April 23, 1963 T. C. BARBER 3,086,739

KITE CONTROL APPARATUS

Filed Oct. 3, 1961 3 Sheets-Sheet 1

Fig. 1

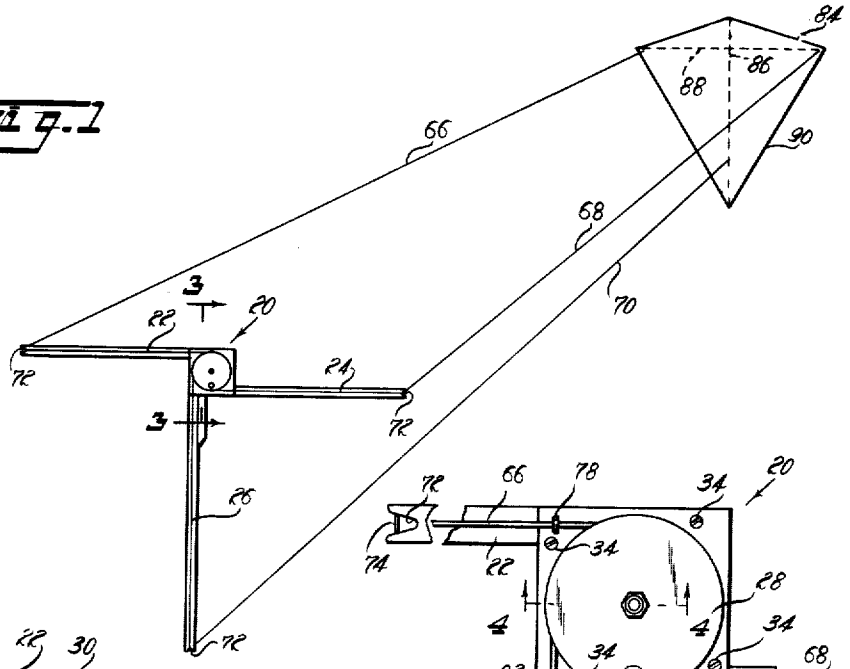


Fig. 2

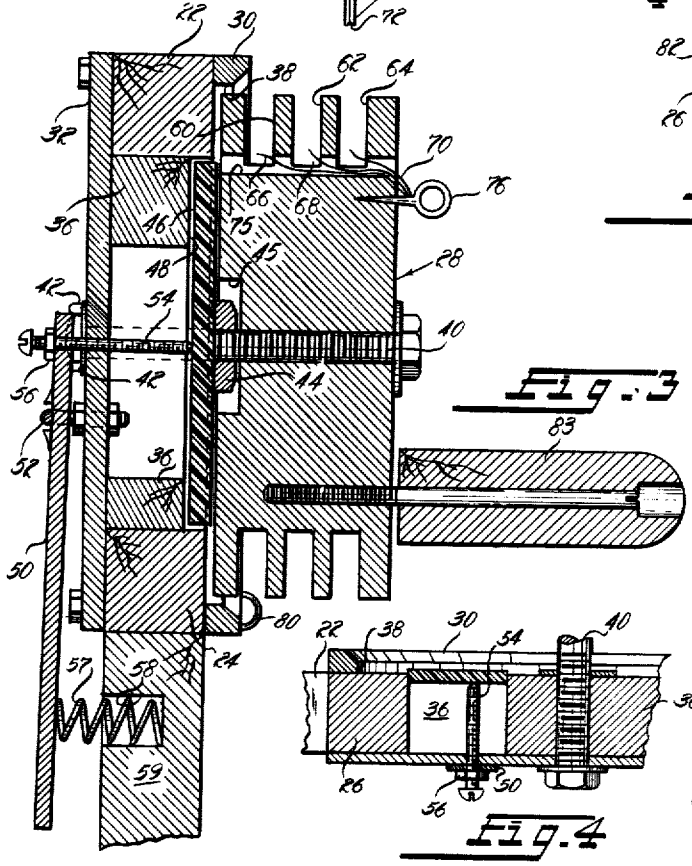


Fig. 3

Fig. 4

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April 23, 1963 T. C. BARBER 3,086,739

KITE CONTROL APPARATUS

Filed Oct. 3, 1961 3 Sheets-Sheet 2

Fig. 5

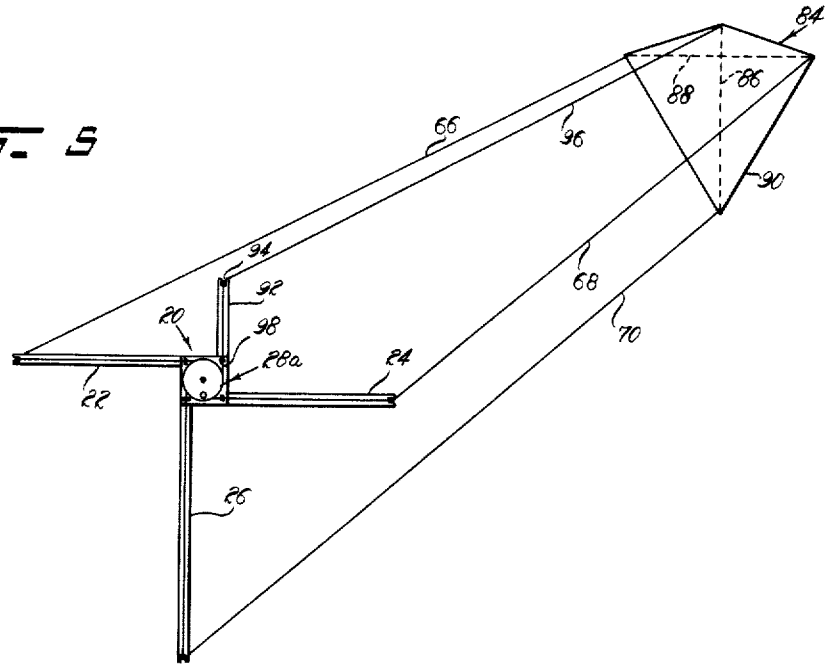
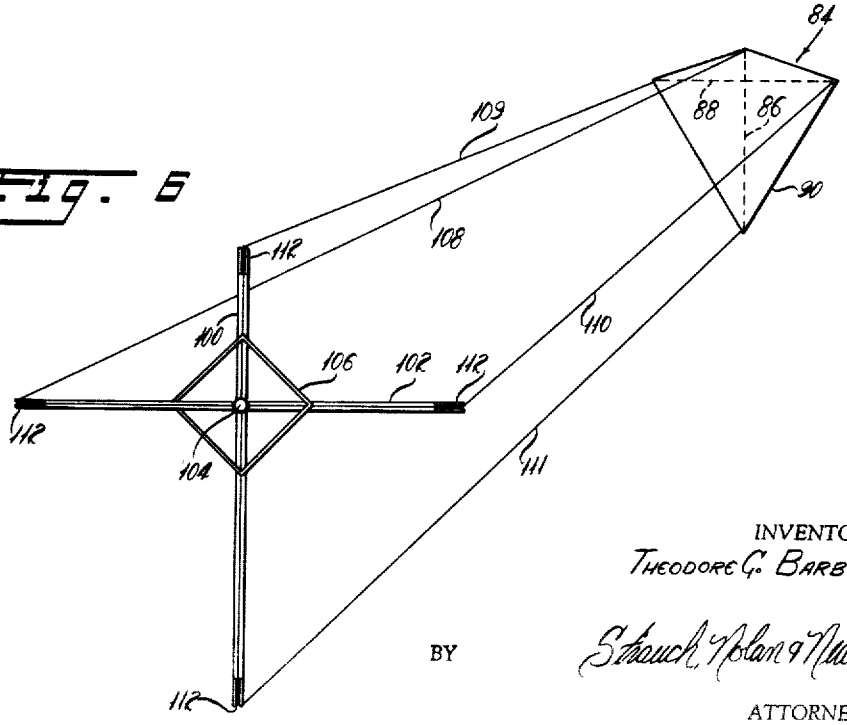


Fig. 6



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KITE CONTROL APPARATUS

Filed Oct. 3, 1961 3 Sheets-Sheet 3

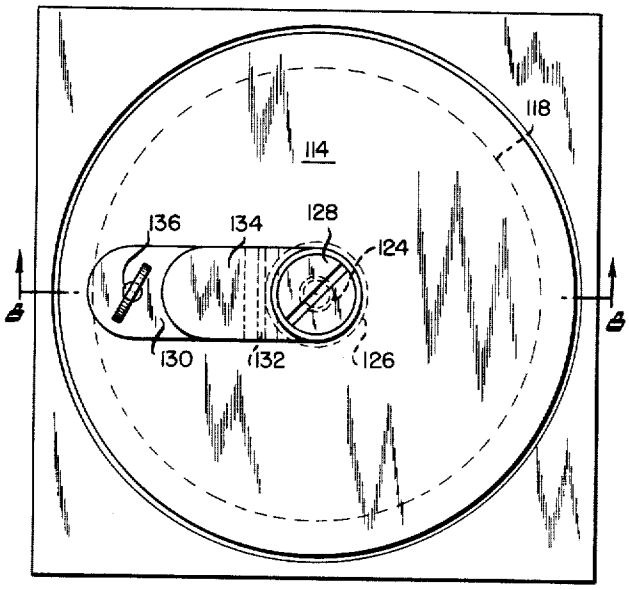


Fig. 1

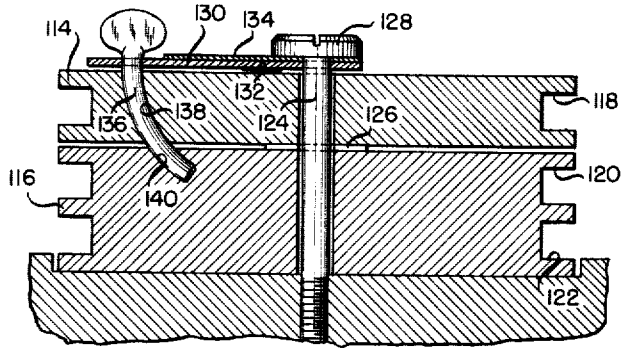
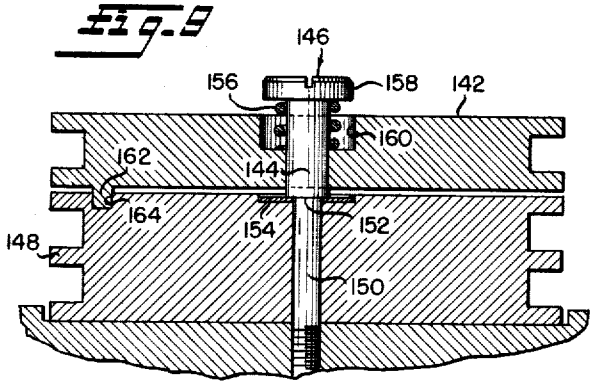


Fig. 8

Fig. 9



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3,086,739

KITE CONTROL APPARATUS

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Filed Oct. 3, 1961, Ser. No. 142,718
6 Claims. (Cl. 244—155)

This invention relates to devices for controlling the flight of kites and more particularly to improved kite control devices especially adapted for controlling the flight of bow kites to provide improved maneuverability and ease of control.

Conventionally such kites are flown and controlled by a single control line so attached to the kite as to render the kite stable in a single flight attitude. Accordingly, control of the kite is limited with control devices of this nature.

In order to provide increased maneuverability, control devices have been proposed which include more than one control line leading from the control device to the kite. However, such devices provide at best only a limited increase in the maneuverability of the kite and are generally cumbersome and complex. Further, so far as can be determined all such devices have been constructed primarily for military use where the cost of the unit is of secondary importance and none have provided sufficient improvement over the use of the conventional single control line to warrant their purchase by the general public.

The improved kite control devices of the present invention comprise a generally T-shaped or cross-shaped frame assembly formed by a horizontal control spar and a vertical control spar. Control lines pass over the ends of the spars and are attached to the vertical and horizontal frame members of the kite in such a manner that tilting or swinging movement of the control assembly produces corresponding movements of the kite so that the kite may be flown in a substantially unlimited series of maneuvers. The preferred form of the invention includes a reel assembly for simultaneously increasing or decreasing the effective length of all of the control lines and for permitting independent control of the effective length of one of the lines.

It is, accordingly, the principal purpose and object of the present invention to provide improved kite control devices which afford increased control over the flight of a kite to enable the operator to maneuver the kite in a manner and to an extent not possible heretofore.

It is a further object to provide improved kite control devices which are of relatively simple construction and which can be manufactured and sold at relatively low cost.

It is also an object of the invention to provide improved kite control devices which facilitate launching and bringing the kite down as well as controlling its action while in flight.

Additional objects and advantages will become apparent as the description proceeds in connection with the accompanying drawings in which:

FIGURE 1 is a front elevation of a preferred form of the kite control device showing the device in use;

FIGURE 2 is an enlarged front elevation of a portion of the control device of FIGURE 1 showing details of construction;

FIGURE 3 is an enlarged fragmentary section taken substantially along line 3—3 of FIGURE 1 showing details of construction;

FIGURE 4 is a further fragmentary section taken along line 4—4 of FIGURE 2 with parts removed for clarity;

FIGURE 5 is a view similar to FIGURE 1 illustrating a modified form of the invention;

FIGURE 6 is a view similar to FIGURE 1 showing a further modification of the control device;

FIGURE 7 is a top plan view of a modified control reel assembly;

FIGURE 8 is a transverse section taken along line 8—8 of FIGURE 7; and

FIGURE 9 is a central section of another form of reel assembly.

Referring now more particularly to the drawings and especially to FIGURE 1, the principal components of the form of the invention thereshown are a central frame assembly 20, lateral control spars 22 and 24, a vertical control mast or spar 26, and a control line reel indicated generally at 28. The frame assembly 20 includes front and rear cover plates 30 and 32, respectively, the marginal edges of which are secured by suitable means such as bolts 34 to the inner ends of the three spars 22, 24 and 26. To impart additional rigidity to the structure a mounting block 36 is secured in place in the space bounded by the inner portions of spars 22, 24 and 26. While the dimensions and materials of the structure thus far described are not critical and may be varied within reasonable limits, the spars 22, 24 and 26 are preferably three-quarter inch square wood strips and the front and rear cover plates 30 and 32 are of Masonite or similar material, the former being one-quarter inch thick and the latter being one-eighth inch thick. The frame structure 20 is approximately a four and a half inch square. The front cover plate 30 is provided with a central circular opening 38 to accommodate the reel 28 which is mounted for free rotation on a bolt 40 extending through block 36 and non-rotatably secured in place by nuts 42 and 44. The rear surface of reel 28 is recessed as at 45 to accommodate the nut 44.

A rectangular brake shoe 46 preferably fabricated from one-quarter inch tempered Masonite is received in a recess 48 in the front face of the block 36. A brake lever 50 is pivotally mounted on the outer surface of the rear cover plate 32 by a U-bolt assembly 52. A bolt 54 which is adjustably locked in place on brake lever 50 by a lock nut 56 extends through the cover plate 32 into contact with the brake shoe 46. A brake spring 57, compressed between the lever 50 and the bottom of a recess 58 formed in the rear surface of a grip member 59 secured to the main vertical spar 26, biases the brake lever 50 about the pivot formed by the U-bolt 52 to resiliently urge the bolt 54 into contact with the rear surface of the brake shoe 46. Thus the brake assembly normally urges the brake shoe 46 into frictional contact with the rear surface of the reel to prevent free rotation of the latter on the bolt 40. The brake may be released to permit rotation of the reel 28 by squeezing the lower end of the brake lever 50 against the spar 26 and grip 59.

The outer periphery of the reel 28 is provided with three grooves 60, 62 and 64 which receive the respective control lines 66, 68 and 70 which lead respectively to the outer ends of the horizontal spars 22 and 24 and to the lower end of the vertical spar 26. It will be noted that the cover plate 30 forms a guard to prevent tangling of the control lines between the rear surface of reel 28 and the brake shoe 46 or the block 36. The outer ends of each of the spars 22, 24 and 26 are provided with grooves 72 through which the control lines pass. Brads 74 are passed through the outer ends of each of the spars to enclose the grooves and retain the control lines within the grooves. The control lines pass through a hole 75 which intersects the bottom of the grooves and at their inner ends are secured to screw eye 76 secured to the front surface of the reel 28. The control line 66 is guided into the lowermost groove 60 by a staple 78 mounted in the horizontal spar 22 adjacent the frame 20. Eyelets 80 and 82 are secured by suitable means to the respective spars 24 and 26 and the frame 20 at the proper

height to guide the respective control lines **68** and **70** into the grooves **62** and **64**. The assembly is completed by a handle **83** suitable mounted on the forward surface of the reel **28**.

As suggested above the control units of the present invention are particularly adapted for controlling the flight of a standard bow kite of the type shown generally at **84**. Kites of this type comprise a vertical mast **86** and a horizontal spar **88** which form a framework covered by cloth, paper or plastic indicated at **90**. In a typical case both the vertical and horizontal frame members of the kite are thirty-six inches long and the horizontal spar **88** intersects the vertical mast **86** to a point approximately six inches below the top of the kite.

In use the control lines **66** and **68** are preferably secured to the kite **84** at the opposite ends of the horizontal spar **88**. The control line **70** leading from the bottom of the vertical control spar **26** is attached to a vertical kite spar **86** preferably at a point spaced above the lower end of the spar.

Experience has shown that in a control unit for use with a kite of this size and construction the outer ends of the horizontal spars **22** and **24** are preferably approximately eighteen inches from the center of the reel **28**. The lower end of the vertical control mast **26** is preferably approximately twenty-six inches from the center of the reel. Thus the dimensions of the control assembly preferably correspond closely to the dimensions of the standard kite mentioned above and the center of the reel **28** corresponds to the intersection of the kite members **86** and **88**.

The length of the spars **22** and **24** and their angular relation is such that the points at their outer ends through which the respective control lines **66** and **68** pass are located in a plane containing the axis of the reel **28**. Furtheir the length and angular position of the mast **26** are such that a plane containing the outer end of the mast and the reel axis is normal to a plane containing the reel axis and the outer ends of spars **22** and **24**.

This construction provides in the control device the symmetry of the kite.

The lower kite control line **70** is preferably attached to the kite approximately nine inches from the bottom of the vertical kite mast **86**. The exact point of attachment of the control line **70** to the kite may be varied in practice depending upon the desired performance of the kite. When the kite and control device are constructed in accordance with the dimensions given above, the movement of the kite about the spar **88** which forms the horizontal pivot and about the mast **86** which forms a vertical pivot correspond to similar movements of the control assembly about the horizontal spars **22** and **24** or the vertical spar **26**.

The kite may be launched easily by one person in a manner similar to that used for launching kites employing the conventional single control line. Preferably the control device is grasped near the frame structure **20** so that the hand encircles the brake lever **50**. By squeezing slightly on the brake lever the rate at which the control lines unwind from the reel may be regulated as desired. When the kite has been launched and has reached an appropriate altitude it may be flown in a substantially unlimited variety of maneuvers by turning the control device about the axis of the vertical control spar **26** or tilting the control device about the axis of the lateral control spars **22** and **24** or by a combination of these motions. For example, the kite may be moved up or down, to the left, to the right, or it may be looped or flown inverted as desired. The kite may be brought down simply by reeling in the control lines **66**, **68** and **70**.

When the kite is reeled in, the side control lines **66** and **68** always are under substantially equal tension and accordingly wind evenly on the reel grooves **60** and **62**. However, depending upon the velocity of the wind and

the manner in which the operator is maneuvering the kite at the moment, the bottom line **70** may wind on the reel more loosely than the other two strings. When this occurs the diameter increases faster in the groove **64** causing the bottom control line **70** to wind in faster than the two side control lines **66** and **68**. It has been found in practice that this tendency is substantially eliminated by attaching the bottom control line **70** at the point described above. If, when the control lines are being unreeled or reeled in, the bottom control line becomes relatively too short or too long, this condition may be corrected easily by tilting the entire control device. If insufficient compensation is obtained in this manner a length of string may be wound on or unwound from the reel as desired. It is for this reason that the bottom control line **70** is received in the outermost of the grooves, since the remaining control lines cannot be wound into or out of the inner grooves while the kite is in flight.

The control device shown in FIGURE 5 is of the same general construction as that shown in FIGURES 1 and 2 except that it includes a fourth control spar **92** suitably secured to the frame assembly **20**. The outer end of the control spar **92** is provided with a groove and brad construction **94** through which a fourth control line **96** is guided which is preferably attached to the top of the kite as shown in FIGURE 5. The control line passes through a locating eyelet **98** which guides the line into a fourth groove in the modified reel **28***a* which is preferably located inwardly of the groove in which the control line **70** is carried to permit the winding and unwinding of the control line **70** during flight of the kite as described above.

If the control assembly of FIGURE 5 is to be used with the standard thirty-six inch kite described above the upper vertical control arm **92** will project above the axis of the reel **28***a* a distance of approximately ten inches. In any case the upper end of the spar **92** will be disposed in the above-described plane containing the axis of reel **28** and the lower end of mast **26**.

The control assembly of FIGURES 1 through 4 is preferred to the control assembly of FIGURE 5 because of its relative simplicity and because actual experience has shown that it provides as good or better control than the assembly of FIGURE 5.

FIGURE 6 discloses a further modified and simplified form of kite control device. This form of the invention comprises a vertical mast **100** and a horizontal spar **102** bolted together as at **104**. The assembly is braced by a wire **106** which is attached to the vertical and horizontal members **100** and **102** by suitable screw eyes or eyelets. In addition to imparting rigidity to the assembly the wire **106** also provides a convenient frame on which the four control lines **108**, **109**, **110** and **111** may be wound when the assembly is not in use. The four lines **108–111** preferably pass through groove and brad constructions **112** provided on the outer ends of the vertical and horizontal members **100** and **102** in a manner similar to that described above. The control lines **109** and **111** are preferably attached to the opposite ends of the vertical kite mast **86** and the control lines **108** and **110** are attached to the ends of the horizontal spar **88**. The dimensions of the horizontal and vertical control members are preferably the same as the corresponding members in the kite and the point of attachment of the member **102** to the member **100** is preferably at somewhat below the point at which the kite spar **88** crosses the kite mast **86**. Accordingly, any movement of the control assembly will produce corresponding movements of the kite to permit complete control of the kite and maneuvering of the kite as desired. The simplicity of this form of the invention recommends it for certain uses. However, with this form of control device the kite can be launched only after the control lines are laid out on the ground in full length. Accordingly, it is difficult for one person to launch the kite and bring it in.

As stated above, depending upon the velocity of the wind and the manner in which the kite is maneuvered the bottom control line **70** does not always leave or return to the reel structure at the same rate of speed as the side control lines **66** and **68**. In the form of the invention shown in FIGURES 7, 8 and 9 provision is made for moving the portion of the reel structure with which the bottom control line **70** is associated either independently of the remainder of the reel structure or with the remainder of the reel structure.

In this form of the invention the reel structure is divided into two separate rotatable components **114** and **116**, the former having a groove **118** for the reception of the bottom control line **70** and the latter **116** having grooves **120** and **122** for the reception of the side control lines **66** and **68**. The reel components **114** and **116** are rotatably supported on a stud **124** which is carried by a frame assembly in the same manner as the stud **40** in the embodiment of FIGURES 1 through 4. Preferably a washer **126** or other antifriction device is interposed between the reel components **114** and **116**.

Interposed between the head **128** of the stud **124** and the outer surface of the reel component **114** are a plate **130** which is hinged as at **132** and a leaf spring **134**. A retaining pin **136** is rigidly secured to the outer end of the hinged plate **130** and is adapted to extend through an opening **138** in the outer reel component **114** into an opening **140** in the inner reel component **116**. It will be noted that both the pin **136** and the openings **138** and **140** are curved about the axis of the hinge **132** to permit the pin to be lifted free of the opening **140** about this axis.

When the pin is raised out of the opening **140** the outer reel component **114** may be rotated freely in either direction to wind or unwind the lower control line **70** as required. The inner end of the pin will travel along the outer surface of the inner reel component **116** until the parts come into alignment at which time the pin will automatically drop back into the opening **140** thus locking the inner and outer reel components together for operation in the same manner as the embodiments of FIGURES 1 through 4.

An alternate form of two-part reel assembly is illustrated in FIGURE 9 to which detailed reference will now be made. In this form of the invention the outer reel component **142**, which carries the lower control line **70**, is rotatably mounted on a relatively enlarged portion **144** of a stud **146** which is associated with a support and brake structure in the same manner as the embodiment of FIGURES 1 through 4. The inner reel component **148**, which carries the side control lines **66** and **68**, is mounted on a relatively reduced portion **150** of the stud, a shoulder **152** on the stud bearing against a washer **154** to retain the inner reel component **148** in position without interfering with its free rotation. The inner surface of the outer reel component **142** is urged against the outer surface of the inner reel component **148** by a spring **156** compressed between the head **158** of the stud **146** and the bottom of a recess **160** in the outer reel component. The spring **156** normally holds a projection **162** on the outer reel component **142** in a recess **164** in the inner reel component thus locking the outer reel component against rotation with respect to the inner reel component.

The outer component may be released for independent rotation by lifting it away from the inner component. After the projection **162** is disengaged from the recess **164** the outer component may be rotated independently as required until the projection is again in alignment with the recess at which time the parts will automatically become locked together again.

Alternately, the two reel components may be selectively locked and unlocked by mounting the operating handle **83** for axial sliding movement in the outer reel component into and out of a recess in the inner reel component. A spring may be provided to retain the handle in a locking position.

From the foregoing it will be apparent that the above stated objects of the invention have been attained by the provision of improved devices for controlling the flight of kites which permit control of the kite to a degree not previously obtainable and which are simple, durable, lightweight and sufficiently inexpensive to permit purchase by a wide class of users.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. Apparatus for controlling the flight of a kite having a vertical mast and a horizontal spar comprising, a frame assembly, at least four control arms, means mounting one end of each of said control arms on said frame assembly, the axes of two of said arms being substantially horizontal when the apparatus is in use, and the axes of the third and fourth arms being substantially normal to the axis of said two arms and being substantially vertical when the apparatus is in use, the opposite ends of said two arms being spaced apart a distance substantially equal to the length of said horizontal spar, guide means mounted adjacent the outer ends of each of said arms, a control line extending along each control arm through said guide means for attachment to said kite, a reel mounted on said frame assembly for rotation about an axis substantially normal to the axes of each of said control arms and having peripheral grooves for receiving said control lines, the control line leading from said fourth control arm being received in the outermost groove of said reel, the control lines leading from said two control arms being attached to said horizontal spar and the control lines leading from said third and fourth arms being attached to the vertical mast of said kite.

2. Kite and control apparatus comprising a kite having a vertical mast and a horizontal spar, a frame assembly, three control arms, means mounting one end of each of said control arms on said frame assembly, the axes of two of said arms being substantially horizontal when the apparatus is in the use and the axis of the third control arm being substantially vertical when the apparatus is in use, the opposite ends of said two arms being spaced apart a distance substantially equal to the length of said horizontal kite spar, a reel mounted on said frame assembly for rotation about an axis normal to the axes of said control arms and carrying a separate control line for each of said arms, guide means mounted adjacent the outer ends of each of said control arms, said control lines passing over the guide means at the outer ends of said control arms, the control lines leading from said two control arms being attached to said horizontal kite spar and the control line leading from said third control arm being attached to the vertical mast of said kite.

3. Kite and control apparatus comprising a kite having a vertical mast and a horizontal spar, a frame assembly, four control arms, means mounting one end of said control arms on said frame assembly, the axes of the first and second control arms being substantially horizontal when the apparatus is in use and the axes of the third and fourth control arms being substantially vertical when the apparatus is in use, the opposite ends of said first and second control arms being spaced apart a distance substantially equal to the length of said horizontal spar, a reel mounted on said frame assembly for rotation about an axis substantially normal to the axis of each of said control arms, guide means at the outer ends of each of said control arms

and first, second, third and fourth control lines carried in separate grooves on said reel and adapted, respectively, to pass along the first, second, third and fourth control arms and through said guide means, said first and second control lines being attached to said kite adjacent the opposite ends of said horizontal spar and the third and fourth control lines being attached to said kite adjacent the opposite ends of said vertical mast.

4. Kite control apparatus for a kite having a vertical mast and a horizontal spar, comprising a frame assembly, three control arms, means mounting one end of each of said control arms on said frame assembly, the axes of two of said arms being substantially horizontal and the axis of the third control arm being substantially vertical when the apparatus is in use, the opposite ends of said two arms being spaced apart a distance substantially equal to the length of said horizontal kite spar, a reel assembly mounted on said frame assembly for rotation about an axis normal to the axes of said control arms, said reel assembly having two independently rotatable components, one of said components carrying control lines passing over guide means on the outer ends of said two control arms for attachment to said horizontal kite spar and the other reel component carrying a control line passing over guide means at the outer end of said third control arm for attachment to the vertical mast of said kite, and means for selectively locking and unlocking said two reel components to permit simultaneous adjustment of the length of all of said control lines or the independent adjustment of the length of the control line leading to the vertical mast of said kite.

5. Apparatus for controlling the flight of a kite having a vertical mast and a horizontal spar comprising a frame

assembly, at least three control arms, means mounting one end of each of said control arms on said frame asparallel and the axis of the third arm being substantially parallel and the axes of the third arm being substantially normal to the axes of said two arms and being substantially vertical when the apparatus is in use, guide means mounted adjacent the outer ends of each of said arms, a control line extending along each control arm through said guide means for attachment to said kite, a first reel assembly mounted on said frame assembly for rotation about an axis substantially normal to the axes of each of said control arms and having peripheral surface formations for receiving the control lines extending along said two control arms and a second reel assembly mounted for rotation coaxially of said first reel assembly and having a peripheral surface formation for receiving the control line extending along said third control arm, and means for selectively locking and unlocking said first and second reel assemblies to permit simultaneous adjustment of the length of each of said control lines or the independent adjustment of the control line leading along said third control arm.

6. The apparatus according to claim 5 together with brake means for selectively locking each of said reel assemblies against rotation with respect to said frame.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,086,739 April 23, 1962

Theodore C. Barber

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 3, for "suitable" read -- suitably --; column 8, line 3, strike out "parallel and the axis of the third arm being substantially" and insert instead -- sembly, the axes of two of said arms being substantially --.

Signed and sealed this 3rd day of December 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWIN L. REYNOLDS
Acting Commissioner of Patents