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MINE MOORING CUTTER-TOGGLE TYPE

Filed July 24, 1941

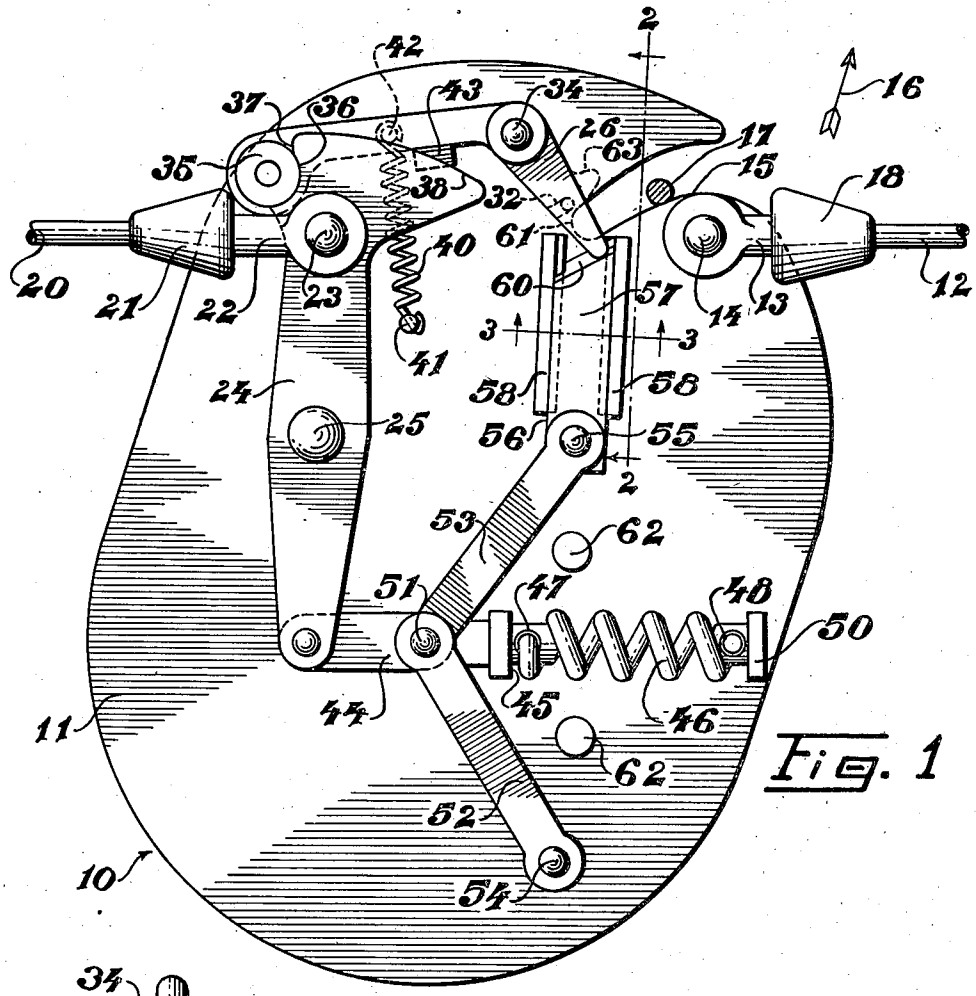


Fig. 1

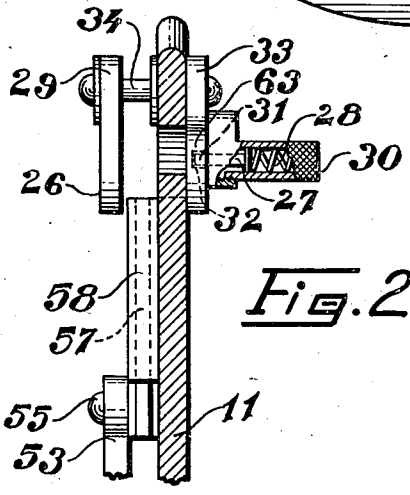


Fig. 2

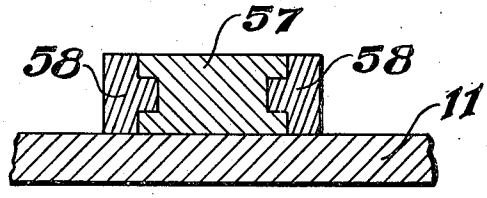


Fig. 3

INVENTOR
Mark Kurtz

BY

ATTORNEY

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MINE MOORING CUTTER—TOGGLE TYPE

Mark Kurtz, Washington, D. C.

Application July 24, 1941, Serial No. 403,794

9 Claims. (Cl. 114—221)

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

This invention relates to a mine mooring cutter, and has for an object to provide an improved device for mechanically cutting moorings, cables or anchor chains of submarine mines.

A further object of this invention is to provide a mine mooring cutter which utilizes the tension in the sweep cable to cause the cutting operation.

Still a further object of this invention is to provide a mine mooring cutter which may automatically reset itself so as to make it capable of cutting a plurality of successive mine moorings without the necessity of removing the cutter from the water for manual manipulation.

A further object of this invention is to provide a repeater mine mooring cutter utilizing the tension of the sweep cable for performing the cutting operation and then re-setting itself for the next cutting operation by the mere act of temporarily easing the tension on the sweep cable.

A further object of this invention is to provide a repeater self re-cocking mine mooring cutter.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts hereinafter described and illustrated in the drawing, in which:

Fig. 1 is an elevational view of the repeater mine mooring cutter of this invention; and

Figs. 2 and 3 are sectional views on lines 2—2 and 3—3 of Fig. 1.

There is shown at 10 the repeater mine mooring cutter of this invention, which includes a main body 11 in the form of a large oval shaped fin. A sweep cable is provided which usually extends in a catenary between two mine sweeping vessels or one vessel and an otter for drawing the cutter through the water with the fin keeping the device in horizontal position as it passes through the water. One portion 12 of the sweep cable is secured by means of a link 13 to a pivot 14 adjacent the open mouth 15, so that as the cutter is drawn in the direction of the arrow 16 a mine mooring 17 contacting the portion 12 of the sweep cable will travel therealong over the swivel joint 18 and into the mouth 15. The other portion 20 of the sweep cable, connected either to another vessel or to an otter, is provided with a similar joint 21 and link 22 which is pivotally secured as at 23 to a lever 24, which lever 24 is itself pivoted as at 25 to the body or fin 11.

As the mine mooring 17 enters into the mouth 15 and descends into the depth thereof it strikes a bifurcated trigger 26 held in cocked position by means of a shear pin 27. This shear pin 27 is yieldably fed thereagainst by means of a spring 28 within a knurled barrel 30. One end 31 extends into a depressed notch 32 in the leg 33 keyed on a journal 34 to which the other leg 29 of trigger 26 is likewise keyed, this journal 34 being pivoted through the body or fin 11. The trigger 26 is bell crank shaped, as shown, and is provided at its other end with a roller 35 which fits into a recessed notch 36 on the back of the upper end of the lever 24. Leading to this recessed notch 36 on the lever 24 is a curvature 37 whose radius has its center at the center of the pivoted journal 34. The upper end of the lever 24 is provided with a curvature 38 having its radius at the center of the pivot 25.

A spring 40, anchored as at 41 to the body 11, has its other end secured as at 42 to the trigger 26, while a stop 43 on body 11 limits the movement of the trigger 26 in a counter-clockwise direction to the position where its roller 35 just fits snugly into the recessed notch 36. Pivoted to the other end of the lever 24 is a rod 44 provided with a shoulder 45 acting as a base for one end of the spring 46 secured thereto as at 47, the other end of the spring 46 being secured as at 48 to a bracket 50 on the body 11.

Pivoted as at 51 to the rod 44 are a pair of toggle links 52 and 53, the toggle link 52 being pivoted as at 54 to the body 11. The toggle link 53 is pivoted as at 55 to one end 56 of a reciprocable knife blade 57 which extends through a pair of knife guides 58 on the body 11. The other end of the knife blade 57 is provided with an angular knife edge 60 whose path of movement is across the inner depth 61 of the mouth 15.

In operation, the repeater mine mooring cutter 10 is mounted as customary along the catenary of a sweep cable whose portions 12 and 20 are secured between a pair of mine sweep vessels or a sweep vessel and otter which will travel at an appropriate speed, preferably six to fourteen knots. When the mine mooring 17 contacts the sweep cable portion 12 it passes thereover into the mouth 15 to its inner depth 61. As it approaches its inner depth 61 it strikes the trigger 26 and presses thereagainst until the trigger shears through the shear pin 27. Immediately, the trigger 26 pivots in a clockwise direction about its journal 34 against its spring 40, withdrawing the roller 35 around its curvature 37 from the notch 36. The tension in the sweep cable 12 and the sweep cable 20 causes the sweep cable 20 to rotate the upper end of the lever

24, now released from roller 35, causing lever 24 to pivot counter-clockwise about its pivot 25, moving rod 44 to straighten out the toggle links 52 and 53 as the toggle links 52 and 53 are brought almost, but not quite, to a straight angle against the stops 62, and the pivot 55 causes the knife blade 57 to push its angular knife edge 60 over the inner depth 61 of mouth 15 and through the mine mooring 17 and releasing the mine therefrom. The mine mooring being released, floats to the surface where it is destroyed in an appropriate manner, the vessels stopping their travel for the purpose of destroying the released mine.

With the vessel stopped, the towing tension on the sweep cables 12 and 20 is temporarily released. Immediately, the compression spring 46 pushing against rod 44 causes the toggle links 52 and 53 to return to their angular position shown, withdrawing the knife edge 60 from across the inner depth 61 of mouth 15. Lever 24 returns to its original position, the roller 35 pressing against the curvature 38 until it passes around curvature 37 into recessed notch 36, spring 40 urging it to travel along curvature 37 into recessed notch 36 as soon as it is in position to do so. In the meantime, the sheared portion of the shear pin 27 in the notch 32 has fallen out of it under the compression of the water while it was still traveling through the water after the trigger 26 was released, the unsheared portion of the shear pin 27 having remained in contact with the face of the leg 33, an extension 63 being provided if necessary to insure that the trigger will not carry the surface of the leg out of contact with the shear pin 27. With the trigger restored to its cocked position in contact with the lever 24, the spring 28 urges the shear pin 27 forwardly into the notched recess 32 again, thus restoring the mine mooring cutter to its original cocked position shown in the drawing. Upon the vessels resuming their sweeping operation, tension is again restored to the sweep cables 12 and 20, making the cutter ready for repeating the same cycle of operation.

Obviously, by making the shear pin 27 of suitable length, the mine mooring cutter may automatically re-set itself a number of times. However, it is obvious that it will operate even though the shear pin 27 is entirely used up or its mechanism entirely omitted. If desired, the shear pin 27 and its mechanism could be entirely omitted and the same tension on the trigger against premature operation being provided by making the recessed notch 36 of suitable depth below the curvature 37.

Other modifications and changes in the number and arrangement of the parts may be made by those skilled in the art without departing from the nature of the invention, within the scope of what is hereinafter claimed.

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

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for reciprocating said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, and a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable descending into said mine mooring mouth.

2. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mine mooring cable descending into said mine mooring mouth, and yieldable means cooperating with said toggle means urging said toggle means to its angular position to withdraw the knife blade from said mine mooring mouth.

3. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering into said mine mooring mouth, and yieldable means cooperating with said trigger means urging its return to cocked position.

4. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable descending into said mine mooring mouth, said pivoted lever having a notch therein, and means on said trigger cooperating with said notch.

5. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth,

means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering into said mine mooring mouth, said pivoted lever having a notch therein, and means on said trigger cooperating with said notch, said notch-cooperating means comprising a roller on said trigger.

6. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering said mine mooring mouth, said pivoted lever having a notch therein, means on said trigger cooperating with said notch, said notch-cooperating means comprising a roller on said trigger, and a curvature on the end of said lever having its radius at the pivotal center of said lever.

7. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering and descending into said mine mooring mouth, said pivoted lever having a notch therein, means on said trigger cooperating with said notch, said notch-cooperating means comprising a roller on said trigger, a curvature on the end of said lever having its radius at the pivotal center of said lever, and a shear pin means cooperating with said trigger to hold the trigger in cocked position.

8. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering and descending into said mine mooring mouth, said pivoted lever having a notch therein, means on said trigger cooperating with said notch, said notch-cooperating means comprising a roller on said trigger, a curvature on the end of said lever having a radius at the pivotal center of said lever, a shear pin means cooperating with said trigger to hold the trigger in cocked position, said trigger having a notched recess therein, a shear pin of considerable length, and yieldable means urging said shear pin into said notched recess each time said trigger is operated and then re-set by releasing the tension on the towing means.

9. A repeater mine mooring cutter comprising a fin body, towing means secured thereto, a mine mooring mouth in said fin body substantially aligned with said towing means, a trigger extending across said mouth, a knife blade reciprocally mounted on said fin body, the path of said knife blade extending across said mine mooring mouth, means actuatable by the tension of said towing means upon release by said trigger for advancing said knife blade, said means comprising a toggle means pivoted to said knife blade and said fin body, a pivoted lever linked to said toggle means and to said towing means, said trigger cooperating with said lever to hold it against movement until said trigger is actuated by a mooring cable entering and descending into said mine mooring mouth, said pivoted lever having a notch therein, means on said trigger cooperating with said notch, said notch-cooperating means comprising a roller on said trigger, a curvature on the end of said lever having a radius at the pivotal center of said lever, a shear pin at the pivotal center of said lever, a shear pin means cooperating with said trigger to hold the trigger in cocked position, said trigger having a notched recess therein, a shear pin of considerable length, yieldable means urging said shear pin into said notched recess each time said trigger is operated and then re-set by releasing the tension on the towing means, and a curvature, whose radius is concentric with the trigger pivot, leading from the curvature on the end of the pivot lever to said roller notch therein.

MARK KURTZ.