Aug. 16, 1966 H. J. MACK ETAL 3,266,833

RELEASE MECHANISM

Original Filed Nov. 30, 1960

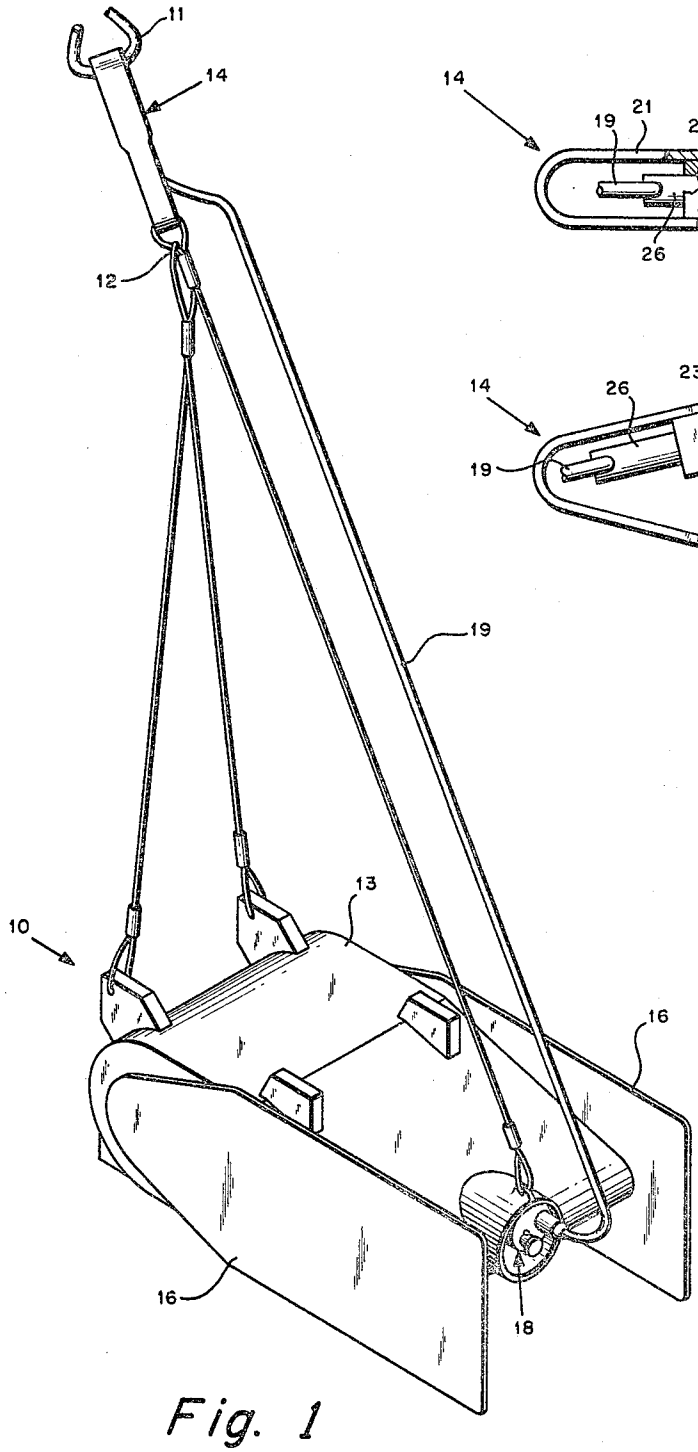
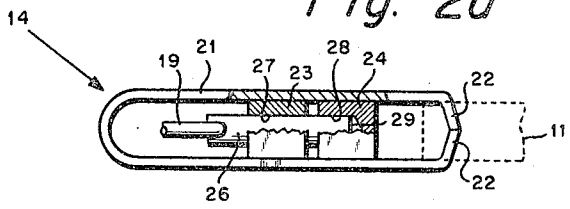


Fig. 1

Fig. 2a



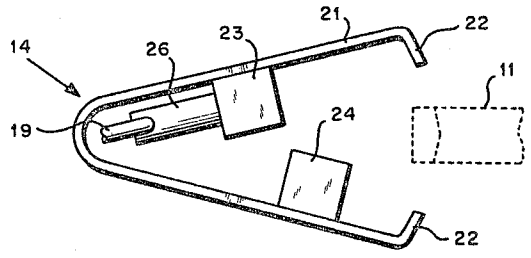


Fig. 2b

INVENTORS

HAROLD J. MACK
JOHN E. SMITH
DONALD F. SMITH

United States Patent Office 3,266,833 Patented August 16, 1966

3,266,833

RELEASE MECHANISM

Harold J. Mack, Allentown, John E. Smith, Hatboro, and Donald F. Smith, Norristown, Pa., assignors to the United States of America as represented by the Secretary of the Navy

Original application Nov. 30, 1960, Ser. No. 72,806, now Patent No. 3,196,790, dated July 27, 1965. Divided and this application May 25, 1962, Ser. No. 197,802

6 Claims. (Cl. 294—83)

This application is a division of application Serial No. 72,806, filed November 30, 1960, for Control Mechanism for Underwater Explosive Charge which has matured into Patent 3,196,790, granted July 27, 1965.

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 an underwater explosive device of the type depending from a hydrofoil and used for detecting and destroying submerged marine mines, and more particularly to the control mechanism of such an underwater explosive device characterized by including provision for being automatically armed at a predetermined depth for releasing the device from the hydrofoil and for exploding it a predetermined time interval after becoming attached to a marine mine.

In marine mine sweeping operations, helicopters have become an important and very useful vehicle. A hydrofoil having means for maintaining itself below the surface of the water is dragged by a helicopter through an area to be cleared of submerged mines. A plurality of encased explosive charges provided with protruding magnets for attracting the charges to a ferromagnetic marine mine depend from the hydrofoil. A charge so attracted will cling to the marine mine and thereafter become detached from the hydrofoil and subsequently exploded, thereby destroying the mine. Such a mine sweeping method and apparatus therefor are disclosed in application Serial No. 793,939 of Donald F. Smith for Anti-mine Weapon, filed February 17, 1959.

The explosive charge device, or so called magnetic leech, must be a completely self-contained unit capable of being automatically armed when submerged to a predetermined depth in the water to assure against premature detonation, of being self-detaching from the hydrofoil when a mine is contacted, and of exploding a predetermined elapsed time thereafter. Conventional and existing hydrostatic arming devices and delay timers have been found unsuitable for the specific application to the magnetic leech and were heretofore unobtainable in a combined form that would perform the several functions in the order of operation as described above. Furthermore, if their combination were possible, an assembly would be produced which would be utterly too large for specific application to a magnetic leech. The mere reduction in part sizes of such existing conventional devices would render the device economically unfeasible, unreliable, and unsafe for the extensive and severe use contemplated.

Accordingly, it is an object of the present invention to provide a device of unitary construction to be carried in a magnetic leech device whereby, by operation of the device, the firing circuit of the magnetic leech device is armed at a predetermined depth by a hydrostatic pressure responsive switch, the leech device is automatically detached from the hydrofoil from which it depends at the instant the leech clings to a marine mine, and the magnetic leech device explosive charge is detonated at a predetermined time interval after the detachment thereof thereby allowing the hydrofoil and the towing vehicle to move a safe distance beyond the place where the magnetic leech device became detached prior to detonation of the explosive charge.

Various other objects and advantages will appear from the following description of one embodiment of the invention, and the most novel features thereof will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

FIG. 1 represents an isometric view of a magnetic leech device as suspended in an operative position from a hydrofoil;

FIGS. 2*a* and 2*b* represent a larger view of the squib actuated connector of the magnetic leech device.

In the illustrated embodiment of the invention, the magnetic leech assembly **10** depends from a hydrofoil (not shown) having a streamer extending downwardly therefrom and terminating in a connector ring **11**, as shown in FIG. 1. A bridle **12** which forms a single point of connection at the upper end thereof, supports an explosive charge and magnet at convenient points on the housing **13** thereof. A squib actuated release clip **14** interconnects the ring **11** and the bridle **12**. The three flexible suspending members of the bridle are so disposed and of such length as to maintain the longitudinal axis of the charge and magnet housing **13** parallel to the flow stream and directed thereinto. A pair of guide vanes **16** stabilize the housing laterally. The rear end of the charge and magnet housing **13** includes a receptacle for receiving the hydrostatic switch and timer mechanism, shown generally by the numeral **18**. A shielded cable **19** connects the mechanism **18** to the release clip **14**. The general construction of the charge and magnet housing is disclosed in the above-mentioned application Serial No. 793,939.

Release clip **14** is illustrated in the closed and opened positions, respectively, in FIGS. 2*a* and 2*b*, and comprises a flat strip of steel or other spring material bent into a clip or bifurcated spring **21** with suitable jaws **22** formed at the open end thereof. In the normal position, jaws **22** stand open and the spring must be urged to the closed position. Dowel couplings **23**, **24** are offset on spring **21** so that they nest in the spring closed position. A dowel pin **26** inserted through an open-end dowel hole **27** in coupling **23** into a closed-end dowel hole **28** in coupling **24** secures the spring in the closed position. Pin **26** hollow at the insertion end **29** thereof is inserted into closed-end dowel hole **28** and includes an electrically energized explosive charge pocketed therein and exposed to the closed end of the continuous closed end dowel hole **28**. Cable **19** functions to couple a low energy electrical pulse to the charge from hydrostatic switch and timer mechanism **18** to thereby detonate the charge causing pin **26** to be ejected from couplings **23**, **24**. Spring **21** then is biased to the open position, as shown in FIG. 2*b*, thereby disengaging jaws **22** from connector ring **11** releasing leech assembly **10** from the hydrofoil.

It will be understood, of course, that various changes in the details, materials, steps and arrangement of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What is claimed is:

1. An electrically-released clip comprising: a bifurcated member having resilient legs, the legs being turned inwardly at the open end to form a pair of opposing jaws adapted to close about a connecting member when said member is urged in the closed position, a first coupling

fixed to the inner face of one of said legs and having a dowel hole extending therethrough, a second coupling fixed to the inner face of the other of said legs and having a closed-end dowel hole extending thereinto, said couplings being offset relative to each other so that the dowel holes align to form a continuous closed-end hole when said member is urged to the closed position, a dowel pin insertable in said continuous hole for maintaining said member in the closed position, an electrically detonated charge set in the insertion end of said dowel pin and exposed to the closed end of the continuous closed-end hole, and means for selectively energizing said charge whereby said dowel pin is ejected from said dowel holes and said member springs to its normally open position and said jaws separate.

2. An electrically-released clip comprising: a bifurcated member having resilient legs, the legs being turned inwardly at the open end to close about a connecting element when said member is urged to the closed position, a pair of couplings fixed to the opposite inner faces of said legs, one of said pair having a hole extending therethrough and the other of said pair having a closed-end hole extending thereinto, said couplings positioned relative to each other so that the holes align to form a continuous closed-end hole when said member is urged to the closed position, a pin insertable in the continuous hole for maintaining said member in the closed position, a detonator in the insertion end of said pin and exposed to the closed end of the continuous hole, and means for selectively energizing said detonator whereby said pin is ejected from said holes and said member springs to its normally open position and said legs separate.

3. An electrically-released clip comprising: a bifurcated spring member formed at its open end to close about a connecting element when it is urged to the closed position, a first receptacle fixed to the inner face of one leg of said member, a second receptacle fixed to the inner face of the other leg of said member, said receptacles being positioned relative to each other so that they align to form a continuous hole closed at one end when said member is urged to the closed position, pin means insertable in said continuous hole for maintaining said member in the closed position, electrically activated means for ejecting said pin means from the continuous hole, and means for selectively energizing said ejecting means whereby said pin means is ejected from said hole and said member springs to its normally open position.

4. Mechanism for releasably connecting two elements, comprising: a spring clasp formed to be connected at the

folded end thereof to one of the elements, the free ends of said clasp being opposite from each other and separated when said clasp is in a normally open position, said free ends being formed to grasp the other element when said clasp is closed, a pair of recessed bosses secured to opposite inner surfaces of said clasp, said bosses being disposed adjacent to each other when said clasp is closed with the recesses forming a confined space, bolt means insertable in said space for holding said clasp in the closed position, explosive charge means contained in said space for ejecting said bolt means whereby said clasp returns to the normally open position, and electrical means connected to said explosive charge means for detonating the latter from a remote position.

5. Mechanism for releasably connecting two elements, comprising: a spring clasp formed to be connected at the folded end thereof to one of the elements, the free ends of said clasp being separated when said clasp is in a normally open position, said free ends being formed to grasp the other element when said clasp is closed, a pair of recessed bosses secured to opposite inner surfaces of said clasp, said bosses being disposed adjacent to each other when said clasp is closed with the recesses forming a space closed at one end, bolt means insertable in said space for maintaining said clasp in the closed position, and force-exerting means operatively connected to said clasp for ejecting said bolt.

6. A spring clasp, the free ends of said clasp being opposite from each other and normally separated, a pair of recessed bosses secured to opposite inner surfaces of said clasp which are disposed adjacent to each other when the free ends of said clasp are joined and the recesses form a chamber closed at one end, explosive bolt means including an explosive charge insertable in said chamber for maintaining said clasp in the closed position, and detonating means operatively connected to said bolt means.

References Cited by the Examiner

UNITED STATES PATENTS

352,778	11/1886	Randall	24—260
497,972	5/1893	Welch	24—260 X
2,585,870	2/1952	Spielman.	

GERALD M. FORLENZA, *Primary Examiner.*

ARTHUR M. HORTON, SAMUEL FEINBERG, *Examiners.*

R. F. STAHL, G. F. ABRAHAM, *Assistant Examiners.*