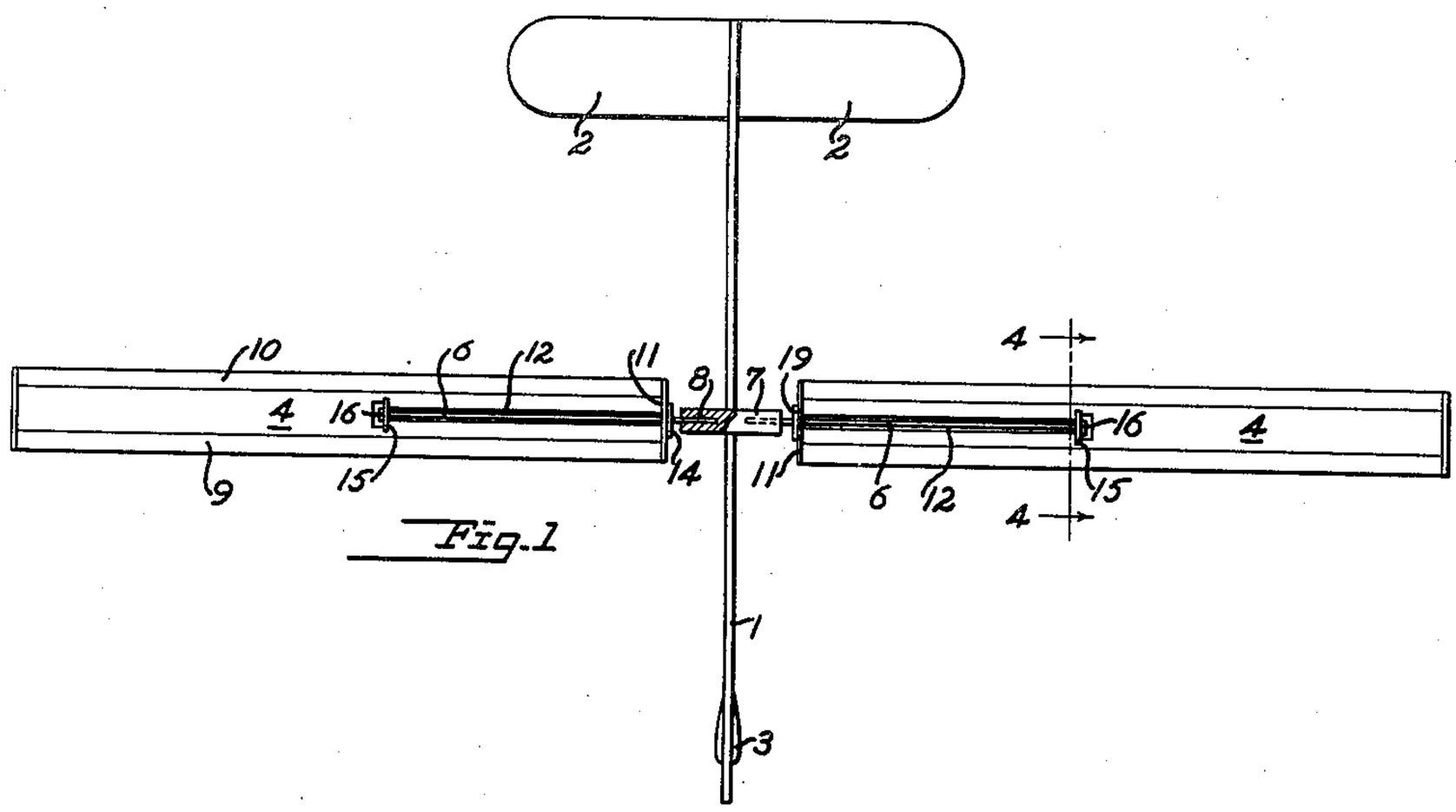

Fig. 1

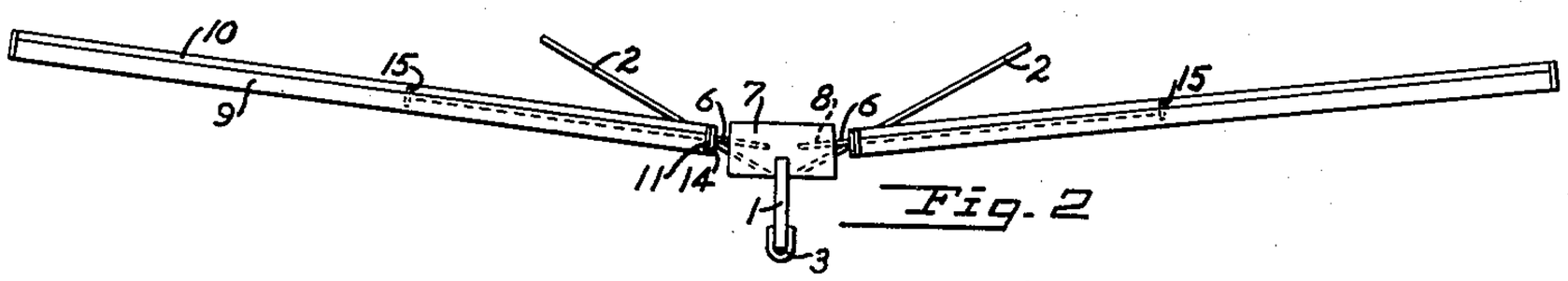

Fig. 2

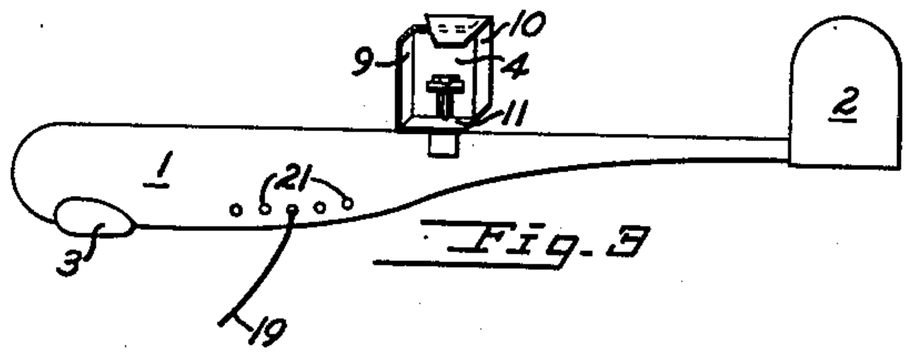

Fig. 3

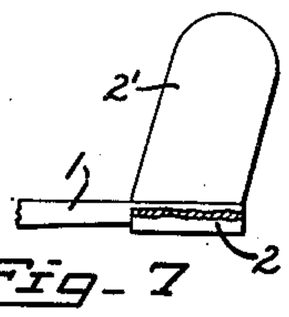

Fig. 7

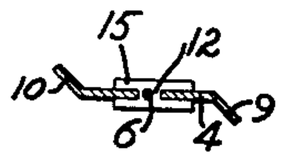

Fig. 4

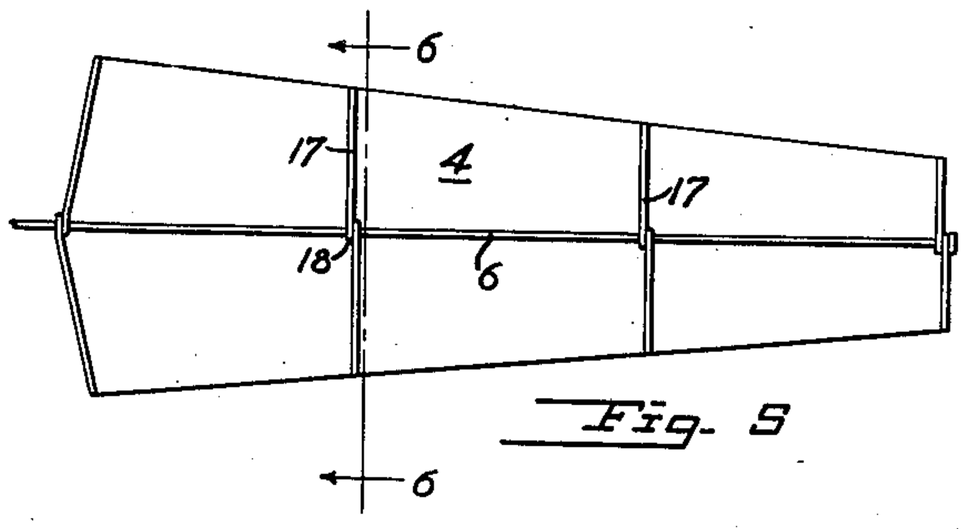

Fig. 5

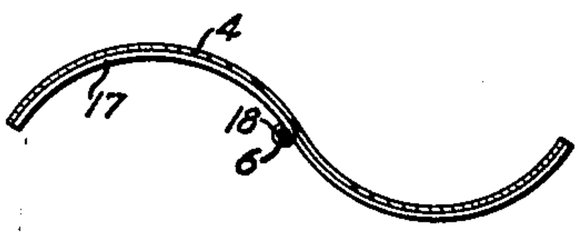

Fig. 6

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FLYING TOY

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3 Claims. (Cl. 244—154)

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My invention relates to a toy, and particularly to a winged toy capable of captive kite-like flight under the impulse of wind pressure.

It is among the objects of my invention to provide a toy, of generally airplane form, provided with rotatable wings impelled by the flow of an air current therepast.

Another object is to provide a wing construction for toy airplanes capable of maintaining a fluttering action, and impelling flight of the toy in winds of moderate velocity.

A further object is to provide a flying toy in which the flow of air currents past the wings imparts rotation and a lifting impulse to the wings.

The invention possesses other objects, some of which with the foregoing will be set forth at length in the following description wherein are explained those forms of the invention which have been selected for illustration in the drawings accompanying and forming a part of this specification. In said drawings, illustrative forms of the invention are shown, but it is to be understood that it is not limited to those forms, since the invention as set forth in the claims may be embodied in a plurality of other forms.

In the drawings:

Figure 1 is a plan view of a toy embodying my invention;

Figures 2 and 3 are front and side elevations respectively of the device as shown in Figure 1; a portion of the near wing tip being broken away in Figure 3;

Figure 4 is a transverse section of the preferred wing structure, the plane of the section being indicated by the line 4—4 of Figure 1;

Figure 5 is a bottom plan view of another form of wing structure; and

Figure 6 is a transverse section of the wing shown in Figure 5, the plane of the section being indicated by the line 6—6 of Figure 5.

Figure 7 is a fragmental side elevation, partly in section, showing a modified form of the stabilizing means.

In terms of broad inclusion, the flying toy of my invention comprises a toy airplane body provided with laterally extending wings upon opposite sides of the body. The wings are rotatable about their longitudinal axes; and are provided with oppositely inclined edge portions by which the movement of air currents past the wings will impart rotation and a lifting action to the wings, for impelling flight. The body is preferably provided with stabilizers positioned back of the wings; and the toy is held captive by a suitable string in the nature of a kite string.

In terms of greater detail, the toy of my invention comprises a body 1, shaped in general profile likeness to the fuselage of an airplane. The body is made of balsa wood, cardboard, plastic, or other

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material of comparable lightness and strength. Stabilizers 2 are secured to the tail portion of the body 1 to resist tipping of the body in flight. The stabilizers preferably comprise a strip of cardboard, attached, to the tail of the body 1, and bent to upwardly diverging relation, as shown in Figure 2. The angle at which the stabilizers 2 diverge may be readily varied to stabilize the toy under prevailing wind conditions, or to meet other varying requirements. Plastic, balsa wood or other suitable material may be used instead of cardboard for the stabilizers. If desired, a vertically disposed stabilizer 2' may be added, as indicated in Figure 7 of the drawings. A weight 3 may be mounted near the nose of the plane to further stabilize the plane during flight.

Wings, designated in general by the numeral 4, are mounted in laterally extending positions upon opposite sides of the plane. The wings 4 are rotatably mounted upon laterally extending wing mounting shafts 6 secured to the body 1. Preferably the shafts 6 are mounted by means of a mounting block 7 secured transversely of the body and having openings 8 into which the inner ends of the shafts are pressed. The shafts 6 are positioned directly opposite each other in balanced relation; and are preferably inclined upwardly toward their outer ends.

In the preferred form illustrated in Figures 1 to 4 inclusive, the wings 4 comprise a planar mid-portion, formed of balsa wood, cardboard, plastic or other strong light material. Vane portions 9 and 10 are formed along the leading and trailing edges respectively of the wing, the vane portions 9 and 10 of each wing being inclined in opposite directions relative to the plane of the wing. When the wing body is in a substantially horizontal plane the forward vane inclines downwardly and the rearward vane upwardly. Reinforcing end pieces 11 may be secured upon the inner or outer ends, or both inner and outer ends of each wing. The ends of the pieces 11 are shaped to conform to the inclination of the vanes, and are secured thereto to brace and hold the vanes in fixed angular relation relative to the mid-portion of the wing, and to give rigidity to the wings.

The wings 4 are provided with axial slots 12 extending outwardly from the inner ends of the wings a distance slightly more than the outwardly extending length of the shafts 6. The wings are rotatably mounted upon the shafts 6, with the shafts centered within the slots 12 by means of bearing plates 14 and 15. The plate 14 for each wing is secured to the inner end piece 11, the shaft 6 extending through matching openings in the end piece 11 and plate 14 to rotatably support the inner end of the wing. The plates 15 are inset in the wings to rotatably engage the outer ends of the shafts. Retaining means, such as a head 16 upon the outer end of each

shaft prevents movement of the wing mounted upon the shaft from outward axial displacement therefrom. The plates 14 and 15 are preferably made of thin sheet material, such as brass, copper or plastic, apertured to receive the shafts 6 which are preferably made of stiff wire. The wings are assembled onto the shafts 6 before the shafts are attached to the block 7.

Another effective form of wing is illustrated in Figures 5 and 6 of the drawings. In this form of wing, a piece 16 of thin sheet material such as paper, cardboard, plastic or even thin sheet material, is secured to a plurality of cross stays 17. The stays 17 may be made of copper or brass wire, or other suitable material to which the sheet material may be cemented or otherwise secured. The stays and facing material are bent so that in cross section the shape will be a reverse curve, approximating the form shown in Figure 8 of the drawings. The stays 17 have loops 18 centrally positioned to engage the shafts 6 and rotatably support the wings upon the shafts. The wings of this form preferably taper toward their outer ends, as shown in Figure 5. The reverse curvature, which approximates the shape of what is sometimes referred to as a "Savonius" curve, is such that air pressure against the concave curvature at the leading edge tends to rotate the wing about its longitudinal axis, while the convex trailing edge permits the air to flow past the edge with relatively little resistance.

In operation the toy is flown in the manner of a kite, with the plane held captive by a suitable thread or kite string 19. In a moderate wind the effective wind pressure exerted against the vanes upon opposite edges of the wings is unbalanced, with the result that the wings are rotated rapidly about the shafts 6. Thus, at any instant, the vanes or reversed curvature of the wings present a recessed or cupped area to the wind along one edge of each wing, and a similar cupped area faced away from the wind along the other edge. An air current entering the forwardly faced cupped portion of the wing exerts an effective turning force thereagainst, while the air stream is diverted and flows past the opposite edge with relatively little resistance. As the effective cupped area passes its center position toward the back of the plane, the opposite edge of the wing passes its forward center position and admits the air current into the cupped area which has just previously been disposed behind the plane edge, thereby causing that edge to become the driving edge of the wing. The cupped sides of the wing are thus moved alternately to face the wind and maintain a turning moment for continuously rotating the wing.

This unbalanced air pressure also produces an upward component of force tending to raise the plane. The combined rotation and lifting effect causes the toy to be impelled upwardly, as a kite, with the rotating wings producing a continuous fluttering action. The kite string 19 is attached to the body 1 in any of a plurality of openings 21 along its under side in advance of the wings, the string being attached at a point suited to prevailing wind conditions, and the character of flight desired. At a particular wind velocity, the string may be attached at a point which will result in a substantially steady flight at a height controlled by the length of kite-string paid out. By shifting the point of attachment forwardly or rearwardly the stability may be modified to give a dipping action or a laterally swinging action as desired. The range of the dips or side sway may be controlled by adjustment of the stabilizers 2, or by shifting the position of the weight 3.

The toy may of course be made in various sizes, within the weight limitations necessary to permit flight under the pressure of ordinary winds. In the preferred form of wing shown in Figures 1 to 4, an overall length of 7 inches and width of 1 inch gives an efficient operation. For such a wing, the inclined vane portions 9 and 10 should be about ⅛ inch wide, and incline at an angle of about 45°. The wing supporting shafts should extend about 3 inches from the sides of the body.

I claim:

1. A flying toy comprising a piece of thin flat material forming a planar body having a forwardly extending stabilizing portion of relatively large area, a wing mounting block inset transversely of the body and extending laterally from the sides thereof substantially midway between its ends, a pair of wing mounting shafts mounted in symmetrical laterally extending relationship on opposite ends of the block, wings mounted upon the shafts in freely rotatable relation thereto, said wings being rotatable by the flow of air currents therepast, and a cord attached to the body forwardly of the wings.

2. A flying toy comprising a piece of thin flat material forming a body having its major portion forming a vertically disposed forward stabilizer, laterally extending stabilizing planes upon the rearward portion of the body, cord engaging means upon the forward portion of the body, a wing mounting block secured to the body in laterally extending relation thereto intermediate its ends, shafts mounted upon the block in outwardly extending relation thereto, wings freely rotatable upon the shafts, and a cord attached to the cord engaging means.

3. A flying toy comprising a thin flat planar body having its major portion positioned in a forwardly extending vertically disposed stabilizing position, a wing mounting block extending laterally from opposite sides of the body at a point substantially midway between the ends of the body, wing shafts mounted upon and extending laterally from the ends of the block, wings rotatable upon the shafts, each wing being provided with oppositely inclined portions positioned to impart a turning movement to the wings under the pressure of an air stream flowing therepast, a stabilizing weight upon the forward end of the body, and a cord attached to the body between the weight and the wings.

RAYMOND J. STEPHAN.

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