July 2, 1946. K. H. WILCOXON ET AL 2,403,036

WATER KITE

Filed June 1, 1944

Fig. 1.

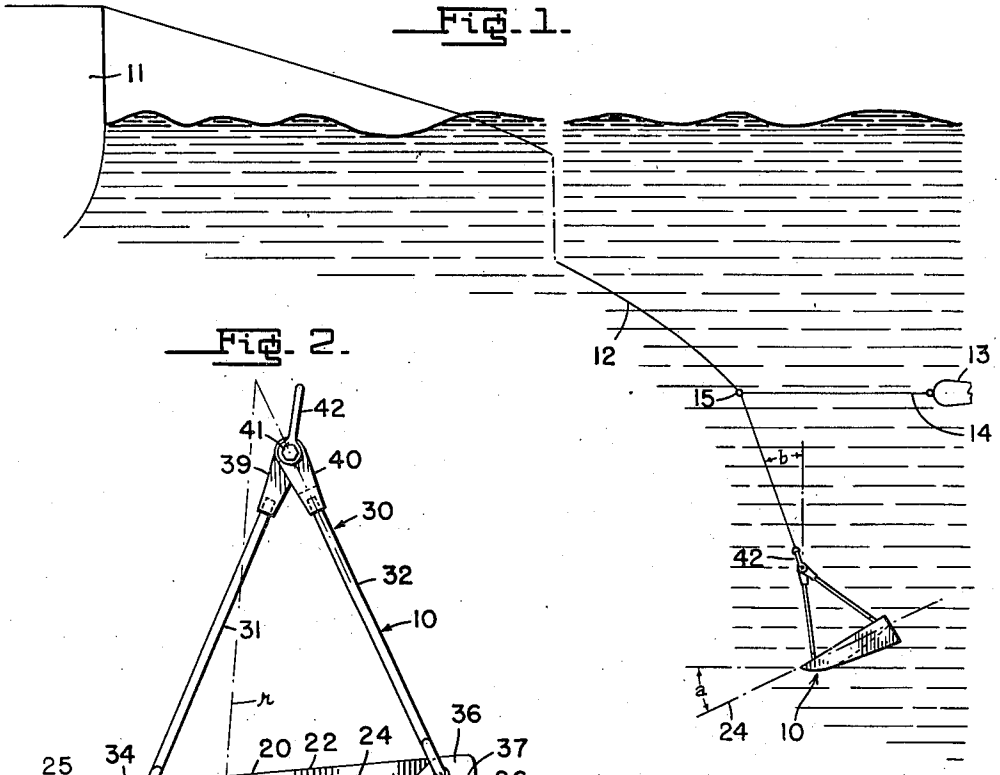


Fig. 2.

Fig. 5.

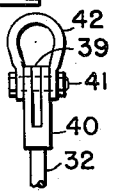


Fig. 6.

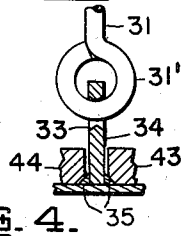


Fig. 3.

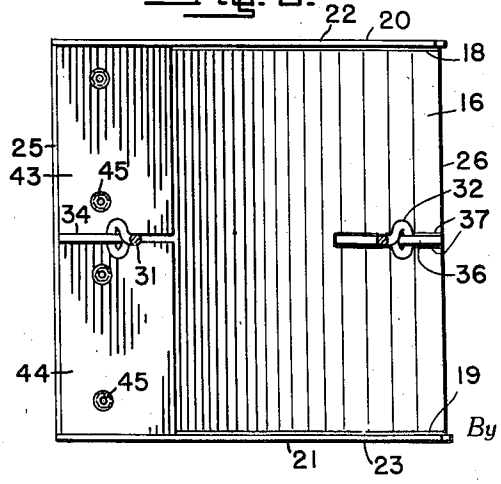
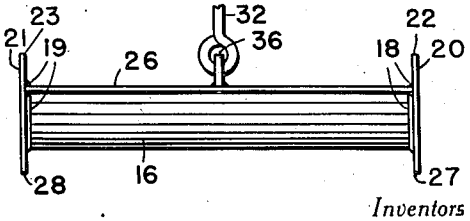


Fig. 4.



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WATER KITE

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7 Claims. (Cl. 114—235)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention relates to improvements in water kites, and more particularly to a water kite particularly well adapted for use as a depressor for underwater towed objects.

An important object of the invention is to provide a water kite capable of developing in the tow line, upon shearing travel of the kite through the water, a tension which is extremely high considering the low weight and small size of the kite.

Another object of the invention is the provision of a hydrodynamic depressor or kite which is stable at all towing speeds up to twenty-five knots when the area of the shear plate is one square foot.

A further object is to provide a kite of the character described which may be economically produced from metal plates or sheets.

The invention also aims to provide a depressor with weights disposed forwardly of its center of pressure and which will tend to stabilize the depressor and make it tow directly or almost directly below and behind the ship.

Other objects and advantages of the invention will become apparent during the course of the following detailed description, taken in connection with the accompanying drawing, forming a part of this specification, and, in which drawing,

Figure 1 is a diagrammatic view in side elevation and illustrating the use of the kite as a depressor for a towed object.

Figure 2 is a view of the improved kite partly in side elevation and partly in central vertical section.

Figure 3 is a top plan view of the kite, with portions of the bridle broken away and shown in section.

Figure 4 is an elevational view of the trailing end of the kite.

Figure 5 is a fragmentary detail view of the bridle-towline connection.

Figure 6 is a fragmentary sectional detail view showing means connecting the bridle to the kite.

In the drawing, which shows only a preferred embodiment of the invention, and wherein similar reference characters denote corresponding parts throughout the several views, the numeral 10 generally designates the improved kite, 11 a ship towing the kite, 12 the tow line between the stern of the ship and the kite, and 13 the underwater towed object which preferably is attached to the tow line 12, as by a line 14, at a point 15 spaced from the kite.

The kite 10 includes a rectangular sheet metal shear plate 16, which is rolled or otherwise lon-

2

gitudinally curved into the shape shown in Figure 2, the forward or leading marginal portion 17 being elliptical and decreasing in curvature toward the lowermost section of the shear plate, and the cylindrical after portion having the same radius r of curvature as the lowermost section.

Rigidly affixed to the opposite side edges of the shear plate 16, as by welding 18, 19, are stabilizing side plates 20, 21. These side plates 20, 21 project from the concave side of the shear plate and terminate in edges 22, 23 beyond the chord 24 defined by the leading and trailing edges 25, 26 of the shear plate. At the convex side of the shear plate, the side plates terminate in edges 27, 28 aligning with the convexly curved surface of the shear plate at its forward end portion 17, and diverging from the convex surface of the shear plate aft of the forward end portion 17.

In order to attach the tow line 12 to the kite, we have provided an improved bridle 30 having rigid forward and aft links 31, 32 which permit limited movement of the kite about a longitudinal axis preferably in the vicinity of the chord 24 of the shear plate. As shown more particularly in Figure 6, the forward link 31 is provided at its lower end with a loop 31' extending through a suitably beveled opening 33 in an upstanding central longitudinal fin 34 fixed to the concave side of the shear plate 16 at its forward marginal end portion 17, as by welding 35. The after link 32 is likewise connected to an upstanding fin 36 which is rigidly affixed to the after portion of the shear plate 16 in spaced longitudinal alignment with the fin 34, as by welding 37. The fin 36 may be provided with a forwardly and downwardly inclined edge 38 which will tend to prevent the accumulation of seaweed or the like on the fin 36.

Fixed to the upper ends of the links 31, 32 as by welding, are tongue and clevis fittings 39, 40 provided with a clevis bolt 41 on which is pivotally secured a bight member 42 to which the towline 12 is connected.

In order to have the center of gravity forward of the center of pressure, weights 43, 44 may be secured, as by bolts 45, to the concave side of the shear plate at its forward marginal portion between the side plates 20, 21 and the fin 34. These weights 43, 44 preferably are of segmental shape in cross section so as to provide convexly curved sides 46 fitting the concave surface of the shear plate, and plane upper surfaces 47.

During towing, the kite 10 will, because of the angular relation of the shear plate to the direc-

tion of travel of the kite, develop a relatively high tension in the tow line, thereby depressing the towed object 13 to a great depth, if desired, and with the tow line 12, adjacent its point of connection to the kite, disposed at a relatively small angle *b*, approximately 20° from the vertical. The angle *a* of attack defined by the chord 24 and the direction of travel of the kite will be about 24°.

The weights 43, 44 forward of the center of pressure will tend to make the kite tow stably in the vertical plane directly behind the ship. The stability of the kite in the vertical plane is also enhanced by its low aspect ratio of 1.0 and by the fact that the axis of roll of the kite, through the feet of the bridle legs, is in the vicinity of the chord 24. The two-legged bridle also provides pitching stability. The vertical side plates 20, 21 furnish directional stability and tend to increase the lift-drag ratio by increasing the effective wing span without producing the instability of a wing of high aspect ratio.

Various changes may be made in the form of invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

We claim:

1. In a water kite, a longitudinally curved rectangular shear plate, stabilizing plates fixed to the sides of the shear plate, means for attaching a tow line to the kite, and a weight fixed within the concave side of the shear plate along its forward marginal edge portion.

2. In a water kite, a longitudinally curved rectangular shear plate, parallel stabilizing plates fixed to the sides of the shear plate, said stabilizing plates terminating at the concave side of the shear plate in edges extending at least to the plane defined by the forward and trailing edges of the shear plate, and terminating at the convex side of the shear plate in edges aligning with the shear plate at its forward marginal portion and diverging rearwardly from the shear plate aft of the forward marginal portion, and means for attaching a tow line to the kite.

3. In a water kite, a longitudinally curved rectangular shear plate, stabilizing plates fixed to the sides of the shear plate, and means for attaching a tow line to the kite comprising a bridle having links connected to the shear plate at two spaced points along the longitudinal center line of the shear plate.

4. A water kite comprising a longitudinally curved shear plate, stabilizing plates fixed to the sides of the shear plate, and means for attaching a tow line to the kite, comprising longitudinally aligned forward and aft fins fastened to the concave side of the shear plate and a bridle having forward and aft links hingedly connected to said forward and aft fins, respectively, at portions thereof in the vicinity of the plane defined by the forward and trailing edges of the shear plate, so as to permit limited swinging movement of the kite about a longitudinal axis.

5. A water kite as specified in claim 4, with weights fixed to the concave side of the shear plate at its forward marginal portion in the zones between the forward fin and the stabilizing plates, said weights having convexly curved sides fitting the concave side of the shear plate.

6. A water kite including a longitudinally curved rectangular shear plate comprising a leading marginal portion having an elliptical curvature which decreases from the leading edge of the shear plate, and a cylindrical after portion extending rearwardly from said leading marginal portion, said cylindrical after portion having substantially the same radius of curvature as said leading marginal portion at its juncture with said after portion, stabilizing plates fixed to the sides of the shear plate, and means for attaching a tow line at the concave side of the kite.

7. A water kite as defined in claim 6, said shear plate having an aspect ratio of approximately 1.0.

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