

[54] **EXPLOSIVELY ACTUATED UNDERWATER ANCHOR LINE CUTTER**

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[22] Filed: **Mar. 7, 1973**

[21] Appl. No.: **338,994**

Related U.S. Application Data

[62] Division of Ser. No. 193,381, Oct. 28, 1971.

[52] U.S. Cl. 114/221 A, 24/134 R

[51] Int. Cl. **B63b 9/00**

[58] **Field of Search**..... 114/221 R, 221 A, 206 R,
114/206 A; 83/386; 30/228, 180; 166/54.5,
166/54.6; 24/132 SB, 134 R, 134 E,
24/134 KA

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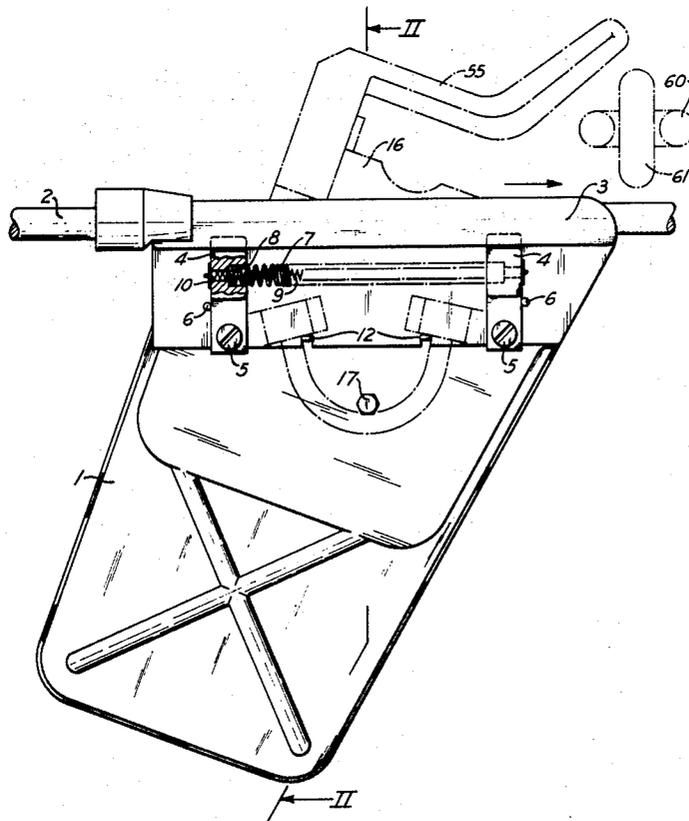
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[57] **ABSTRACT**

The frame of a chain cutter is mounted in a housing on a stabilizing fin. The fin is held on a sweep line by a pair of pivoted lugs that can be released from the line by pulling back on a spring between the lugs. Attached to the front of the cutter frame is an anvil forming with the frame a chain-receiving recess. A barrel in the frame contains a piston for driving a chisel forward through the chain link in the recess. The piston is hollow and contains a cartridge holder provided with an axial passage having a breach block in its rear end. A plunger, slidably mounted in the breach block and in an opening in the frame behind it, carries a firing pin on its front end. The frame is provided with means, actuated by a mine anchor line in the chain-receiving recess, for suddenly increasing water pressure to drive the plunger and firing pin ahead.

5 Claims, 4 Drawing Figures



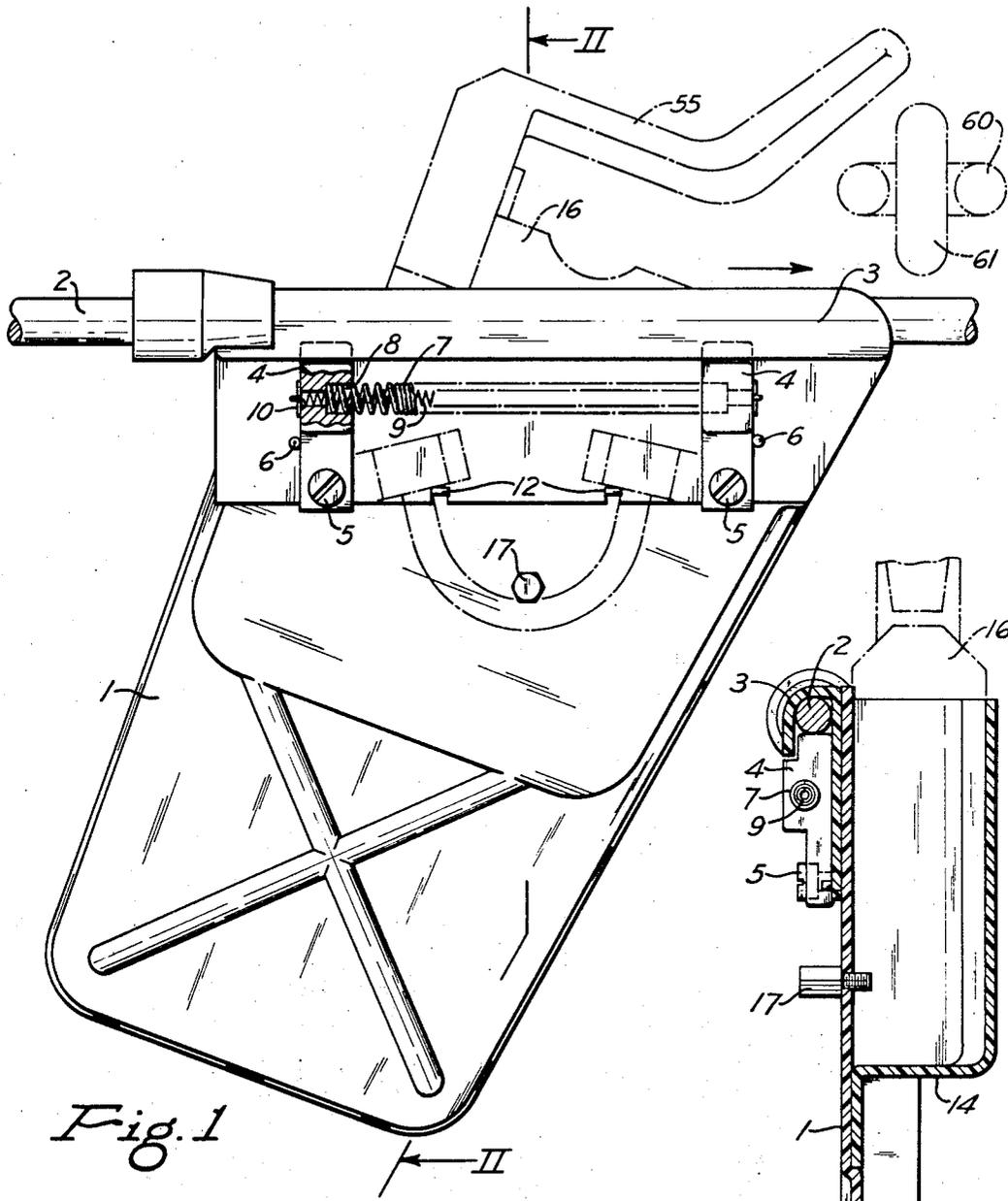


Fig. 1

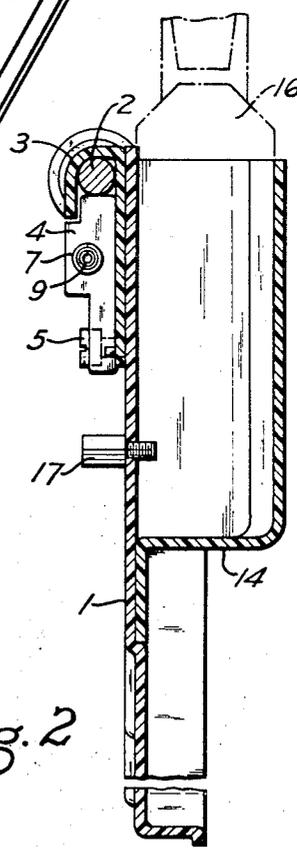


Fig. 2

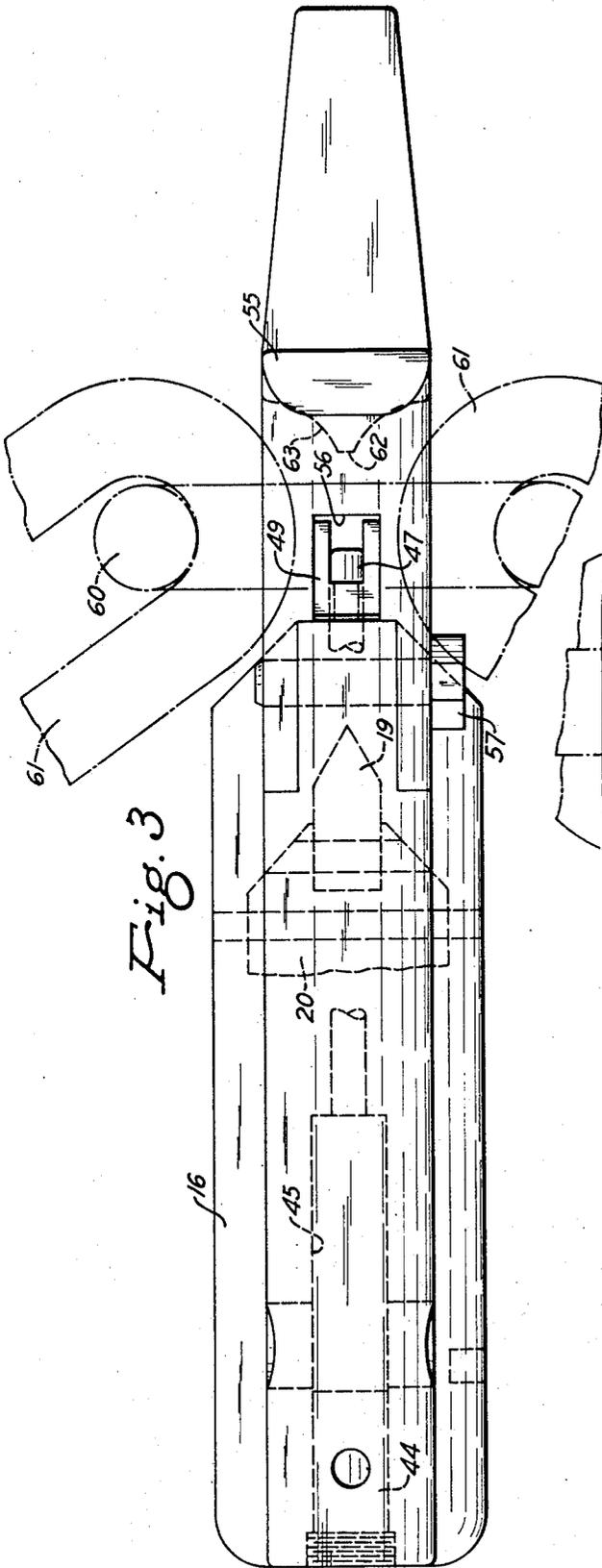


Fig. 3

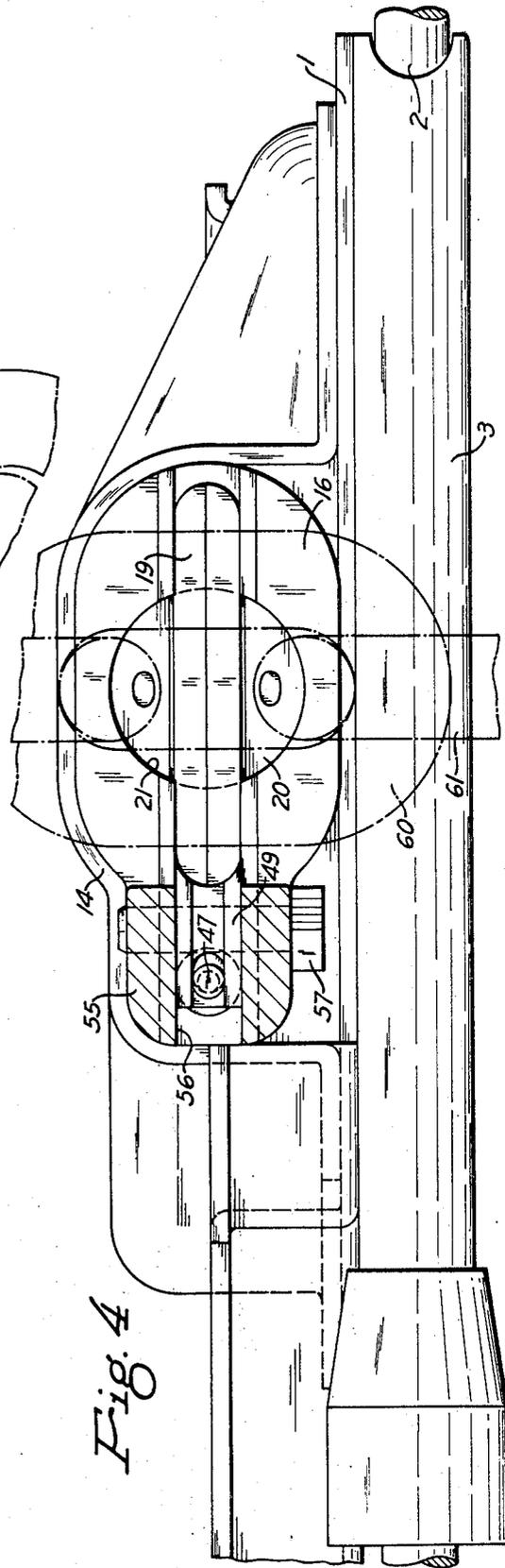


Fig. 4

EXPLOSIVELY ACTUATED UNDERWATER ANCHOR LINE CUTTER

This application is a division of our copending U.S. Pat. application, Ser. No. 193,381, filed Oct. 28, 1971.

It is among the objects of this invention to provide an explosively actuated underwater anchor line cutter which is particularly suitable for cutting chains, and which can be quickly and easily attached to a sweep line.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a plan view of the stabilizing fin;

FIG. 2 is a longitudinal section taken on the line II—II of FIG. 1;

FIG. 3 is an enlarged rear view of the cutting unit itself; and

FIG. 4 is a cross section taken through the chain-receiving recess of FIG. 1, but including the sweep line and fin.

Referring to FIGS. 1 and 2 of the drawings, a holder for a mine anchor line cutter includes a stabilizing fin 1 that can be drawn through a body of water by means of a sweep line 2 extending outwardly away from a mine sweeper in a well-known manner. The fin has a leading front edge and is disposed more or less horizontally as it is drawn through the water. To attach the fin to the sweep line a channel member 3 extends along the leading edge of the fin and is joined to its top or bottom surface in any suitable manner, such as by a water-proof adhesive or by screws. This member has an open side facing the trailing edge of the fin so that the channel member can be hooked over the sweep line. In order to lock the fin on the line, a pair of laterally spaced lugs 4 are disposed in substantially parallel relation with their front ends projecting into the channel member and their rear ends pivotally connected by means of pivots 5 to a flat rearward extension of the channel member. The lugs are held in this locking position by spring means between them normally pressing their outer sides against stop pins 6. Preferably, the spring means are formed from two concentric coil springs. The ends of the outer spring 7 are mounted in sockets 8 in the inner sides of the lugs and this spring is under slight compression to hold the lugs against the stop pins. The inner spring 9 extends out of the opposite ends of the outer spring and the rest of the way through the lugs, where the outer ends of the inner spring are held by clips 10. This spring is under slight tension.

In order to disconnect the fin from the sweep line, or to prepare the fin for connection to a sweep line, the central portion of the spring system is pulled rearwardly to the dotted line position shown in FIG. 1, which causes the inner tension spring to swing the front ends of the lugs inwardly toward each other and rearwardly until they engage stops 12 that are located far enough back to prevent the bowed outer compression spring from swinging the lugs forward again. That is, the pressure of the ends of the compression spring outwardly against the sides of the lug sockets is exerted along lines passing behind the axes of the lug pivots 5, so that the compression spring actually causes the lugs to be pressed against stops 12. There is sufficient room between the retracted lugs and the entrance to the channel member to accommodate the sweep line,

whether it is being removed from the channel or inserted in it. If the latter, the springs then are pushed forward a short distance to swing the lugs forward far enough for an overcenter action to take place, upon the occurrence of which the tendency of the springs to straighten out will quickly swing the lugs the rest of the way forward against the stop pins 6 as shown in full lines. Consequently, with this locking system a fin can be attached to a sweep line very quickly and easily by simply first pulling back on the springs to retract the lugs, then hooking the channel member over the line and then pushing the springs forward until they snap the lugs forward into locking position.

The side of the stabilizing fin opposite to the channel member supports a housing 14 that is rigidly secured to it. This housing is at the front end of the fin and has an open front end so that an anchor line cutter can be inserted in it, as indicated in dotted lines in FIGS. 1 and 2 and in full lines in FIG. 4. The cutter is of the explosively actuated type, in which a chisel is driven forward by an explosive charge to sever a mine anchor line that has been caught in the cutting recess of the cutter ahead of the chisel. Housing 14, and preferably the stabilizing fin also, are formed mainly of rupturable material, such as a plastic or a low strength metal. When the explosive charge is fired, the chisel is driven forward to cut the anchor line, but the recoil against housing 14 causes the housing and the fin to break or tear apart so that the cutter and the major portions of the housing and the fin are separated from the channel member that remains on the sweep line. This remnant of the device hanging from the sweep line is easily by-passed by another mine anchor line for cutting by a cutter located farther out along the sweep line.

As shown in FIGS. 3 and 4 of the drawings, and more in detail in our copending application Ser. No. 193,381, the cutting tool itself includes a block-like frame 16 that fits within housing 14 on the stabilizing fin, where it is held by a set screw 17 (FIGS. 1 and 2) extending from the opposite side of the fin into a threaded opening in the frame. The front end of the frame projects a short distance from the housing and is provided with a rearwardly extending opening, in which a cutting chisel 19 is slidably mounted. This chisel is held in the bifurcated front end of a piston 20 disposed in a barrel 21 extending rearwardly from the back of the opening. The rear end of the piston is spaced a short distance from the rear end of the barrel and is provided with a forwardly extending axial bore that receives a cartridge (not shown), behind which there is a firing pin.

In order to drive the firing pin ahead, a water passage in the frame communicates with the inside of a hollow plug 44 that is screwed into the rear end of a bore 45 that extends forward throughout the length of the frame. The front end of the hollow plug is open and contains a piston (not shown) on the rear end of a firing rod 47 that extends forward through the bore and out of its front end. A coil spring compressed between the piston and a shoulder in the frame urges the piston rearwardly, but it is normally held in a retracted forward position by a trip slide 49 that engages the front end of the frame and is provided with a slot through which the front end of the rod extends. A short distance behind the front end of the rod it is reduced in diameter where it passes through the slide slot. This forms a head

on the rod that overlaps the slide at the outer end of the slot to hold the spring compressed.

If the slide is pushed outwardly by a mine anchor line, it will become disengaged from the head of the firing rod, whereupon the spring will expand and drive the rod and its piston toward the rear end of the frame. Since the water passage in the frame, and the hollow plug 44, are full of water, the sudden pressure of the piston against the water will cause the latter to exert pressure against the rear end of the firing pin and drive it forward to detonate the explosive charge. This will cause piston 20 to drive the chisel forward.

When the chisel is driven forward it cuts through a mine anchor line that has been caught in a recess formed between the front end of the frame and an anvil 55 spaced a short distance ahead of it. The end of the anvil adjacent the trip slide 49 is forked to provide a passage 56 for the slide and to straddle the frame, to which it is connected by a screw 57. The anvil directly in front of the chisel is parallel to the front end of the frame, but has a forwardly inclined front end to help guide a mine anchor line into the cutting recess. As the cutter is towed through the water by the sweep line, the line will engage mine anchor lines and slide across them until one of them enters the cutter recess between the chisel and the anvil. The pressure of the anchor line against the trip slide moves it and releases the firing rod, which results in the cartridge being fired and the anchor line being cut by the chisel.

Although the mine anchor line may be a cable, this cutter is designed primarily for cutting chains and it is formed so that the link 60 that is caught in the cutting recess will be held broadside to the chisel, whereby both sides of the link will be cut simultaneously rather than in succession. To help guide a link into cutting position in the recess, the chain-engaging side of the anvil is shaped to substantially engage the adjacent ends of the two chain links 61 that are connected directly to the link between them in the cutting recess. The planes of the two links just mentioned will be perpendicular to the plane of the link being cut. Depending upon the size of the links and the width of the anvil, the anvil may or may not engage both links 61 at the same time. Generally, the anvil will only engage one of those links, or it may slide up and down on the link 60 in the recess. The chain-engaging side of the anvil preferably has a longitudinally extending central flat area 62 for engaging link 60, and side areas 63 diverging from the opposite

edges of the flat area for engagement by the adjacent curved end portions of the two adjoining links. Also, as shown in FIG. 3, the front end of frame 16 in the recess is bevelled to permit entrance of a link 60 where the adjoining links 61 are rather close together.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. A holder for underwater anchor line cutting means, comprising a stabilizing fin having top and bottom surfaces and a leading front edge, channel means adjacent said leading edge and connected to the fin, said channel means having an open side facing the trailing edge of the fin for admitting a sweep line into the channel means, a pair of laterally spaced lugs normally extending rearwardly away from the open side of the channel means to hold a sweep line therein, means pivotally supporting the rear ends of the lugs, and spring means between the lugs and secured thereto for normally holding them in line-holding position, the front ends of the lugs being swingable inwardly toward each other by the spring means to open said channel means when the spring means is pulled rearwardly.

2. A holder for underwater anchor line cutting means according to claim 1, in which said channel means is a channel member extending along said leading edge and joined to one of said surfaces.

3. A holder for underwater anchor line cutting means according to claim 1, in which said spring means include concentric coil springs, one of said springs being compressed and engaging said lugs to urge them apart, and the ends of the other spring being secured to the lugs.

4. A holder for underwater anchor line cutting means according to claim 3, in which the lugs are provided with sockets receiving the ends of said one spring, and the other spring is under tension.

5. A holder for underwater anchor line cutting means according to claim 1, including means limiting said inward swinging of the lugs to a retracted position in which said spring means will hold them.

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