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ROTARY KITE

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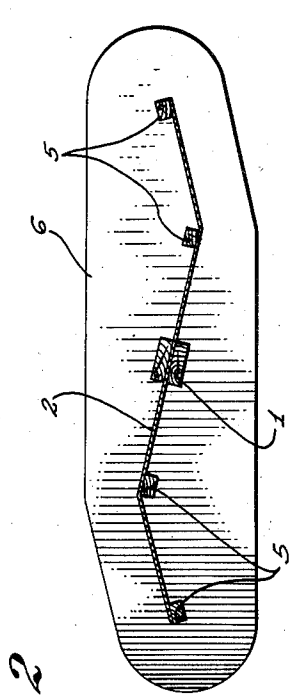

Fig. 2

Fig. 1

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ROTARY KITE

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The present invention relates to amusement devices, and more particularly to a new and novel rotary kite.

Revolving cylindrical devices have been known, which utilize the "Magnus" effect to produce a useable force for the purpose of propelling or sustaining a load. Devices of this type have been used as kites, wherein a rotating cylindrical member causes a lift. However, since an integral power means is not, of course, present in a kite, the success of its operation depends on the relative wind, and the kite should therefore have a minimum weight combined with maximum lift and strength. Prior kites of the rotating type have been relatively inefficient due either to low lift-to-weight ratios or excessively complicated construction.

It is, therefore, an object of my invention to provide an improved rotary kite having a simple and especially strong construction so that light materials can be used to the best advantage.

Another object of this invention is to provide an improved type of rotary kite with a high lift-to-weight ratio, using a different principle heretofore not known in the field of kites.

It is a further object of the present invention to provide a rotary kite having simple parts which are made in flat form and readily adapted to make up a kit for easy assembly.

Briefly, my invention comprises an airfoil-shaped lift member having two circular end pieces for stability. The lift member is preferably S-shaped in cross section and is composed of a thin main surface having a framework of lengthwise spar elements and a plurality of rib-like cross members, the latter arranged to hold the desired cross sectional shape of the main surface.

The afore-mentioned features may be more fully understood by reference to the following detailed description of a preferred embodiment of my invention, illustrated by the accompanying drawings, wherein:

Figure 1 is an overall perspective view showing the kite ready to fly. Thicknesses of most of the parts have been exaggerated for clarity.

Figure 2 is a cross section taken as indicated by the line 2—2 in Figure 1, showing details of the main airfoil member components.

Referring first to Figure 1, a center spar 1, consisting of an upper half and a lower half, is attached to a main airfoil 2 preferably passing between the halves of the center spar 1. Located a small distance inwardly from each end of the kite is a circular stabilizer disc 3 through the center of which passes the center spar 1. A disc stiffener 4 is secured across the inner diameter of each disc, preferably with a liquid or paste adhesive, or glue.

The airfoil 2 has four additional spar sticks 5 extending lengthwise thereof and parallel to the center spar 1. The two rearward spar sticks are located on the upper surface of the airfoil 2 and the two forward spar sticks are against the lower surface of the airfoil. This arrangement results in a great advantage, as will be discussed in more detail later. Near the forward edge, the airfoil 2 is

deflected downwardly, while toward the rear edge it is similarly deflected upwardly, thus giving a substantial S-shape to the airfoil. The center spar 1, spar sticks 5, and airfoil 2 are all glued or otherwise suitably attached to the stiffener 4 at each end of the assembly, and the stabilizers 3 have a diameter appreciably larger than the chord of the airfoil 2. The stabilizers 3 prevent tip loss of lift, a condition present with a normal plain airfoil.

Two ribs 6 are equally spaced between the stabilizers 3, and are formed of solid material except for the required space through which the airfoil and spars fit. As shown in Figure 2, the airfoil 2 is substantially centered in the relatively large ribs 6, and the ribs have a suitably formed outline generally conforming to the shape of the airfoil. The airfoil and spars are preferably fixed, as by glue, to the ribs around the entire intersection therewith.

It is seen from the drawings that the S-shape of the airfoil is reinforced and the kite is held sturdy by the arrangement of the spar sticks 5 on the concave side of the airfoil. Thus, the airfoil 2 may be made of exceptionally light material, paper, for example. If a bending force upwardly on one end of the kite occurs, the airfoil surface on the lower side of the spar sticks is put in tension, and since the sheet material is inherently rigid in tension, the kite will retain its shape and be relatively very difficult to break or strain. Similarly, any bending tendency of the kite in the downward direction will be strongly resisted by the tension in the upper airfoil surface on the other side of the center spar 1. Actually, more or less than four spar sticks 5 may be used, as desired. In fact, the two inner spar sticks may be omitted, for example, in favor of a lighter and more economical construction, since the ribs 6 further insure the maintenance of the S-shape airfoil and resultant shape of the kite. Buckling forces of the aforementioned nature occur especially when the airfoil 2 is in a substantially vertical position in operation, and being acted upon by the wind.

The kite is held in flying position and allowed to rotate by means of a bridle 8 fastened to end bearings 9 which are rotatably attached to the ends of the center spar 1 by screws 10, for example. The screws 10 are left loose enough to permit free rotation of the kite in the bridle 8.

A loop 11 is formed at the center of the bridle 8, and the main kite cord 12 is tied to this loop 11. The bridle must be long enough to prevent interference with the edge of the stabilizers 3 when the bridle is held taut, as when flying.

This completes the basic structure of the present invention. Due to the construction as described, very light materials can be used, and thereby a high strength-to-weight ratio is achieved. With the relative wind in a left-to-right direction as shown by the arrows in Figure 1, the proper rotational direction is clockwise, as also indicated, in which direction it spins very rapidly. However, this kite will also fly while rotating in the reverse direction, but with lesser efficiency and slower.

A preferrred embodiment of the present kite includes balsa spars, smooth thin cardboard stabilizers and ribs, paper airfoil, and bridle of button and carpet thread to prevent twisting. The main line cord 12 should also be button and carpet thread, unless a small swivel assembly is connected between the cord and bridle. The kite is assembled from all flat pieces, and no bending to shape is required. The ribs 6 may be supplied with a thin punched-out interior slot conforming to the space required for inserting the airfoil and spars.

It is thus seen that a new and novel rotary kite with superior flying qualities is provided by the present invention, which differs substantially from the conventional cylindrical drum apparatus embodying solely the Magnus effect. With this construction, using the simple, approxi-

mately S-shape of flexible airfoil sheet material supported by the spars and ribs as specified, extremely good flight is attained even in light winds. The stabilizer discs 3 and inherent action of the rotating airfoil maintain excellent stability without a tail of any kind.

While the invention has been described and shown herein in certain specific detail, it is to be distinctly understood that the invention is not limited to the specific embodiment disclosed, since many modifications may be made without departing from the principles involved, and the invention is therefore claimed in any of its equivalent forms within the scope of the appended claims.

I claim:

1. In a rotary kite having an airfoil member and two end stabilizing discs, the airfoil construction comprising a main spar member extending completely along the rotational axis of said kite, a single airfoil of thin flexible sheet material centered at said main spar member, the forward extent of said airfoil deflected downwardly toward the leading edge thereof, the aft extent of said airfoil deflected upwardly toward the trailing edge thereof, secondary spars positioned on the concave side of said airfoil along the respective deflection lines lengthwise of said airfoil, and other secondary spars positioned along said airfoil leading and trailing edges.

2. A rotary kite comprising a single sheet paper airfoil having a main spar upper section attached lengthwise completely along the top center of said airfoil and extending beyond both ends thereof, a main spar lower section attached completely along the bottom center of said airfoil and matching said upper section, a secondary spar positioned along the lower side, only, of said airfoil

forward of said main spar, another secondary spar positioned along the upper side, only, of said airfoil to the rear of said main spar, leading and trailing edge spars attached to said airfoil on the same side thereof as their respective secondary spars, all the spars except said main spar having the same length as said airfoil, a plurality of rigid rib members having perforations therein to receive said spars and said airfoil, said perforations defining an approximate S-shape cross section for said airfoil with said secondary spars located on the concave sides of the S-shape, said ribs firmly attached chordwise around said airfoil and equally spaced between the ends thereof, and a thin circular stabilizer disc attached to each end of said airfoil with said main spar extending therethrough, the diameter of said discs exceeding the chord dimension of said airfoil.

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