

- [54] **CABLE GRAPPLE**
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- [58] Field of Search..... 294/83 R, 83 AE, 99 R, 294/99 SAJ, 66 R, 66 A, 106, 111, 112, 115, 116, 110 R, 118

- 2,621,069 12/1952 Anguera..... 294/110 R X
- 2,745,695 5/1956 Peyer 294/110 R X
- 3,266,353 8/1966 Gretter et al. 294/66 R X
- 3,572,808 3/1971 Miller 294/118

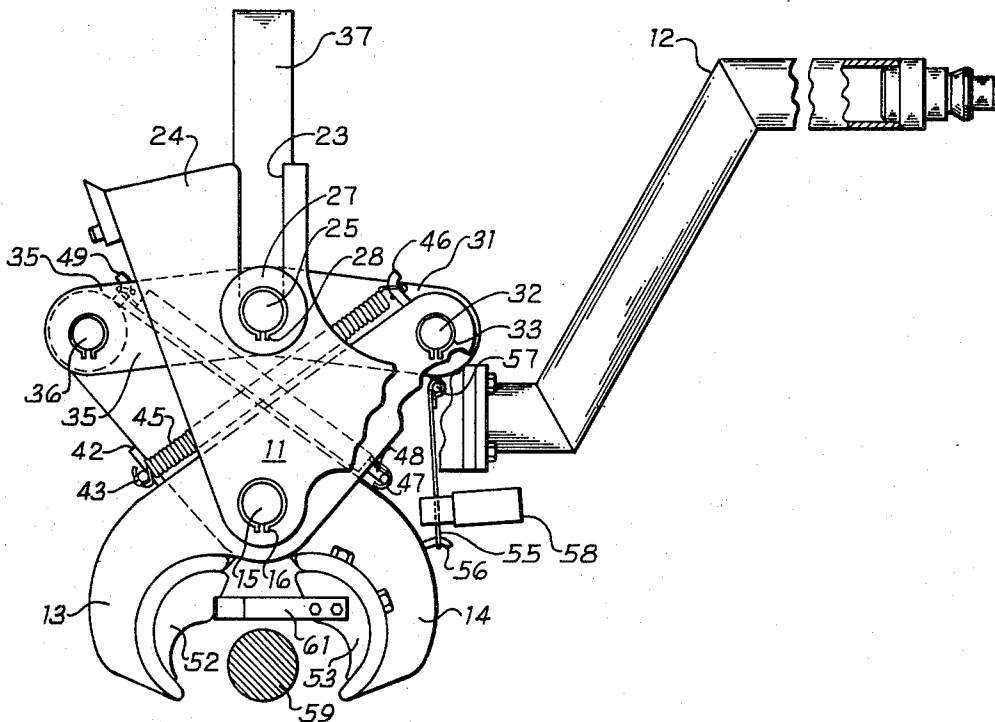
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[57] **ABSTRACT**

A grapple for hoisting an undersea cable having first and second cable engaging jaws which are normally biased in a closed position. The first and second jaws are pivotally connected to a guide plate at a common pivot point and a restraining wire is provided to keep the jaws in an opened position. Upon locating a cable undersea, the restraining wire is severed and the biased jaws are closed around the cable. A cam surface is provided on the guide plate and a shaft which is attached by linkage to the first and second jaws moves onto the cam surface to lock the jaws in a closed position around the cable to be recovered.

- [56] **References Cited**
- UNITED STATES PATENTS**
- 1,266,233 5/1918 Eckerson 294/112 X
- 2,476,734 7/1949 Jellison 294/110 R X

2 Claims, 4 Drawing Figures



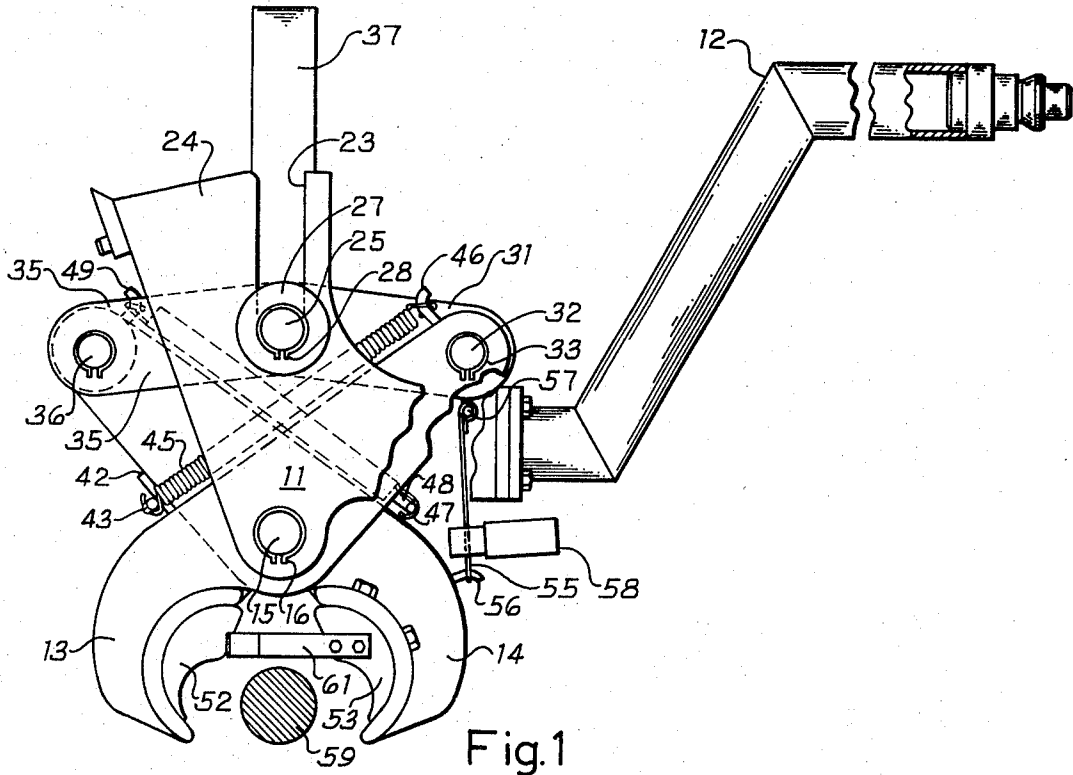


Fig. 1

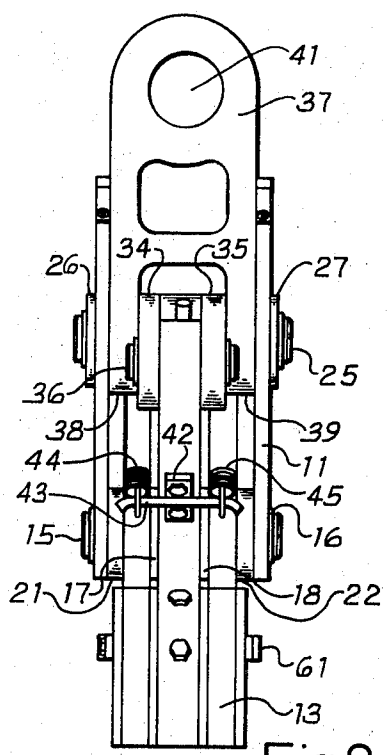


Fig. 2

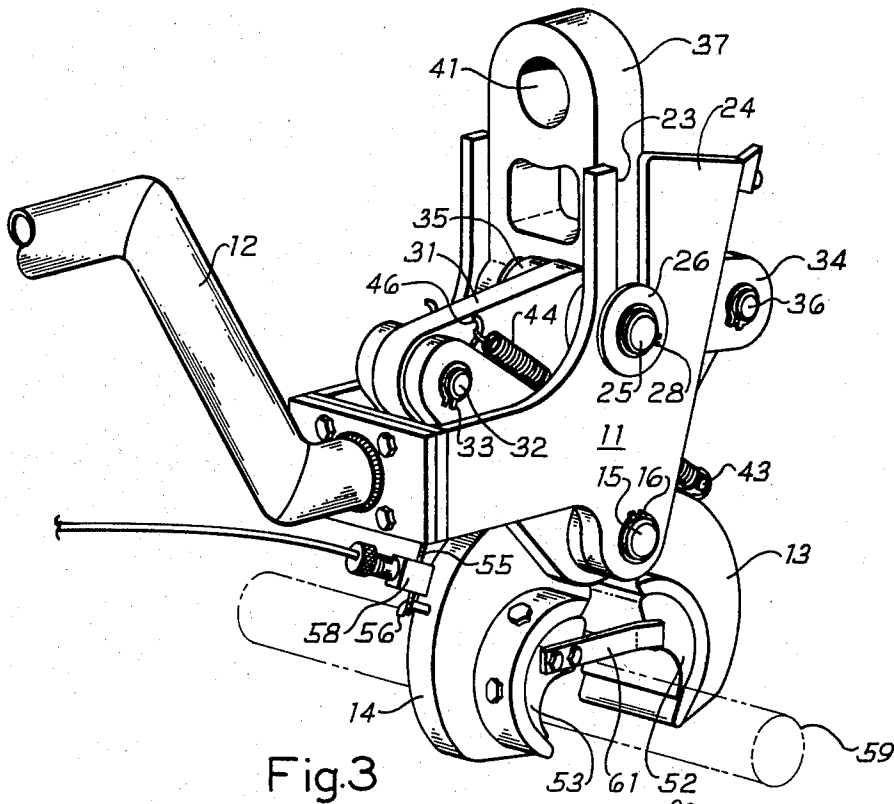


Fig. 3

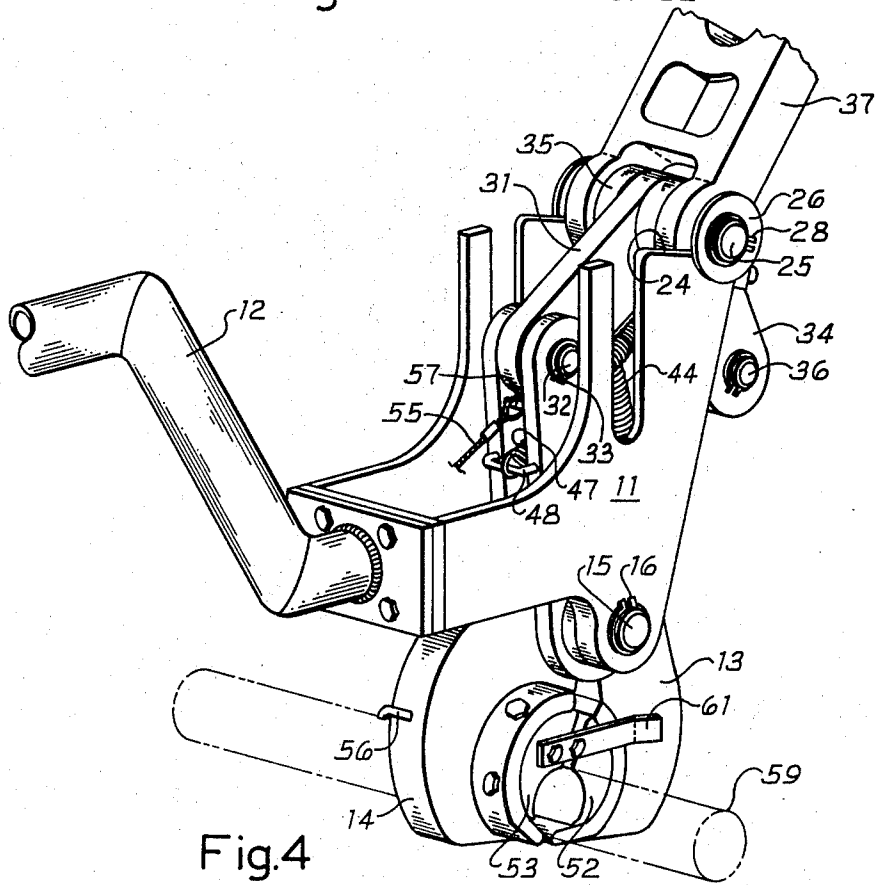


Fig. 4

CABLE GRAPPLE

BACKGROUND OF THE INVENTION

The present invention relates to a grapple and more particularly to a cable grapple for attachment to a severed cable that is undersea.

Various grapple devices are available for lifting and moving objects and some grapple devices are specifically designed to lift cables. As is well known in the art, ocean communication cable, which is also known as underwater or submarine cable, extends usually between different continents and is laid on the floor of an ocean where it is subjected to the hazard of becoming damaged by various causes, such as by the action of marine organisms or by becoming fouled in trawling gear operated by fishing boats. In addition, there may be failures of electronic assemblies, such as repeaters and equalizers, which are commonly connected into the cable at spaced intervals along its length. Thus, any one of a number of factors may make it necessary to find an underwater cable and pull it up above the surface of the water so that it can be examined and repaired. The process of finding a cable and pulling it up is called "cable-retrieval" or "cable-recovery."

In general, underwater cables have been retrieved by means of grapnels dragged by cable-recovery ships. The usual procedure is firstly to estimate the approximate latitude and longitude of the particular cable portion that is to be retrieved. This can be accomplished by referring to the operational record that was made when the cable was laid. After the approximate position of the cable has been determined, a cable-recovery ship is sent to this location and a grapnel is lowered to the ocean floor.

The ship is then caused to travel back and forth in this area while dragging the grapnel in directions that are at right angles to the estimated axial direction of the cable. When the cable is eventually caught or engaged by the grapnel, the grapnel and the engaged portion of the cable are pulled up to the ship so that this section of the cable can be examined and repaired on the deck of the ship. After the necessary repairs have been made, this section of the cable is returned to its former position on the ocean floor.

One grapnel specifically designed for retrieving underwater cable is shown and described in U.S. Pat. No. 3,266,353, entitled, Equipment For Retrieving Underwater Cable, which issued Aug. 16, 1966, to Ralph W. Gretter; et al. In this patented device, a grapnel is provided with flukes for guiding an engaged or hooked cable into a slot in the body of the grapnel. A pair of cable grippers are then engaged with the cable and the cable is severed between the two grippers. Ropes, which are connected to the grippers are then hoisted to raise the severed cable to the surface. The main disadvantage of this patented device is that it can only be used with a cable that is not broken or severed, as the flukes cannot engage a cable end.

SUMMARY OF THE INVENTION

The present invention provides an improved grapple for recovering a broken undersea cable and is designed to be operated from an underwater research vessel. A line is attached to the grapple and upon locking around a cable the grapple is separated from the underwater research vessel.

The grapple is comprised of a pair of cable engaging jaws that are connected to a guide plate at a common pivot point. Springs are provided to normally bias the jaws in a closed position and a restraining wire is provided to keep the jaws in an opened position until it is desired to close the jaws. An explosive device is provided to sever the restraining wire whereupon the jaws close. A slot is provided in the guide plate and a shaft is slidably positioned in the guide plate and links connect this shaft with the cable engaging jaws. A trunnion plate is also attached to the shaft and has a hole for attaching a lifting cable. Upon closing of the cable engaging jaws, the shaft moves out of the slot in the guide plate and onto a cam surface that locks the grapple in a closed position.

It is therefore a general object of the present invention to provide an improved grapple for recovering an undersea cable.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view, partially broken away, of a preferred embodiment of the present invention;

FIG. 2 is a side view of the preferred embodiment shown in FIG. 1;

FIG. 3 is a perspective view of the cable gripper shown in FIG. 1 with the jaws being in an opened position around a cable; and

FIG. 4 is a perspective view showing the cable gripper of the present invention locked on a cable.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a U-shaped guide plate 11 is attached to an arm 12 which is connectable with an attachment on an underwater research vessel. The arm 12 and attachment are constructed so that they can be readily disconnected from one another. First and second cable engaging jaws 13 and 14 are pivotally connected to guide plate 11 by a shaft 15 that is held in place by retaining rings 16. As best shown in FIG. 2 of the drawings, the upper portion of jaw 13 is forked and jaw 14 extends through the forked portion of jaw 13. Spacers 17 and 18 are provided between jaws 13 and 14, and spacers 21 and 22 are provided between the ends of jaw 13 and U-shaped guide plate 11.

Guide plate 11 has a slot 23 that extends to a cam surface 24, which is the top edge of guide plate 11. A shaft 25 is slidably positioned in slot 23 and is retained by spacers 26 and 27 and retaining rings 28. Link 31 is connected to shaft 25 and has its outer end connected to jaw 13 by shaft 32 and retaining rings 33. A pair of links 34 and 35 have one end connected to shaft 25 and their opposite ends are connected to jaw 14 by shaft 36. Link 31 is positioned on shaft 25 between links 34 and 35 and a trunnion plate 37 has legs 38 and 39 that are connected to shaft 25 and extend between guide plate 11 and links 34 and 35. Trunnion plate 37 is provided with a hole 41 so that a lifting cable can be readily attached to trunnion plate 37. A spring clip 42 is attached to the upper portion of jaw 14 and has an arm 43 to which one end of springs 44 and 45 are attached. The other ends of springs 44 and 45 are attached to arms 46 on the forked ends of jaw 13 and springs 44 and 45 tend

to bias jaws 13 and 14 to a closed position. A third spring 47 has one end attached to arm 48 on jaw 13 and the other end attached to arm 49 on jaw 14, and spring 47 provides an additional biasing force that tends to close jaws 13 and 14.

As springs 44, 45, and 47 will close jaws 13 and 14, a restraining wire 55 is provided to hold jaws 13 and 14 in an opened position. One end of wire 55 is attached to arm 56 on jaw 14 and the other end of wire 55 is attached to arm 57 on link 31. A cable cutter 58 is provided to sever wire 55 and is preferably an explosive type that is initiated by an electrical signal. Explosive-type cable cutters are wellknown in the art and basically comprise a piston type punch which is actuated by an explosive charge. Explosive cable cutters are commercially available from Mine Safety Appliance Co., Pittsburgh, Pa.

Jaws 13 and 14 are provided with inserts 52 and 53 that can be changed to accommodate different size cables 59. Inserts 52 and 53 are selected so that when jaws 13 and 14 are closed the diameter of a hole formed by inserts 52 and 53 is slightly less than the diameter of cable 59. A slip bar 61 is attached to insert 53 and prevents cable 59 from entering too deeply into jaws 13 and 14, and thus permits jaws 13 and 14 to completely close.

OPERATION

Prior to operation, inserts 52 and 53 are selected to accommodate the particular size cable 59 that is to be recovered. Jaws 13 and 14 are then opened and wire 55 attached to keep the jaws in an opened position. When jaws 13 and 14 are fully opened, shaft 25 is near the bottom of slot 23 in guide plate 11. A lifting cable is attached to trunnion plate 37, and arm 12 is attached to an underwater research vessel. This vessel may have an operator inside who looks for cable 59 to be recovered, or a television system may be employed and the vessel remotely operated. When the cable is sighted, arm 12 is maneuvered so that jaws 13 and 14 encompass cable 59. Cable cutter 58 is then energized and severs wire 55. Jaws 13 and 14 will spring shut and as they close, shaft 25 will move up the vertical slot 23 in guide plate 11 until shaft 25 clears slot 23 and, upon shaft 25 clearing slot 23, guide plate 11 will be free to rotate about

shaft 15 and when arm 12 is released from the research vessel, guide plate 11 will rotate and shaft 25 will engage cam surface 24 thur locking jaws 13 and 14 on cable 59. This engaging or wedging action of shaft 25 on surface 24 prevents opening of jaws 13 and 14 and loss of cable 59 as the cable grapple and cable 59 are raised by a lifting cable attached to trunnion plate 37. Once cable 59 is aboard a ship, guide plate 11 can be rotated back by hand so that shaft 25 is aligned with slot 23 and then jaws 13 and 14 can be opened to release cable 59.

It can thus be seen that the present invention provides an improved cable grapple which can be locked onto an underwater cable during lifting operation.

Obviously many modifications and variations are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

We claim:

- 1. A cable grapple comprising,
 - a guide plate having a cam surface thereon and a slot therein,
 - first and second cable engaging jaws pivotally connected to said guide plate at a common point,
 - spring means biasing said first and second cable engaging jaws in a normally closed position,
 - guide means slidable in said guide plate slot and engageable with said cam surface
 - a first link connecting said first cable engaging jaw and said guide means and a second link connecting said second cable engaging jaw and said guide means whereby said guide means moves in said slot during closing of said jaws and onto said cam surface to lock said jaws in a closed position,
 - a wire connected to said first link and said second cable engaging jaw for holding said first and second cable engaging jaws in an opened position, and
 - means for severing said wire whereby said first and second cable engaging jaws are closed by said spring means.
- 2. A cable grapple as set forth in claim 1 wherein said means for severing said wire is an explosive cable cutter.

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