Jan. 3, 1933. C. W. HUGHES 1,892,985

KITE

Filed Feb. 27, 1932 2 Sheets-Sheet 1

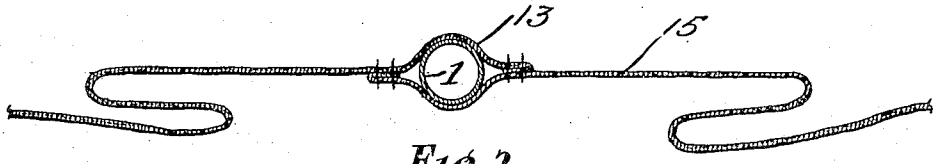


Fig. 2.

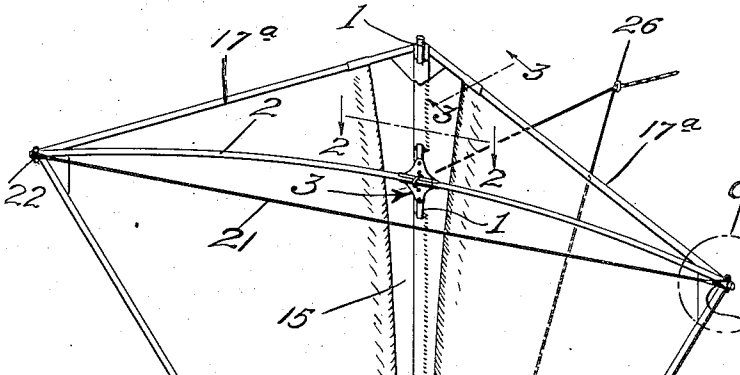


Fig. 1.

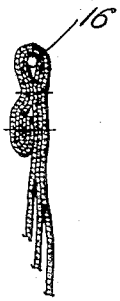


Fig. 3.

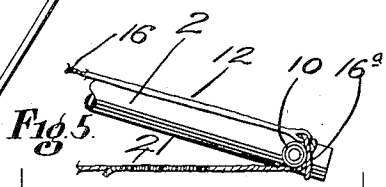


Fig. 5.

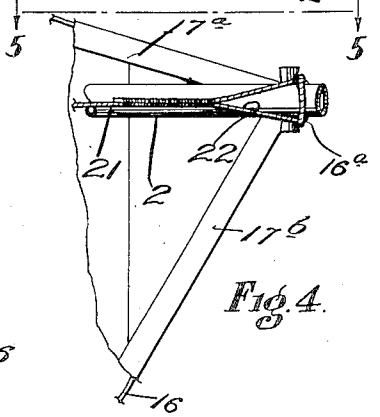


Fig. 4.

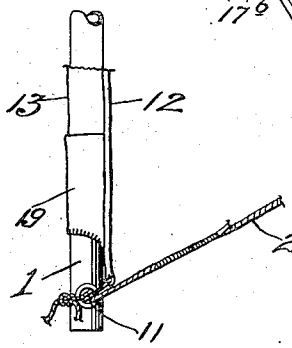


Fig. 7.

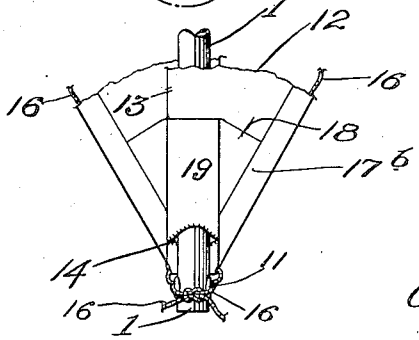


Fig. 6.

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Jan. 3, 1933. C. W. HUGHES 1,892,985

KITE

Filed Feb. 27, 1932 2 Sheets-Sheet 2

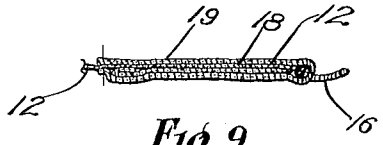


Fig. 9

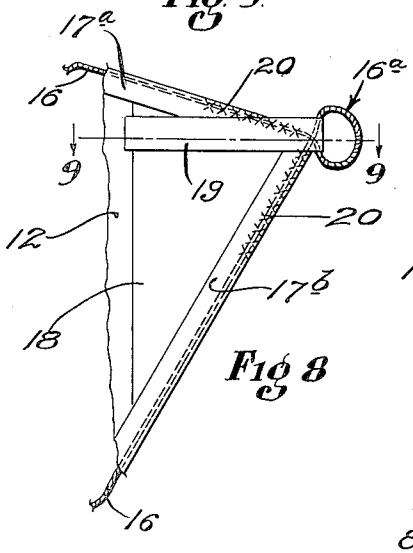


Fig. 8

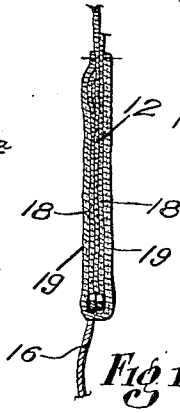


Fig. 11

Fig. 10

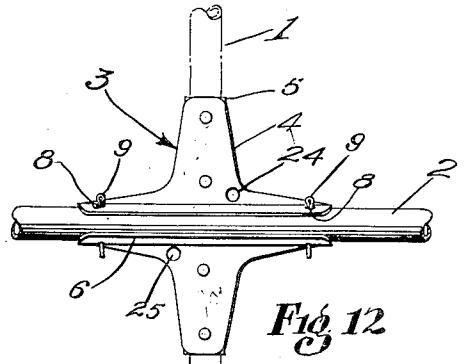


Fig. 12

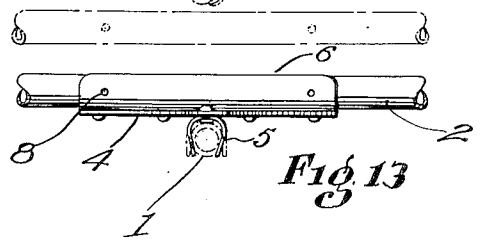


Fig. 13

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UNITED STATES PATENT OFFICE

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KITE

Application filed February 27, 1932. Serial No. 595,617.

This invention relates to kites, and the primary object of the invention is the provision of a kite which may be knocked down and packed in relatively small space for transportation and storage purposes.

Another object of the invention is to provide a kite of novel construction which embodies stability and reliability in flight and is adaptable to a wide range of wind velocities.

Another object of the invention is to provide a kite having a novel form of resilient bracket for connecting the vertical arm and cross bow forming the kite skeleton.

Another object of the invention is to provide a resilient bow for the cross arm of the kite, thus providing a suitable billow to the sail for lifting purposes.

Another object of the invention is to provide a kite having a sheet or sail novelly constructed with a box plait permitting the formation of concavities therein when under the pressure of wind.

Another object of the invention is to provide a kite having novel means for securing the sheet or sail to the skeleton framework of said kite.

Another object of the invention is to provide a kite which may be made and sold cheaply but which will nevertheless be substantially rugged and in all respects admirably adapted for its purposes.

Other features and details of construction will be disclosed hereinafter and are shown in the accompanying drawings, in which:

Figure 1 is a view in perspective of an assembled kite involving the features of the present invention;

Fig. 2 is an enlarged fragmentary view in section on line 2—2, Fig. 1;

Fig. 3 is an enlarged detached view in section on line 3—3, Fig. 1;

Fig. 4 is an enlarged detached view of the portion of the kite bounded by the circle designated as *a*;

Fig. 5 is an enlarged fragmentary view on line 5—5, Fig. 4;

Fig. 6 is an enlarged detail view of the portion of the kite bounded by the circle designated as *b*;

Fig. 7 is a side elevation view of the disclosure of Fig. 6;

Fig. 8 is a view similar to that disclosed in Fig. 4 showing the specific construction of a portion of the kite sail;

Fig. 9 is a fragmentary view in section on line 9—9, Fig. 8;

Fig. 10 is an enlarged detail view similar to the disclosure in Fig. 6, showing the detail construction of a portion of the kite sail;

Fig. 11 is a fragmentary view in section on line 11—11, Fig. 10;

Fig. 12 is a view in front elevation showing the cross arm supporting bracket; and

Fig. 13 is a plan view of the disclosure in Fig. 12.

For the various purposes of signal communication, the raising of wireless telegraph antennæ in the Naval Aviation Service and in the Signal Corps of the Army, it is very necessary to employ a kite possessing a substantial lifting power in ascent and capable of flight with substantial stability and reliability at great heights and yet extremely adaptable to a wide range of wind velocities and it is to the attainment of these results and features that the present invention is directed.

Referring now more particularly to the drawings, a kite made in accordance with the present invention consists of a vertical arm 1 and a cross or bow arm 2. In the present instance, the vertical arm and cross bow are of aluminum alloy tubing of such measurements as to afford a certain resiliency to said members and yet effect a frame structure which is substantially rugged and capable of endurance. The vertical arm 1 and bow strut 2 of the kite skeleton or frame are detachably connected, one to the other, by means of a bracket designated generally as 3 and shown in Figs. 12 and 13 respectively of the drawings. In the present instance, the bracket 3 comprises the rigid body plate 4 on opposite sides of which and disposed at right angles to each other are resilient longitudinal clamps 5 and 6 respectively, the clamps 5 and 6 being open as shown in the drawings to permit the insertion of the vertical and bow struts 1 and 2 respectively therein. The

vertical strut 1 is preferably, at all times, secured in the clamp 5 of the bracket 3 by means of cotter pins 9 passing through coinciding apertures in the clamp 5 and the strut 1, so that in the assembly of the kite, there will be fewer parts to be handled. The resilient clamp member 6 is provided with suitable apertures 8, which are suitably positioned to correspond with similar apertures formed in the cross arm 2 through which cotterpins 9 or other suitable retaining means may be inserted for the purpose of maintaining predetermined relative positions of the aforementioned cross arm.

The outer extremities of the cross arm or bow, are drilled to permit the insertion therein of a cross piece 10, the purpose for which will be set forth in detail hereinafter. The cross pieces 10 are rigidly secured in the apertures in the cross arm 2 by distorting or expanding the extremities thereof to prevent removal of said cross pieces from said apertures. In a similar manner, the extremities of the vertical strut member 1 are drilled to permit eyelets 11 to be inserted therein, the purpose for which will be set forth in detail hereinafter.

In the present instance the kite comprises a sail or sheet 12 which is provided with a suitably positioned longitudinal envelope seam 13 having suitable openings 14 therein to permit passage therethrough of the vertical arm 1, the said envelope seam 13 being eliminated for a sufficient distance intermediate the upper and lower vertices of the feet to permit the vertical arm 1 to be connected with the cross arm by means of the aforementioned bracket 3.

The sail is further provided with a box plait 15 centrally located on said sheet and vertically with respect to the kite and extends from adjacent each side of the upper central vertex thereof to a point substantially below the middle of the sail 12 where it loses itself in the body of said sail. The box plait is best illustrated in Fig. 2 of the drawings which shows the relation thereof to the sail and the vertical arm 1. The termination or finishing of the box plait at the upper periphery of the sail or sheet, to afford sufficient strength thereto and also provide for the passage of a rigging cord 16 therethrough, is best illustrated in Fig. 3 of the attached drawings. The three thicknesses of the material are folded as shown and subsequently stitched at suitable points to secure the hem and yet permit sufficient openings for the passage of the cord 16. The function of the kite when equipped with a sail, arranged as shown, is to afford a surface conformation, best fitted, as experiment shows, to give the kite its greatest lifting energy when under wind pressure of the atmosphere.

The particular and novel construction of the kite sail proper, is best disclosed in Figs. 8 to 11 inclusive, of the drawings. The periphery of the sail 12 is provided with an overlapping seam 17 comprising upper and lower sections 17*a* and 17*b* respectively, which afford a closed passage for the positioning of the sail attaching or rigging cord 16. The portions of the kite sail adjacent the areas where the said sail is attached to the vertical and cross arms 1 and 2 respectively, are reinforced by suitable patches 18 and further reinforced by a tape or strip 19, the said patch and strip members 18 and 19 being securely attached to the sail proper 12 by stitching or other desirable means.

The rigging cord 16 in the present instance comprises two sections, one end of each being secured at the upper vertex of the kite to the vertical arm 1 and extending through the seams 17*a* toward the lateral transverse extremities of the kite at which point said cords emerge from said seam and, as shown in Fig. 8 of the drawings, pass downwardly and outwardly of the sail and the reinforcing strip 19 and upward thereabout in forming a loop 16*a* and passing inwardly downward from the top of the strip 19 into the seams 17*b* to the lower apex of the kite at which point they respectively cross, the free ends thereof emerging from the seams 17*b* outwardly of the reinforcing strip 19 and at the opposite sides thereof as shown in Fig. 10 of the drawings.

In the present instance the movement of the rigging cord 16 longitudinally within the seams 17*a* and 17*b* is predeterminedly fixed in said seams by means of cross stitching as at 20, the rigging cord to the seam adjacent the points where said rigging cord emerges from said seams, both at the lateral vertices of the sail and at the lower apex thereof. In this manner, the tension of the cord 16 is maintained at a predetermined tension and the size of the loop 16*a* is fixed. Furthermore, by securing the rigging cord 16 in the above manner adjacent the lower openings of the seam 17*b* and the upper openings of the seam 17*a*, the sail is prevented from slipping on the cords, away from the vertices of the kite frame and the said kite is maintained sufficiently taut on said frame for flight purposes.

A bow cord 21 is provided having predetermined loops 22 at the extremities thereof, the said bow cord 21 being of sufficiently restricted length as to effect a substantial bowing of the cross arm 2 when the end loops 22 thereof are passed over the ends of the said cross arm 2 and are engaged by the cross pieces 10. A sailing or bridle cord 23 is attached at one end and adjacent the lower extremity of the vertical arm, and at its other end passed through the apertures 24 and 25 respectively and about the clamp 6 and cross arm 2 as shown in Fig. 1 of the drawings.

A ring 26 is provided and is adjustable on the bridle cord 23 for the purpose of affording attachment to said bridle of a flying or sailing cord.

In assembling the kite, pass the free end of the bow arm 2 through the loop formed by the bridle cord 23, passing through the spar clamp 3 at the intersection of the spars. This loop or bridle cord is preferably enclosed in varnished cambric tubing to prevent its chafing on the clamp 3. The bow arm 2 is then snapped into the clamp 6 and is secured in predetermined relation by passing the cotterpins or other means 9 through the apertures formed in the clamp and arm respectively.

A reasonable degree of care must be exercised in bending the bow spar 2, in order not to exceed the elastic limit thereof. For this reason, it is best to bend the spar 2 by deflecting it as a column; that is, to rest one end on the floor or deck and apply the load axially at the other end. The bow spar 2 is then deflected to a degree just sufficient to allow the loop in the bow string to be passed over the end of the spar.

The frame of the kite is now completely assembled and since the kite sail 12 is normally attached to the said frame as it is desirable to allow the vertical arm 1 at all times to remain in the envelope seam 13. It is merely necessary to apply tension laterally at the vertices of the sail to permit the loops 16*a* to be passed over the respective extremities of the bow spar 2. It should be noted that the cross piece members 10, adjacent the extremities of the bow spar 2, serve as abutments for the end loops 22 of the bow cord and the loops 16*a* of the rigger cord respectively, and function to maintain the desired tension in the bow cord and the sail sheet. The free ends of the two sections of the rigger cord 16 are preferably permanently tied to the lower extremity of the vertical arm 1 through the eyelet 11 as shown in Fig. 6 of the drawings. Thus to assemble the kite, it is merely necessary to clamp the bow spar 2 in the bracket 3, and attach the extremities of the bow cord and the kite sail at its lateral vertices to the extremities of the said bow spar 2.

While a preferred embodiment of the invention has been herein set forth for the purpose of description, certain other detailed changes in construction and modification of certain features may be incorporated herein without limitation other than as set forth in the appended claims.

What is claimed is:

1. In a kite structure, a vertical arm, a bracket rigidly secured thereto, said bracket including a longitudinal resilient clamp element, a bow arm detachably retained in said clamp, means for maintaining said bow arm in a predetermined relation with said clamp, cross pieces rigidly secured adjacent the extremities of the bow arm, and eyelets positioned adjacent the extremities of the vertical arm.

2. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp and having apertures arranged to coincide with the apertures in the clamp to permit passage of elements therethrough to secure said bow arm in predetermined relation with respect to the vertical arm, cross pieces rigidly secured adjacent the extremities of the bow arm, and eyelets positioned adjacent the extremities of the vertical arm.

3. In a kite structure, a vertical arm, a bracket rigidly secured thereto, said bracket including a resilient clamp element, a bow arm detachably retained in said clamp, cross pieces rigidly secured adjacent the extremities of the bow arm, a kite sail having a centrally located vertical envelope seam and a centrally located box plait, a rigging string extending about the marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices of the sail to permit attachment thereof to said cross arm.

4. In a kite structure, a vertical arm, a bracket rigidly secured thereto, said bracket including a resilient clamp element, a bow arm detachably retained in said clamp, means for maintaining said bow arm in predetermined relation to said clamp, cross pieces rigidly secured adjacent the extremities of the bow arm, eyelets positioned adjacent the extremities of the bow arm, a kite sail having a centrally located vertical envelope seam and a centrally located box plait, a rigging string extending about the marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices of the sail to permit attachment thereof to said cross arm.

5. In a kite having a frame comprising vertical and bow arms, a sail sheet having a centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets and emerging from said seam at the transverse vertices of the sail forming loops to pass over the extremities of the bow arm, a reinforcing patch on the sail adjacent the

points of attachment of said sail to the frame, a reinforcing strip overlying said patch and secured to the sail, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

6. In a kite having a frame comprising vertical and bow arms, a sail sheet having a centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices of the sail forming loops to pass over the extremities of the bow arm, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

7. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp, cross pieces rigidly secured adjacent the extremities of the bow arm, eyelets positioned adjacent the extremities of the vertical arm, a kite sail having centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices of the sail and forming loops to pass over the extremities of the bow arm, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

8. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp having apertures arranged to coincide with the apertures in the clamp to permit passage of elements therethrough to secure said bow arm in predetermined relation with respect to the vertical arm, a kite sail having centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelet and emerging from said seam at the transverse vertices of the sail and forming loops to pass over the extremities of the bow arm, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

9. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp having apertures arranged to coincide with the apertures in the clamp to permit passage of elements therethrough to secure said bow arm in predetermined relation with respect to the vertical arm, cross pieces rigidly secured adjacent the extremities of the bow arm, eyelets positioned adjacent the extremities of the vertical arm, a kite sail having centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets and emerging from said seam at the transverse vertices of the sail and forming loops to pass over the extremities of the bow arm, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

10. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp and having apertures arranged to coincide with the apertures in the clamp to permit passage of elements therethrough to secure said bow arm in predetermined relation with respect to the vertical arm, cross pieces rigidly secured adjacent the extremities of the bow arm, eyelets positioned adjacent the extremities of the vertical arm, a kite sail having a centrally located vertical envelope seam arranged to embrace the vertical arm, a rigging string comprising two sections extending from the upper vertex of the kite, about opposite marginal edges there-

of and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices thereof in the form of loops arranged to pass over the extremities of the bow arm, a reinforcing patch on the sail adjacent the points of attachment of said sail to the arms, a reinforcing strip overlying said patch and secured to the sail, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length and terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

11. In a kite structure, a vertical arm, a bracket rigidly secured thereto in predetermined longitudinal relation and including a horizontal resilient clamp element having apertures therein, a bow arm detachably retained in said clamp and having apertures arranged to coincide with the apertures in the clamp to permit passage of elements therethrough to secure said bow arm in predetermined relation with respect to the vertical arm, cross pieces rigidly secured adjacent the extremities of the bow arm, eyelets positioned adjacent the extremities of the vertical bow arm, a kite sail having a centrally located vertical envelope seam arranged to embrace the vertical arm, a vertical box plait centrally disposed with respect to the kite sail and extending from the periphery adjacent the upper vertex thereof to a point substantially below the middle of the kite at which point the said box plait merges in the body of the kite sail, a rigging string comprising two sections extending from the upper vertex of the kite, about opposite marginal edges thereof and maintained within a seam in said sail, the said string being secured to the upper and lower extremities of the vertical arm through the eyelets, and emerging from said seam at the transverse vertices thereof in the form of loops arranged to pass over the extremities of the bow arm, a reinforcing patch on the sail adjacent the points of attachment of said sail to the arms, a reinforcing strip overlying said patch and secured to the sail, means adjacent the vertices preventing movement of the rigging string with respect to the sail, and a bow cord of restricted length and terminating in loops arranged to be passed over the extremities of the bow arm to flex said arm in bow-like fashion.

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