March 1, 1966 D. D. DAVIES 3,237,895

KITE

Filed March 26, 1964 2 Sheets-Sheet 1

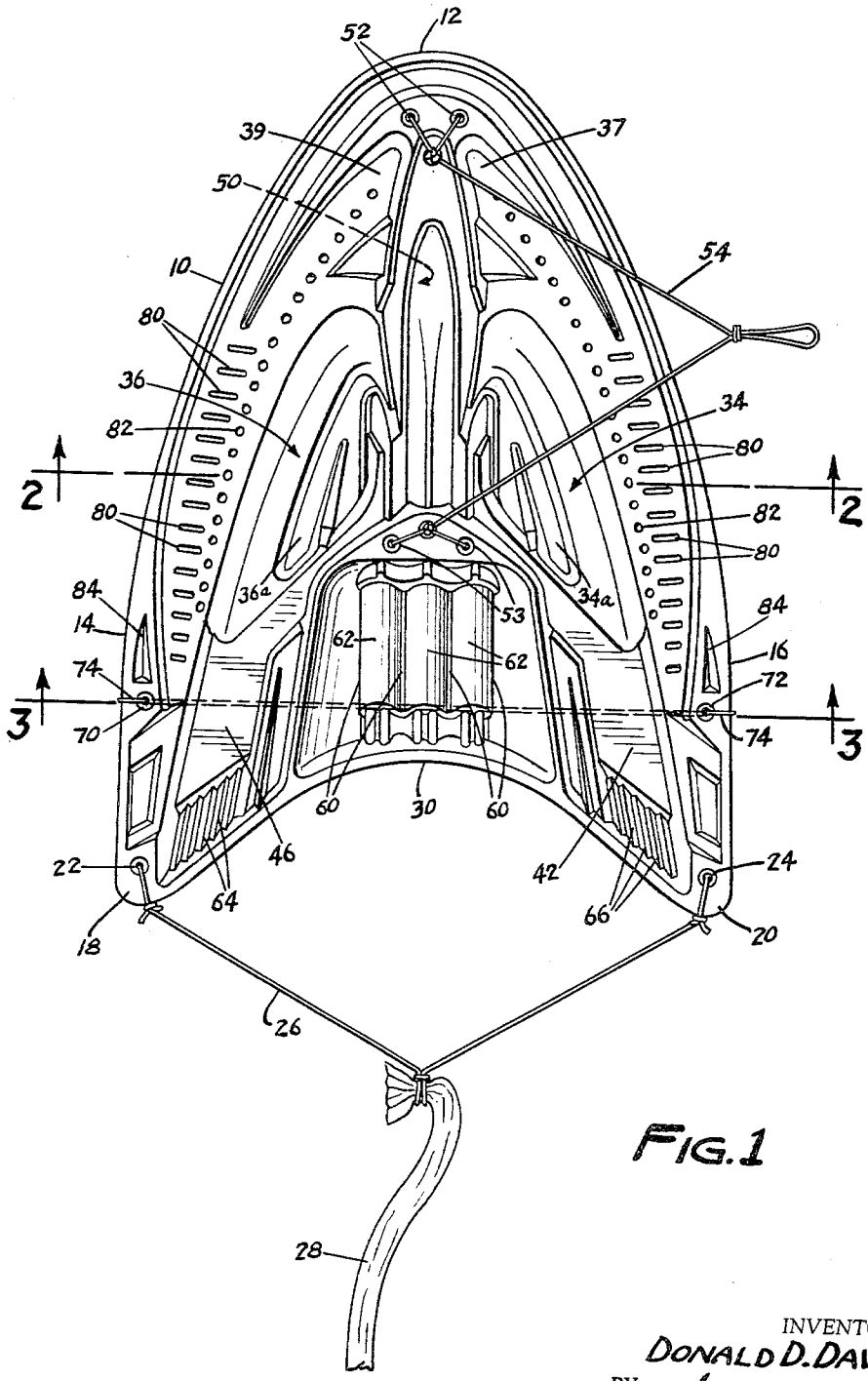


FIG. 1

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March 1, 1966 D. D. DAVIES 3,237,895

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Filed March 26, 1964 2 Sheets-Sheet 2

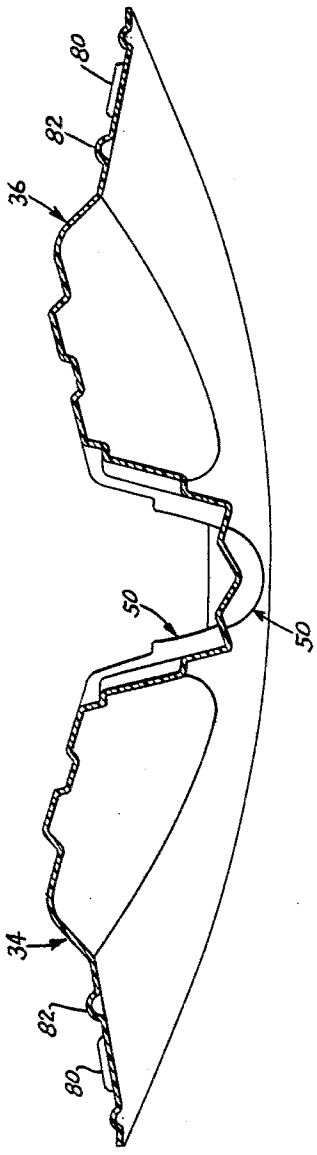


FIG. 2

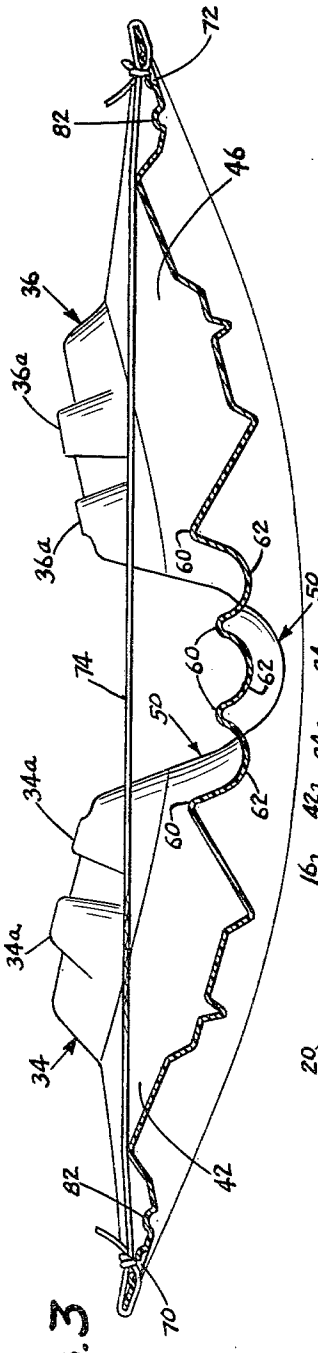


FIG. 3

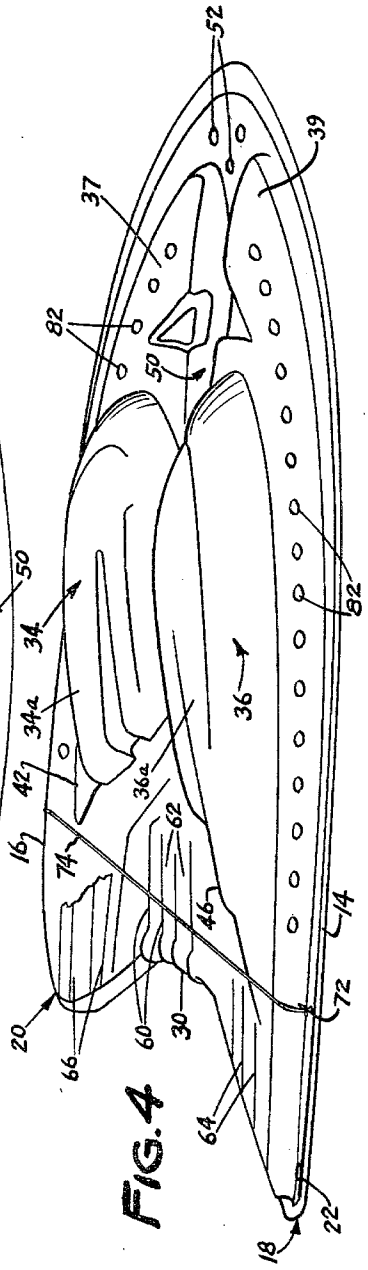


FIG. 4

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KITE

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8 Claims. (Cl. 244—153)

The present invention relates to kites and more particularly to preshaped semirigid kites formed from resinous sheet material.

The kite of the present invention is formed from a preshaped semirigid sheet of resinous material such as a thin sheet of plastic. While the kite can be shaped in various ways, it is preferably done by heating a flat sheet of plastic, draping the sheet over a mold and then applying sufficient pressure to force the sheet into conformity with them old. The preferred sheet material thus comprises a thermoformable plastic. In the forming operation, certain portions of the kite are displaced in a direction normal to the surface of the sheet material to provide additional strength as well as to improve the aerodynamic properties and stability of the kite. The kite has a delta or swept wing shape as seen in plan view and includes pointed extensions on each side which project rearwardly from the bottom or rearward edge of the kite to improve the appearance of the kite and improve flight stability. Kites embodying my invention have a "built in" reinforcing structure and can therefore be formed entirely from a single sheet of plastic without the requirement for sticks or other rigid stiffening members. A bridle of string or cord is tied to the lower surface of the kite and a pull string of the usual kind is secured to the bridle when the kite is to be flown.

One object of the present invention is to provide an improved preshaped kite formed from a single sheet of resinous material and requiring no additional rigid stiffening members or framework.

Another object of the present invention is the provision of an improved kite formed from a semirigid resinous sheet material wherein satisfactory stability is obtained through the use of rearward extensions one on each side of the center line of the kite.

A further object of the invention is the provision of an improved kite formed from a resinous sheet material including a pair of pockets opening downwardly on each side of the center line of the kite to provide a cambered airfoil shape preceding from the front of the kite to the rear thereof.

Another object of the invention is the provision of an improved preshaped kite formed from a semirigid sheet of resinous thermoformable material and including a generally trough shaped stiffening section at the center and extending longitudinally to resist bending about a lateral axis.

Yet another object of the invention is the provision of an improved preshaped kite formed from a semirigid resinous material which has an attractive appearance suggesting speed and motion.

Another object of the invention is the provision of an improved kite which can be made at a relatively low cost on high speed fully automatic machinery.

Another object of the invention is the provision of an improved kite of the type described having good stacking characteristics whereby the kites will occupy relatively little space during storage.

A further object of the invention is to provide an improved preshaped kite formed from a resinous sheet material wherein the sheet includes a plurality of displaced sections or pockets to provide strength as well as an aerodynamic shape.

Other objects of the invention will become apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principles of the invention may be employed.

The invention is illustrated by the accompanying drawings in which the same numerals refer to corresponding parts and in which:

FIGURE 1 is a plan view of a kite embodying the invention;

FIGURE 2 is a transverse section taken on line 2—2 of FIGURE 1;

FIGURE 3 is a transverse sectional view taken on line 3—3 of FIGURE 1; and

FIGURE 4 is a perspective view of the kite, as seen from a position above the upper surface and slightly ahead of the leading edge.

Refer now to the figures wherein there is shown a kite 10 formed from a unitary sheet of a preshaped and semirigid resinous sheet material. The sheet preferably comprises a thermoformable plastic. While various plastics can be employed, materials such as polystyrene, cellulose acetate and polyvinyl chloride or other thermoformable plastic sheets either with or without plasticizers can be employed. The thickness of the sheet 10 can be varied depending upon the size of a kite and the amount of strength desired. For most purposes, a sheet thickness of from about 2 to 15 mils and preferably from about 5 to 10 mils will be satisfactory.

As seen in FIGURES 1 and 4, the kite 10 includes a leading edge or nose 12 which is generally parabolic and includes edges which taper outwardly preceding toward the rear of the kite, then extend parallel to form side edges 14 and 16. A pair of rearward extensions 18 and 20 each includes a fastening means such as openings 22 and 24 for the tieing of a tail string 26 to the kite on which a tail 28 is secured. The lower edge 30 of the kite between rearward extensions 18 and 22 is positioned forwardly of the rear tips of the extensions a distance of about ¼ the length of the kite.

As can be clearly seen in FIGURES 2, 3 and 4 the kite is provided with a plurality of displaced pockets or cavities which open downwardly. According to the invention, major pockets 34 and 36 are provided on opposite sides of the longitudinal center line of the kite. Each of these pockets 34 and 36 has a convex curvature on its upper surface. The greatest vertical height of each pocket is at a point located about ⅓ the distance toward the rear of the kite from the nose 12. Each of the pockets 34 and 36 tapers at 42 and 46 gradually downward toward a plane extending through the edge of the kite. This curvature in each pocket provides an aerodynamic cambered surface most clearly visible in FIGURE 4, to increase lifting power and provide maximum stability. The air which fills the pockets tends to spill out rearwardly and laterally. The lateral flow of air in this manner helps to prevent the kite from rolling. The pockets 34 and 36 are provided with a plurality of relatively small displaced sections such as ribs 34*a* and 36*a* respectively which increase rigidity as well as helping to provide an attractive appearance.

Located between pockets 34 and 36 and positioned longitudinally on the center line of the kite is a trough or depression 50 which extends from the leading edge of the kite almost to the rear edge 30. The depression 50 opens upwardly as can be best seen in FIGURES 2 and 3. At the front and rear end of the trough 50 is provided a

connecting means such as openings 52 and 53 respectively for securing a bridle to the kite. A suitable bridle string 54 is tied to the openings 52 and 53 as clearly shown in FIGURE 1. While the trough 50 can extend all the way to the rear edge of the kite, I prefer to terminate the trough at the tieing means 53, that is to say approximately ⅔ of the way between the nose 12 and the rear edge 30.

Extending forwardly from the pockets 34 and 36 respectively are relatively shallow pockets 37 and 39 which form the frontmost portion of a cambered lifting surface on each side of the kite. The forward ends of pockets 37 and 39 are rounded as clearly shown in FIGURES 1 and 4. The pockets 34 and 36 are separated at the center of the kite by means of the trough 50.

Between the rearward end of the depression 50 and the rear edge of the kite 30 are provided a plurality of longitudinally extending and parallel ribs 60 which are separated by troughs 62 as shown in FIGURES 1 and 4. These ribs can be used to represent engines and at the same time reinforce the rearward portion of the kite. Similar longitudinally extending ribs 64 and 66 are provided at the rearward edge of each of the extensions 18 and 20 to add reinforcement. The forward edges of the pockets 34 and 36 as well as the displaced sections 37 and 39 are rounded or arcuate in shape. By providing rounded intersections, I have found that the kite is much more resistant to breakage than when sharp intersections are provided.

On the side edges 14 and 16, slightly ahead of the rear edge 30, are provided securing means such as openings 70 and 72 to which a fastening means or bowing string 74 is secured. The bowing string 74 is tied to each of the openings 70 and 72 and is tightened so as to bend the side edges 14 and 16 slightly above the plane extending through the center of the kite. The bow string provides the required dihedral necessary to obtain optimum flight characteristics as well as strengthening the rearward aspects of the kite. It has also proved valuable in preventing the kite from diving or buckling in a gust of wind. The amount of dihedral which is provided will of course vary depending upon the weight of the kite, the amount of wind present and other factors but a kite embodying the present invention and having a length of approximately 22 inches and a width of 16 inches should be drawn upwardly at the edges 14 and 16 about 2 inches above the center of the trough 50.

Kites embodying the present invention are very well suited for decorative markings such as laterally extending upwardly displaced bars 80, hemispherical pockets 82, triangularly shaped pockets 84 as best seen in FIGURE 1. These pockets are displaced upwardly. Besides increasing the visual appeal of the kite, these pockets like the others help to strengthen and rigidify the kite.

The kite 10 can be manufactured in a variety of different ways but is preferably produced by thermoforming and specifically by heating a flat sheet of plastic from which the kite is to be made until it has reached a thermoformable temperature and thereafter draping it over a preformed mold and evacuating air from between the mold and the softened plastic sheet. After the kite has cooled, it is removed from the mold. The edges of the kite can be trimmed either simultaneously with the forming operation or subsequent thereto. It is thus seen that the kite in accordance with the present invention can be manufactured at high speed with fully automatic equipment thereby reducing production costs.

A number of kites were manufactured embodying the present invention. These kites were found to have satisfactory lifting power, good flight characteristics and had no tendency to roll or pitch in moderate winds. They also were found to have good stacking characteristics since each is able to rest closely within the one adjacent to it. They therefore occupy very little space during shipment and storage.

It is apparent that many modifications and variations of this invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. The specific embodiments described are given by way of example only and the invention is limited only by the terms of the appended claims.

I claim:

1. A preshaped kite formed solely from a semirigid and unitary sheet of a resinous material and having integral reinforcing trough means extending longitudinally from a point adjacent the front end thereof to a point rearwardly of the center thereof and at least two upwardly displaced pockets, a rounded nose at said front end, substantially parallel side edges and integral extensions projecting rearwardly on each side of the center of the rearward edge of the kite.

2. A preshaped kite formed from a semirigid sheet of thermoformable resinous sheet material having a trough shaped upwardly opening and downwardly displaced reinforcing trough extending longitudinally thereof at the center from the front end of the kite toward the rear thereof, said kite being rounded at said front end and having a delta wing shape, said kite including two integral extensions one on each side of the center line at the rear edge thereof projecting rearwardly from the center of the rearward edge, a pair of upwardly displaced and downwardly opening pockets one on each side of the trough, the elevation of each pocket being greatest at a point positioned approximately one third of the way toward the rear of the kite and each pocket tapering gradually downward toward said rearward edge, said kite also including a plurality of substantially parallel reinforcing ribs, fastening means on the side edges of the kite adjacent said rearward edge for receiving a bow string to support the side edges of the kite at an elevation above the bottom of the trough to provide dihedral and additional fastening means at said front end and at a point on the longitudinal axis positioned rearwardly in the center of the kite, said additional fastening means being adapted to have a bridle string attached thereto.

3. A kite according to claim 2 wherein fastening means is provided on the rearward ends of the extensions to which a tail supporting string can be attached.

4. A kite according to claim 2 wherein the intersection between the forward edges of said pockets and the adjacent sheet material have an arcuate curvature.

5. A kite according to claim 1 wherein a means is connected between said side edges for bending said side edges rearwardly to bend said kite whereby the kite will fly in relatively strong gusts without diving or buckling.

6. A kite formed solely from a unitary sheet of preshaped semirigid resinous sheet material including a nose at one end tapering toward relatively short and substantially parallel side edges, a rearward edge extending generally transverse to the longitudinal axis of the kite, an extension projecting rearwardly on each side of the rearward edge to provide a delta wing shape, a reinforcing trough extending on the longitudinal axis from a point adjacent the nose to a point rearwardly of the center of the kite and a pair of upwardly displaced pockets, one on each side of the trough.

7. A swept wing kite comprising in combination a unitary sheet of preformed semirigid resinous sheet material including an arcuate nose portion at one end, side and rear edges, extensions projecting rearwardly on each side of the longitudinal center line from the rear edge of the kite, stiffening means comprising a trough formed in said sheet material and extending longitudinally of the kite on the center line thereof, a pair of upwardly displaced pockets one on each side of said trough and further reinforcing means comprising a plurality of ribs formed from said sheet material and displaced from a plane extending through the edges of the kite.

8. A preshaped kite formed from a semirigid sheet of a resinous material and having a relatively narrow rounded

nose portion and a relatively wider concave rear edge extending generally transverse to the longitudinal axis of the kite, a stiffening means comprising a trough formed into said sheet and extending from a point adjacent the nose to a point adjacent the center of the rearward edge of the kite on the longitudinal axis thereof, and a pair of upwardly displaced pockets, one on each side of the trough, said pocket on each side of the trough opening downwardly and having an arcuate curvature whose highest elevation is positioned at a point approximately one-third of the way toward the rearward edge of the kite, said nose tapering toward the rearward edge of the kite and said pockets each tapering downwardly to the plane of the rearward edge of the kite.

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