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MEANS FOR RELEASING BUOYANT OBJECTS UNDERWATER

Filed July 17, 1957

2 Sheets-Sheet 1

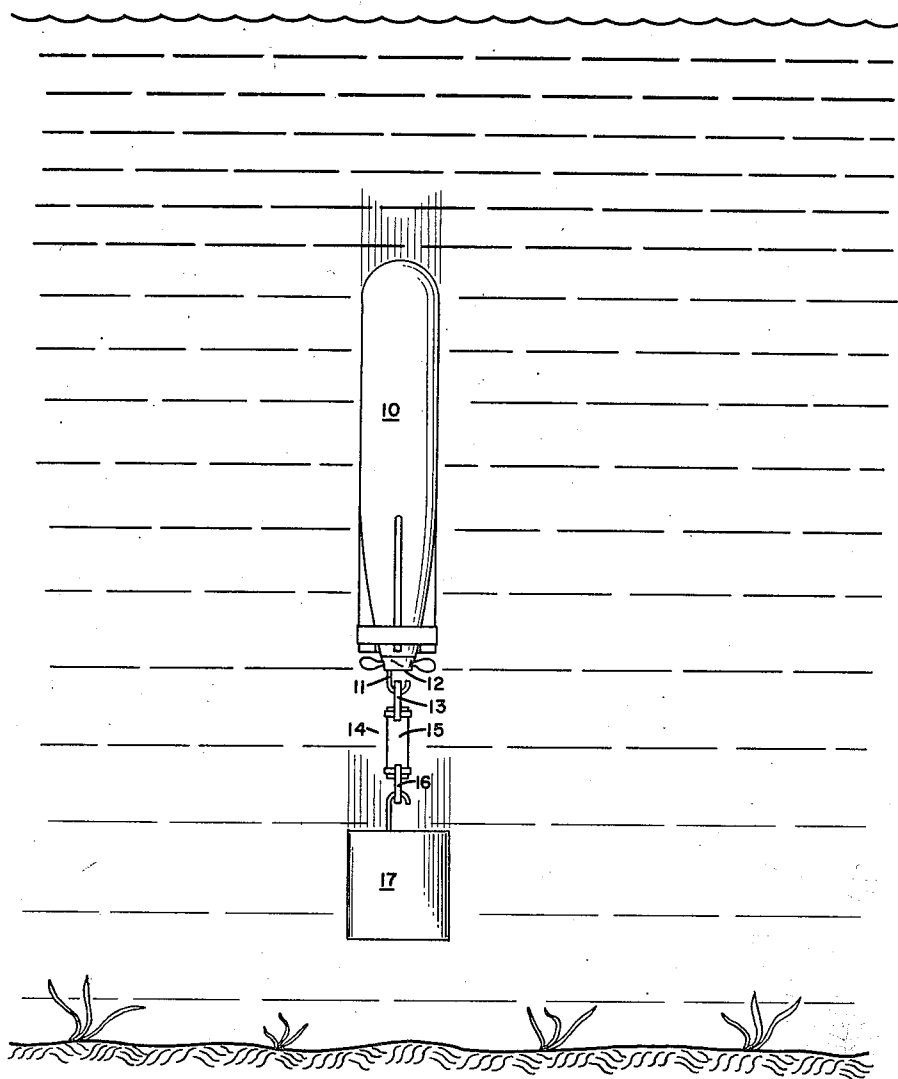


FIG. 1

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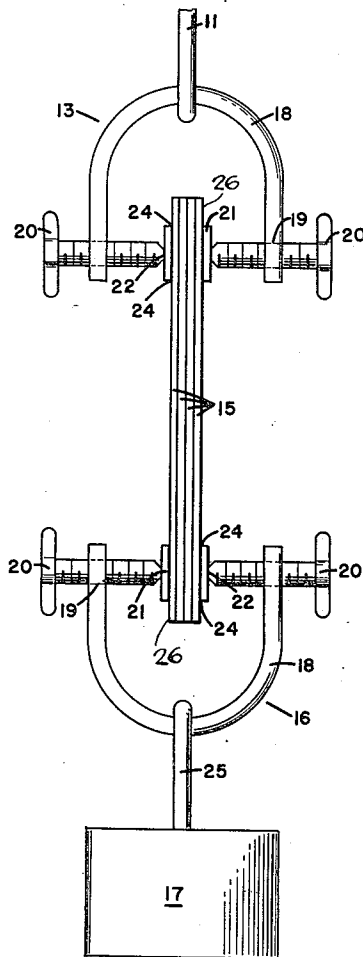


FIG. 3

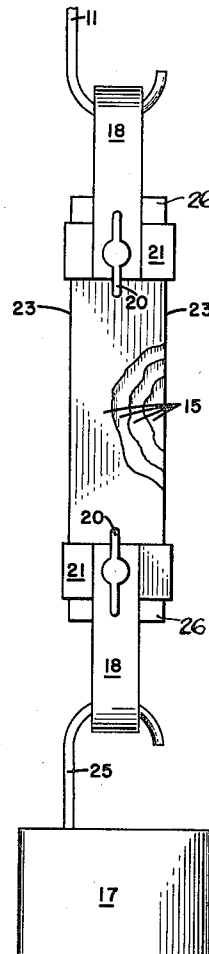


FIG. 2

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MEANS FOR RELEASING BUOYANT OBJECTS UNDERWATER

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Application July 17, 1957, Serial No. 672,529

4 Claims. (Cl. 102—13)

This invention relates to buoyant submersible objects such as torpedoes and mines of the type adapted to be submerged by means of a weight and thereafter allowed to rise by releasing the weight and particularly to means for connecting and releasing the weight.

In the development and design of acoustic detection systems for torpedoes the type and amount of noise created or developed by the torpedo in actual use is an important factor. Similarly the type and amount of noise developed by a torpedo containing an acoustic detection system is important for proper calibration and checking of the detection system prior to actual use. Experiments have shown that the noise developed by a torpedo may be divided into two classes, i. e., flow noise and self-noise. Flow noise may be considered to be that noise which results from the flow of water around the torpedo and particularly the flow of water around the transducer. Self-noise may be considered to be that noise created by the propulsion system and the operation of internal mechanisms in the torpedo.

The total noise developed by a torpedo may be easily determined by firing the torpedo in the conventional manner and recording either internally or externally the magnitude of such noise. However, the determination and detection of flow noise per se requires that the torpedo travel unaided through the water at the required speed without benefit of its propulsion system or being towed since such may create more than sufficient noise to entirely mask any flow noise that may be present. As may now be obvious, flow noise may only be accurately detected and determined by sinking the torpedo with sufficient buoyancy to a predetermined depth such that when the torpedo is released the buoyancy of the torpedo will supply sufficient acceleration whereby the torpedo will attain the desired speed before it reaches the surface.

Since considerable buoyancy may be necessary to attain the relatively high speeds of present day torpedoes and since the torpedo must be allowed to sink to a depth at least below a predetermined minimum depth it should be obvious that the means connecting the torpedo and the releasable weight must have a determinable and preferably adjustable release time in addition to sufficient tensile strength to prevent premature separation of the releasable weight from the torpedo.

With regard to floating submarine mines and the like it has heretofore been the practice to attach a releasable weight or anchor to the explosive and buoyant portion by mechanical release means which are actuated by failure of a water soluble material that is under very little, if

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any, tensile or compressive strain. It is noted that the prior art teaches the use of water soluble means to actuate mechanical release means and that heretofore it has not been considered feasible to eliminate the mechanical release means as is contemplated by the present invention. Accordingly, it is an object of the present invention to provide simplified apparatus for the release of underwater buoyant objects.

Another object of the invention is to provide a simple and economical apparatus having a predictable release time for the release of a weight from a buoyant object underwater.

Another object of the invention is the provision of underwater release means, the release time of which may be controlled and that does not require actuation of mechanical means to release the buoyant object.

These and other objects and features of the invention, together with their incident advantages will be more readily understood and appreciated from the following detailed description of the preferred embodiment thereof selected for purposes of illustration and shown in the accompanying drawings in which:

Figure 1 is a diagrammatic view showing the invention in combination with a rear portion of a torpedo having positive buoyancy and an auxiliary weight adapted to cause the torpedo to sink in a vertical position;

Figure 2 is a side view partly in section of the soluble link; and

Figure 3 is an end view of the soluble link shown in Figure 2.

Referring now in detail to Figure 1 of the drawings there is shown a torpedo 10 of conventional configuration in a submerged and vertical position provided with a hook 11 securely attached to the aft portion 12 of the torpedo and adapted to engage a shackle 13 forming a part of a soluble link 14 and is formed to securely grip the upper portion of a plurality of gelatine strip-like elements 15. Attached to the lower portion of the gelatine elements is a shackle 16 similar to that previously described and formed to securely grip the lower portion of the gelatine elements 15. An auxiliary weight 17 is connected to the lower shackle 16 and provides the means for overcoming the positive buoyancy of the torpedo to cause it to sink.

With reference now to Figure 2 and Figure 3 which show the soluble link in detail there is shown a plurality of relatively thin rectangular strips of gelatinous material 15 assembled in intimate side by side relationship and securely clamped near their respective ends by similar U-shaped shackles 13—16. Each shackle is comprised of a U-shaped center portion 18 composed of cold rolled steel or the like having internally threaded passages 19 in each end adapted to receive an externally threaded wing nut 20. Each wing nut 20 is threadably inserted in its respective passage 19 and provided with a rigid flat bar 21 rotatably mounted on its inner end 22 such that the bar may be held in a fixed position while the wing nut is rotated to advance the bar in a transverse direction. Each bar is preferably formed of cold rolled steel or the like of such thickness that when fully engaged with the gelatine strips the compressive force exerted by each bar will be substantially constant along its entire length. Each bar should be of such length as to extend past the outer edges 23 of the gela-

tine strips and should have its inner longitudinal edges 24 in contact with the gelatine strips 15 rounded such that no sharp edges are presented. The auxiliary weight 17 may be attached to the lower shackle 16 as by a hook 25 or the like. For the purposes of this invention, the use of sheet gelatine of the type developed and used as filters for artificial lights is preferred although other types of sheet gelatine having a relatively high tensile strength may be used.

If desired the necessary parameters may be easily and quickly determined for gelatine strips of the type described herein by use of the formula:

$$t = 2.26N - .23L - .30T + 9.28$$

where t is the time in minutes, N is the number of sheets, L is the load or tensile stress in pounds, and T is the temperature of the water in degrees Fahrenheit.

Sheet gelatine strips of the type described herein, such as for example, individual strips having a thickness of .002 inch and a cross sectional area of 4×10^{-3} square inches, and supported in the manner shown and described herein may be used as a timed underwater release at water temperatures below 90° F. and the release time may be predicted within plus or minus one minute for a load of plus or minus two pounds at a water temperature of plus or minus two degrees Fahrenheit.

In use the proper number and size of gelatine strips 15 are assembled in intimate side by side parallel relationship with their ends disposed between the pressure bars 21 such that a portion 26 of the gelatine strips extend past the pressure bars in a longitudinal direction. The wing nuts 20 are then tightened whereby the pressure bars securely grip the gelatine strips, the uncompressed outer portion 26 of the gelatine strips preventing any movement relative to the pressure bars. The shackles 13-16 may be attached in an articulated manner to the torpedo and the auxiliary weight as by hooks 25, rings or the like, the articulated connections between the torpedo and the auxiliary weight and the flexibility of the gelatine strips thus allowing considerable latitude in the handling and manner of handling the torpedo and its auxiliary weight to hoist it into position to be dropped stern first into the water. When once released the auxiliary weight will cause the torpedo to sink stern first until the action of the water results in failure of the gelatine strip 15 thereby releasing the auxiliary weight 17 and allowing the torpedo, due to its buoyancy, to accelerate in an upward direction.

The soluble link with minor modifications may be used in submarine mines wherein an anchor portion of the mine is released and the buoyant explosive portion allowed to rise to a predetermined distance below the surface. For the utilization of the invention for this purpose the soluble link may be disposed in a conventional free flooding section and comprise the sole connection between the anchor portion and the buoyant portion thereby eliminating the necessity of mechanical release means and the possible malfunction thereof. If the buoyant portion and the anchor portion of the mine are assembled to form a rigid but separable unit such as for example to facilitate handling and the like, a spring or the like adapted or disposed to urge the two portions apart and maintain a tensile stress on the soluble link may be provided to insure separation after failure of the link since in such instances the positive buoyancy of the explosive portion may not be sufficient to guarantee separation such as for example, after long storage. Further, the use of springs or the like as discussed immediately hereinabove allows the soluble link, if desired, to be designed with a safety factor, to compensate for storage conditions and handling, the force exerted by the spring supplying the difference between the design load for the soluble link and the actual load when submerged.

While there is shown a particular embodiment of the present invention it will be understood that the apparatus

is only illustrative and that the invention may be constructed other than as specifically shown and described and that modifications may be made. It is therefore contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the present invention.

Having thus described this invention what is claimed and desired to secure by Letters Patent is:

1. In a device for releasing an auxiliary weight from a submersible buoyant object the combination comprising: a plurality of thin gelatine strips assembled in face-to-face relationship, said gelatine strips having a first end portion, a middle portion and a second end portion; first means adapted for connection to the buoyant object and to grip said first end portions, said means comprising first and second oppositely disposed pressure bars disposed inwardly of and adapted to grip said first end portions of the outer gelatine strips, and means to advance said pressure bars toward said gelatine strips whereby said gelatine first end portions may be securely clamped between said pressure bars; and second means adapted for connection to the auxiliary weight and to grip said gelatine second end portion, said means comprising third and fourth oppositely disposed pressure bars disposed inwardly of and adapted to grip said second end portions of the outer gelatine strips, and means to advance said pressure bars toward said gelatine strips whereby said second end portions may be securely clamped between said pressure bars.

2. In a device for releasing an auxiliary weight from a buoyant torpedo having a front portion and a rear portion the combination comprising: a plurality of thin gelatine strips assembled in face-to-face relationship, said gelatine strips having a first end portion, a middle portion and a second end portion; first means adapted for articulated connection to the buoyant torpedo rear portion and to grip said gelatine first end portions, said means comprising first and second oppositely disposed pressure bars disposed inwardly of and adapted to grip said first end portions of the outer gelatine strips; and means to advance said pressure bars toward said gelatine strips whereby said first end portions may be securely clamped between said pressure bars; and second means adapted for articulated connection to the auxiliary weight and to grip said second end portions, said means comprising third and fourth oppositely disposed pressure bars disposed inwardly of and adapted to grip said second end portions of the outer gelatine strips, and means to advance said pressure bars toward said gelatine strips whereby said second end portion may be securely clamped between said pressure bars.

3. The combination as described in claim 2 wherein each said gelatine strip is of substantially the same configuration and thickness and each said pressure bar extends transversely beyond the gelatine strips and the said pressure bars are formed such that only a smooth surface may be in contact with said gelatine strips.

4. In a device for releasing an auxiliary weight from a buoyant torpedo having a front portion, a rear portion and a longitudinal axis the combination comprising: a plurality of thin gelatine strips assembled in face-to-face relationship, said gelatine strips having a first end portion, a middle portion and a second end portion; first means adapted for articulated connection to the rear portion of said torpedo on the longitudinal axis thereof and to grip said gelatine first end portions, said means comprising a first U-shaped element having a bight and a first end portion and a second end portion, said first element first and second end portions being provided respectively with axially aligned first and second openings, first and second oppositely disposed externally threaded pressure elements each having an inner portion and an outer portion and respectively adapted for threaded engagement with said first U-shaped element first and second openings, first and second oppositely disposed pressure bars disposed inwardly of and adapted to transversely grip

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said gelatine first end portions, each said first and second pressure bar being respectively adapted for rotatable connection to each said first and second pressure element inner portions; and second means adapted for articulated connection to said auxiliary weight and to transversely grip said gelatine second end portions, said means comprising a second U-shaped element having a bight and a third end portion and a fourth end portion, said second element third and fourth end portions being provided respectively with axially aligned third and fourth openings, third and fourth oppositely disposed externally

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threaded pressure elements each having an inner portion and an outer portion and adapted for respective threaded engagement with said second U-shaped element third and fourth openings, third and fourth oppositely disposed pressure bars disposed inwardly of and adapted to grip said gelatine second end portions, each said third and fourth pressure bar being respectively adapted for rotatable connection to each said third and fourth pressure element inner portions.

No references cited.