Oct. 27, 1959 J. R. SULLIVAN 2,910,034

EXPLOSIVE CABLE CUTTER WITH RELEASABLE ANVIL

Filed Jan. 18, 1956 2 Sheets-Sheet 1

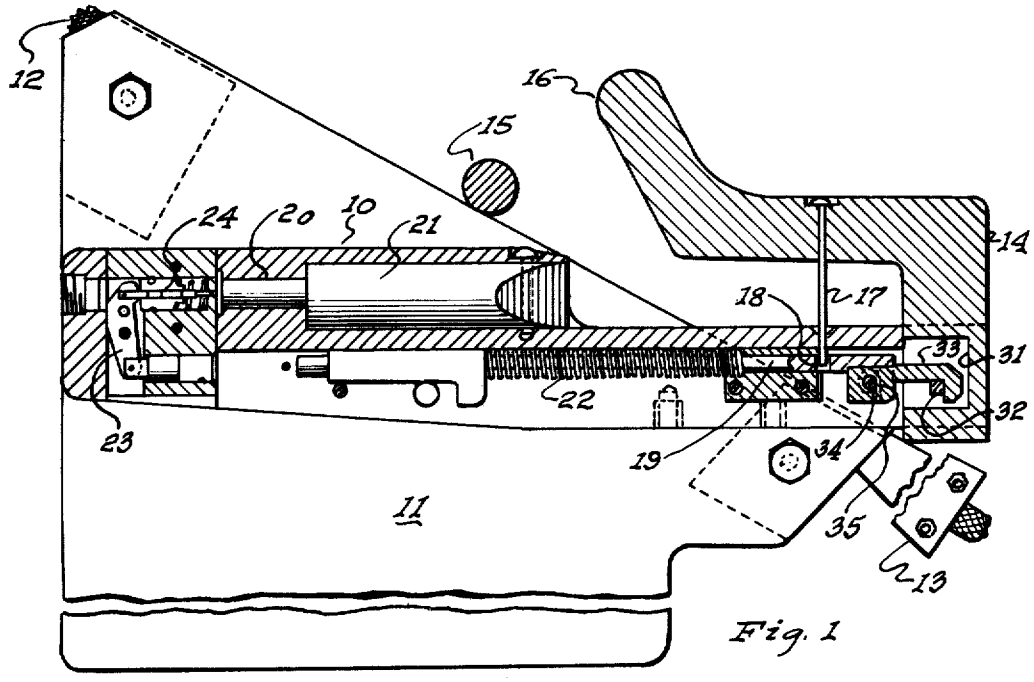


Fig. 1

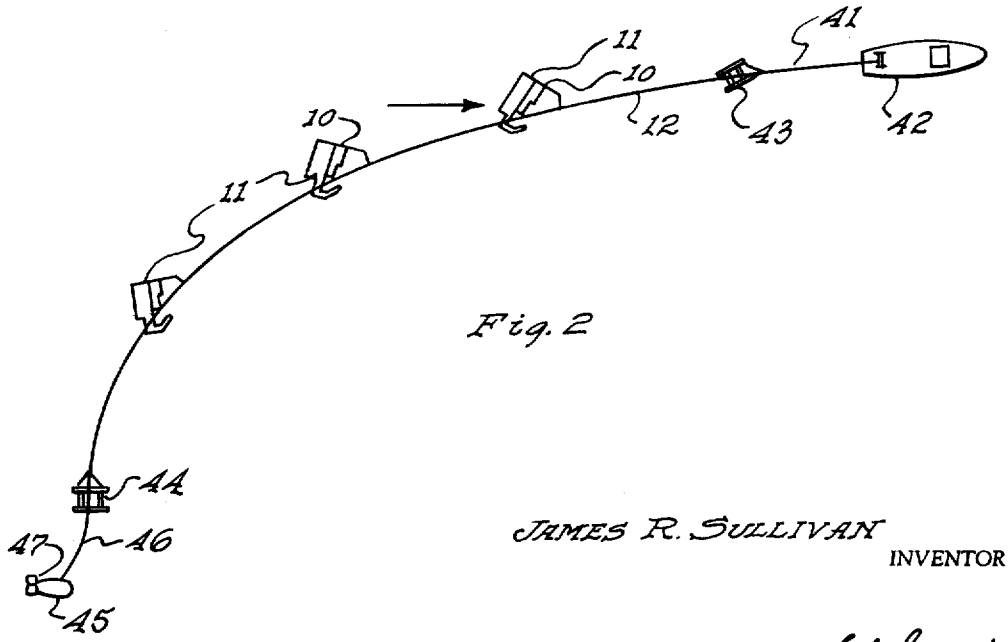


Fig. 2

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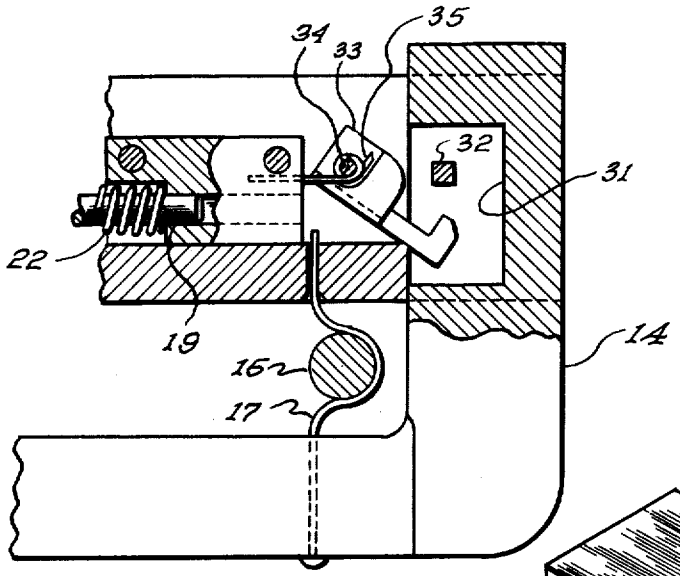


Fig. 3

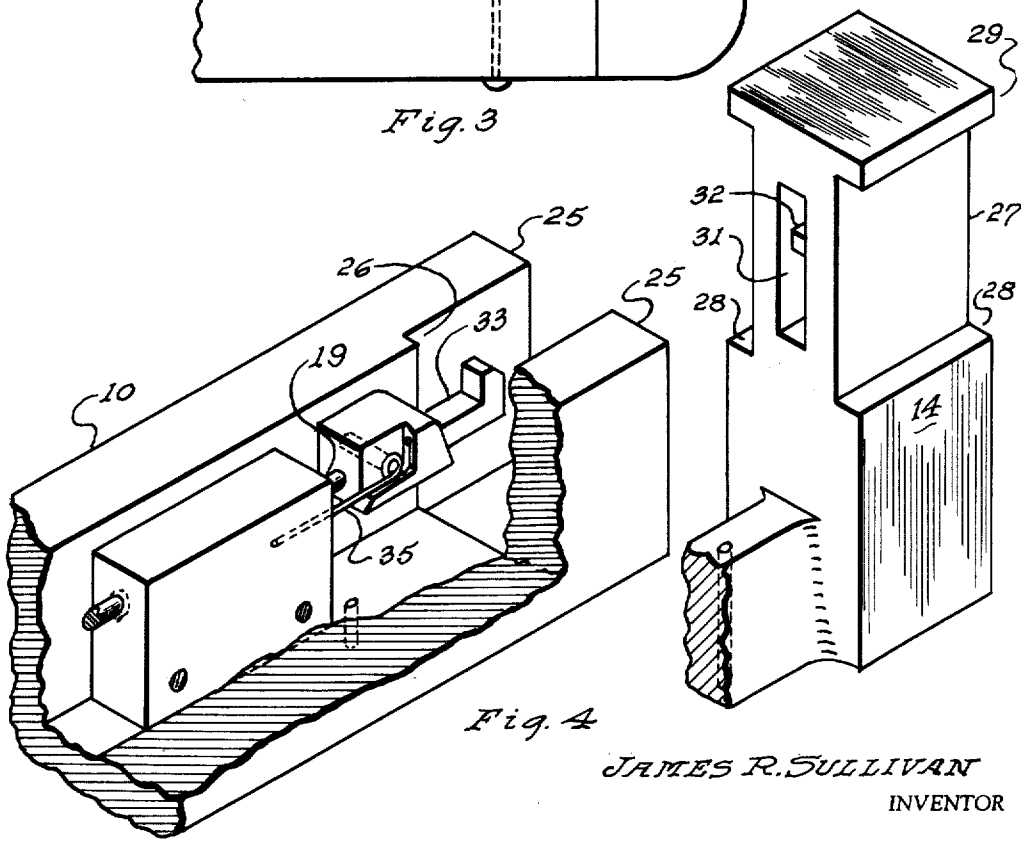


Fig. 4

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EXPLOSIVE CABLE CUTTER WITH RELEASABLE ANVIL

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3 Claims. (Cl. 114—221)

(Granted under Title 35, U.S. Code (1952), sec. 266)

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.

The present invention relates to improvements in cable cutting devices and more particularly to such devices of the explosive type employed for severing the anchoring cables of moored submarine mines.

In one presently used system the sweeping of moored mines is accomplished by towing at a suitable depth a sweep line to which are secured at spaced intervals devices which when a mooring cable is encountered are triggered to cut the cable. These cutting devices are provided with a member shaped for guiding a mooring cable to cutting position on an anvil, the arrangement being such that as the cable approaches the cutting position it releases a firing pin which detonates an explosive charge for propelling a chisel against the portion of the cable overlying the anvil. The function of the anvil is the usual one of backing up of the cable during the cutting thereof by the chisel, after which the anvil together with its shaped guide must be destroyed, detached, or otherwise removed from its original position so that it can no longer capture a mine mooring cable, it being assumed that a single shot cutting device is being used. It sometimes happens that the device fails to fire when the firing pin is released, with the result that the sweep gear becomes fouled and the sweeping operation must be discontinued while the dangerous job of unfouling the sweep gear is undertaken.

It is an object of the present invention to provide a cable cutting device of the explosive type which will greatly reduce the fouling by mooring cables in the event of misfires.

Another object of the invention is to provide an explosive cable cutter with a detachable anvil portion positively secured thereto to prevent loss of the anvils when they are dragging along the bottom.

A further object of the invention is the provision in such a cutter of means responsive to the actuation of the cutter for releasing the detachable anvil connection.

Other objects of the invention as well as the invention itself will be understood from the following description when read in connection with the accompanying drawings in which

Fig. 1 is a sectional plan view of a cutting device embodying the invention attached to a sweep line;

Fig. 2 is a diagrammatic illustration of a single ship sweep employing the invention;

Fig. 3 is a fragmentary view partly in section showing the device encountering a mooring cable; and

Fig. 4 is an exploded view in perspective detailing the detachable anvil securing means.

In accordance with the invention the anvil of the cutting device is secured to the main frame of the cutter by means which are released when the firing pin is withdrawn as when a mooring cable is encountered. Inasmuch as this release of the anvil securing mechanism takes place simultaneously with the withdrawal of the firing pin the releasable securing mechanism is undamaged by the ensuing cutting operation and is in condition for receiving a new anvil. In the event of a misfire after the firing pin is withdrawn the drag of the mooring cable removes the anvil and its guide member from the cutter frame whereby the mooring cable can slide along the sweep line to be engaged and cut by the next cutting device.

As shown in Fig. 1 a main frame **10** of the cutting device of the invention is rigidly mounted on a stabilizing fin **11** which is rotatably secured to a sweep line **12** and is restrained from sliding outwardly along the line **12** by a tapered collar **13**. When under tow as shown in Fig. 2 the stabilizing fin **11** rides in a substantially horizontal plane so that its leading edge is substantially flush with the sweep line **12**, thereby presenting no impediment to the movement of the mooring cable along the sweep line. The longitudinal axis of the main frame **10** extends across the leading edge of the fin **11** to form with its anvil **14** a cutting notch into which a mooring cable **15** sliding along the sweep line **12** and the fin **11** will come to rest. The anvil **14** has a recurved portion **16** flared forwardly to function as a guide member for facilitating the entrance of the mooring cable **15** into the cutting notch provided by the anvil **14**. This guide member **16** and the extended portion of the frame **10** are provided with a trip pin **17**, the lower end of which protrudes into an aperture **18** in a spring loaded rod **19** which when tripped brings about the firing of an explosive cartridge **20** which propels a cutting chisel **21** against any cable or other object in the cutting notch which deformed the trip pin **17** (as shown in Fig. 3) to pull its distal end out of the restraining position in the aperture **18**. This firing operation is well known and is fully described in U.S. Patent 2,422,506 issued to R. Temple, June 17, 1947.

In accordance with the preferred embodiment of the invention illustrated in Figs. 1, 3 and 4, the end of the frame **10** extending over the leading edge of the fin **11** is bifurcated to provide rail members **25** defining a slot having an outwardly facing abutment **26**. The anvil **14** has a tongue portion **27** between shoulders **28** and a flanged end **29** adapted to enter the slot between the rails **25** as guided by the shoulders **28** and the flanges **29** riding on the rails **25**, the tongue **27**, the shoulders **28** and the flanges **29** being shaped for bearing contact with the mating surfaces of the rails **25** thereby providing opposed bearing surfaces to absorb vertical and transverse forces and prevent unnecessary play of the anvil **14**.

The tongue **27** of the anvil **14** has a recess **31** provided with a transversely extending pin **32** adapted to be engaged by a latch or locking dog **33** when the anvil **14** is pressed home on the rails **25** against the abutment **26** and the firing plunger **19** moved to cocking position as shown in Figs. 1 and 4. For this purpose the locking dog **33** is pivotally mounted on a shaft **34** and loaded by a spring **35** to bias the dog **33** toward its unlatched position shown in Fig. 3 in which position it has been rotated into the path of the firing plunger **19**. The bias of the spring **35** yields to the rotative force exerted by the firing plunger **19** on the latch **33** when the plunger **19** is moved to its cocked position shown in Figs. 1 and 4.

By reference to Fig. 2 one manner in which the cutting devices of the invention are utilized in a sweeping operation will be appreciated. As here shown, a plurality of fins **11** carrying cutting frames **10** are secured at spaced intervals to the sweep line **12** which is attached to a tow line **41** streamed from the stern of a mine sweeping vessel **42** and caused to ride at the desired depth below the water surface by a depressor **43**. The other end of

the sweep line 12 is secured to a paravane or otter 44 to which a float 45 is secured by means of a line 46 the length of which determines the depth to which this end of the sweep is submerged. As is well known the float 45 may be provided with rudder fins 47 for assisting the otter 44 to sheer the sweep outward and away from the towing vessel 42.

In a cable cutting operation a mine mooring cable 15 entering the jaw of the cutter bears against the trip pin 17 to bend and pull it out of the retaining aperture 18 in the firing plunger 19. This plunger 19 under the force of its spring 22 moves to the left as viewed in Figs. 1 and 3 to rotate the rocker arm 23 which moves the firing pin 24 to strike the explosive cartridge 20. This same movement of the firing plunger 19 moves it from its supporting position for the locking dog 33, which under the force of its loading spring 35 rotates away from engagement with its cooperating pin 32 to its unlatching position, thereby leaving the anvil 14 free to slide off the end rails 25 of the cutter frame 10. If the cartridge 20 explodes it drives the chisel 21 completely through the mooring cable 15 in its path and strikes the anvil 14 to drive it free of the cutter frame 10, thus presenting an unobstructed surface for succeeding mooring cables to by-pass a cutter which has fired. If the cartridge 20 misfires the drag of the mooring cable 15 forces the unlatched anvil 14 off the end of the cutter frame 10 which thus allows this particular cable to ride along the sweep line 12 to be cut by the next succeeding cutter which does not misfire and leaves the cutter which has misfired in an unobstructing condition due to the fact that it has lost its anvil.

From the foregoing description it will be evident that the explosive cutters of the invention make possible a sweep gear which can tolerate an occasional misfire of a cutter without impairing its sweeping capability. It will be obvious to those skilled in the art that the releasable connection for the anvil portion of the cutter may take forms other than the specific one described for the purpose of disclosing the primary feature of the invention and it is to be understood all such forms are intended to be included within the scope of the appended claims.

What is claimed is:

1. In a mine sweeping apparatus in which a vessel tows a search line in an outstretched position laterally of the forward direction of the sweep so as to engage the anchoring cable of a moored mine and in which a plurality of explosive cable cutting devices spaced along and secured to the search line ensnare and are fired by an anchoring cable sliding rearwardly along the search line, each of said devices including a firing plunger movable to and from a cocked position, an anvil, and spring loaded latch means releasably holding the anvil on said device, said latch means being positioned so that movement of the firing plunger to cocked position moves the latch means to latching condition and movement of the firing plunger from its cocked position permits the spring loaded latch means to return to unlatching condition, whereby a firing movement of said plunger releases the anvil and a misfire will result in an uncut mooring cable displacing the anvil and sliding along the search line to the next cutting device.

2. In a device adapted to be employed in sweeping moored mines and having an anvil portion and explosive means for driving a cutter against the anvil portion, a spring loaded plunger movable against the force of the spring to a cocked position and movable by the spring when released from cocked position to fire the explosive means, a trip pin engaging said plunger to hold it in cocked position and so disposed in front of the cutting face of the anvil that the approach of a mooring line to said cutting face pulls the trip pin from its engagement with said plunger to fire the explosive means, pivotally mounted latch means rotatable between a first position in which it positively secures the anvil portion to the device and a second position in which the anvil portion is free to be detached from the device, said latch means being positioned to be rotated by the cocking movement of the firing plunger to the first position, and means for rotating the latch means to the second position when the firing plunger releases from its cocked position.

3. In an underwater cable cutter of the explosive type having a frame, a cockable firing plunger reciprocable in the frame, and an anvil portion, means for detachably connecting the anvil portion to said frame comprising a latching dog pivotally mounted on the frame for movement between a latched position and an unlatched position and having a surface positioned when in unlatched position to be engaged and moved to latched position by said plunger during its cocking movement, and means operative upon said plunger moving from cocked position to rotate the latching dog to unlatched position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,422,506 Temple ---------- June 17, 1947