Nov. 21, 1967 J. T. DOWNEY 3,353,295

TRANSVERSELY CURVED AERIAL TO WITH WEIGHTED NOSE

Filed March 10, 1966

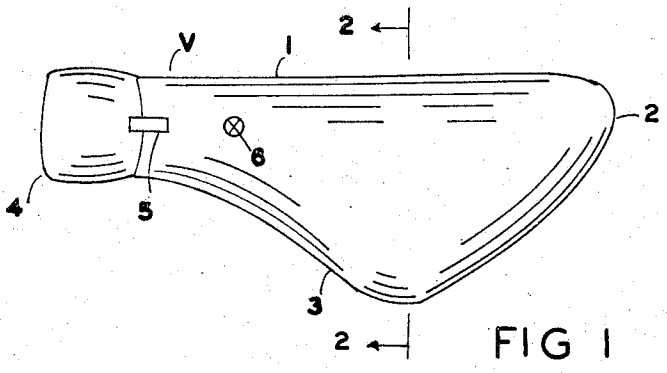


FIG 1

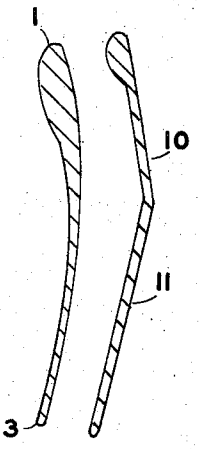


FIG 2 FIG 2A

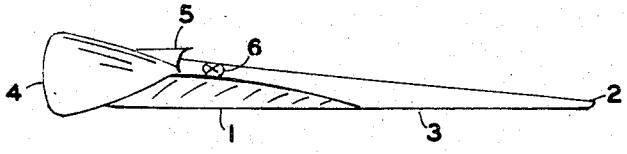


FIG 3

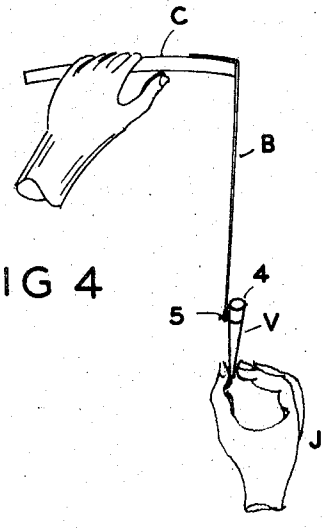


FIG 4

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TRANSVERSELY CURVED AERIAL TOY WITH WEIGHTED NOSE

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1 Claim. (Cl. 46—74)

This invention relates to aerial toys. This invention is an airflight device that has flight characteristics such that it can be propelled vertically into the air to substantial altitudes of from approximately 50 feet up to, including and exceeding 250 feet, climbing in a vertical attitude like a rocket, bullet or arrow, and then at or near the summit, flip over to assume a horizontal attitude, spinning as it does this, and then descend to the ground in a spinning motion, flying, gliding, drifting and riding the air currents, breezes and thermals.

An object of this invention is to provide an amusing toy for people to play with, one that will climb vertically to a substantial altitude where it will spin without assistance as it descends, its speed of rotation or spinning motion increasing in the descent until it reaches a terminal velocity. The device may also be used for aerial drops of equipment, supplies, flares, cameras or other objects within the range and scope of its design.

Another object of the invention is to provide a device of low cost construction with no moving parts, such that its design will incorporate flight characteristics that will permit it to be propelled to high altitudes in a straight path before it slows to the point where its tendency to spin predominates and the device flips over to a horizontal attitude and it begins to spin, whereupon it continues to spin throughout the entire descent.

Another object of the invention is to improve the flight characteristics and performance of aerial spinning toys such that this device may be mechanically propelled to substantially higher altitudes than similar spinning devices and that its special design will allow it to descend at a slower rate.

Other objects of the invention will become apparent from the following specification and drawings of which:

FIGURE 1 is a top view showing the general shape on a two dimensional basis. This shape is similar to that of a propeller blade or a maple seed pod.

FIGURES 2 and 2A are enlarged cross sectional views on the line 2—2 showing the airfoil which has a thicker leading edge and thinner trailing edge and mid-area.

FIGURE 3 is a view in side elevation looking forward from the trailing edge to the leading edge showing the leading edge to be level and the trailing edge also level from the mid-section at lines 2—2 to the tip.

FIGURE 4 is a schematic view showing the launching of the device into the air.

Referring to the drawings, the main elements are vane V having a leading edge 1, tip 2, trailing edge 3, nose 4, launch hook 5 and the approximate position of the center of gravity 6.

This invention relates to the improvement in aerial toys, the object of the invention being to provide a device which may be propelled mechanically into the air with a large rubber band, to a high altitude where it will assume a horizontal attitude, begin to spin, and descend to the ground at a slow rate as it continues to spin.

The general shape and spinning characteristics of the invention are similar to that of a maple seed pod and also to the devices described in Patent Nos. 1,413,316 and 913,381. However, my invention provides certain substantial improvements which I will specifically describe later. The results of these improvements will allow my invention to be propelled vertically to altitudes of from approximately 50 feet up to, including and exceeding 250 feet, the height depending upon such variable

factors as wind conditions, stability or steadiness of launch, trueness of airfoil and undamaged nose design, and the force of the launch.

An average launch for a device of 3 to 4 inches long is approximately 150 feet; however, it is possible to reach altitudes of over 300 feet. The devices described in Patent Nos. 1,413,316 and 913,381 both incorporate a flat flexible vane or wing which will cause the device to begin spinning immediately or within a few feet when it is thrown or launched into the air. This is physically and aerodynamically nothing more than a maple seed pod which Patent No. 1,413,316 relates itself to. A flat vane device has no stability along its longitudinal axis, which as shown in my drawings, is an imaginary line from the nose to the tip. Using a flexible vane as described in Patent No. 1,413,316 will add to its instability causing air to "burble," i.e. cause eddy currents as it passes over its surface resulting in early or immediate spinning. My vane V is rigid and uses an airfoil and relatively blunted nose 4 of large area which will allow the device to climb vertically stable at a high rate of speed to a substantially high altitude where at or near the apex, as its speed decreases, the tendency to spin predominates causing the device to flip to a horizontal attitude and begin to spin, continuing to spin as it descends. The devices described in Patent Nos. 1,413,316 and 913,381 have spinning qualities only. My invention will not only spin, but will climb like an arrow or bullet in a vertical flight path for a considerable distance before it begins to spin. My invention incorporates both these flight characteristics which will become more apparent.

The function and advantages of the new designs and additions will be evident as I describe the design and purpose of the various areas of the device.

Airfoil

The airfoil, FIGURES 2 and 2A, will provide two very important contributions to the flight characteristics of the invention. When launched in a vertical attitude, the airfoil will give increased stability along the longitudinal axis to thereby gain a substantial altitude. Secondly, this airfoil will also provide lift, exactly as that of an airplane's wing, when the device is spinning in a horizontal position. This lift will slow its rate of descent considerably. Without this airfoil the device starts to spin immediately upon launch, will not climb more than a few feet and will descend at a faster rate because it has no appreciable lift. The airfoil will allow it to better ride thermals, vertical air currents and even build a cushion of air beneath it on which to ride. This also contributes to a slower rate of descent. As shown in the accompanying drawings, the leading edge 1 immediately aft of the nose 4 is flat or level. The tip 2 is curved like that of a propeller tip or aircraft wing tip and the trailing edge 3 from the widest part or midsection and marked with the line 2—2 in the drawings, to the wing tip is also level and in line with the leading edge 1. The airfoil may also be of flat sections 10 and 11 as shown in FIGURE 2A.

Specifically, if the device were to be positioned on a flat or level surface with the nose 4 just protruding over the edge, the leading edge 1, tip 2 and trailing edge from the tip 2 to the midsection or line 2—2 would all touch the flat surface and be level. The remaining trailing edge from the midsection to the nose is not level or in line with the leading edge, but is so designed as to allow for a uniform airfoil as shown in FIGURES 2 and 3.

Nose

The nose 4 is relatively blunt and slightly rounded on the end, with the greatest area and substance at the forward end, the purpose of which is to increase stability along the longitudinal axis thereby providing an aero-

dynamic design such that the device will not tumble or spin at high speeds. Its design and action can be described as that very similar to that of our present-day space capsules which our astronauts use to re-enter the atmosphere. Anything other than a relatively wide and blunted nose would cause the capsule to spin and tumble as proven experimentally.

The large mass of material comprising the nose of my invention also provides the necessary weight, or counter balance required to make the device spin when in a horizontal attitude or position.

Leading edge

The leading edge **1** is straight and is thicker than the mid-area or trailing edge, providing the necessary weight to readily start the device spinning in the desired direction, which is toward the leading edge. This thickness or weight extends the full length of the leading edge and the added weight toward the tip acts as counter-balance thereby increasing the rate of spin when in a horizontal attitude and thus provides a slower rate of descent.

Launch hook

The launch hook **5** is positioned on top immediately aft of the nose **4**, but forward of the center of gravity **6**, and may be anyplace on a straight line forward of the center of gravity such that if the device is suspended vertically from any point on this line, the leading edge **1** of the device will be perpendicular to the ground. The launch hook **5** in this position will increase the stability of the launch resulting in a higher altitude before the device begins to spin. Referring to FIGURE 4, the device may be launched with a sling shot or catapult device C having a rubber band B adapted to engage the launch hook **5**.

Construction is preferably of molded plastic, aluminum, sheet metal or other adequate desirable material, rigid and light in property. While I have shown and described the preferred design and construction, it is to be understood that the important improvements in this device are the airfoil, wide area blunted nose, weighted leading edge extending the full length and strategically placed launched hook which will allow for the improved flight characteristics and performance.

The preferred construction is molded in one piece but may be constructed of various parts and materials if so desired.

Differences between this design and that of Patent Nos. 1,413,316 and 913,381 are:

(1) This device incorporates an airfoil for reasons described.

(2) This device incorporates a vane or wing which is rigid rather than flexible, for reasons described.

(3) This device incorporates a nose which is relatively blunt and wider at the forward end for reasons described.

(4) This device incorporates a hook so as to be mechanically launched by use of a large rubber band fastened to the end of the stick.

(5) This device incorporates a full length weighted leading edge for reasons described.

These differences in design produce the improved flight characteristics and results previously described.

Many modifications may be made by those who desire to practice the invention without departing from the scope thereof which is defined by the following claim.

I claim:

An aerial toy comprising a rigid vane airfoil, said vane having a nose thicker than the remainder of said vane, opposite the tip, launching hook means connected to said vane on a straight line between said nose and the center of gravity of said vane, said vane having a weighted leading edge and said vane being shaped so that the leading edge, tip, and trailing edge from the widest point on its midsection to the tip are level and in line with each other such that if the device were to be placed on a level or flat surface with the nose just protruding over the edge, all points along the leading edge, tip and trailing edge just described would touch the surface and be level, said weighted edge and configuration of said vane comprising means increasing stability along the longitudinal axis when being propelled in a vertical attitude and giving lift to the device when it is spinning in a horizontal attitude, said vane nose including nose means which is relatively blunt and tapering to a wider area on the forward end which gives stability along the longitudinal axis when the device is propelled in a vertical attitude into the air thus preventing premature spinning and allowing the device to climb to a high altitude before it begins to spin, said launch hook means being on the top of the airfoil adjacent and forward of the center of gravity and in line with the center of gravity such that if the device is suspended vertically from this hook, the leading edge will be perpendicular to the ground, said vane having its upper and lower surfaces transversely arcuate in the same direction producing a transverse curvature forming an airfoil, said forward edge being thicker than the mid-area and trailing edge so as to provide the necessary weight to assist the device to spin.

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