Feb. 17, 1953

R. I. MASON ET AL

2,629,083

EXPENDABLE RADIOSONIC BUOY

Filed Sept. 21, 1944

2 SHEETS—SHEET 1

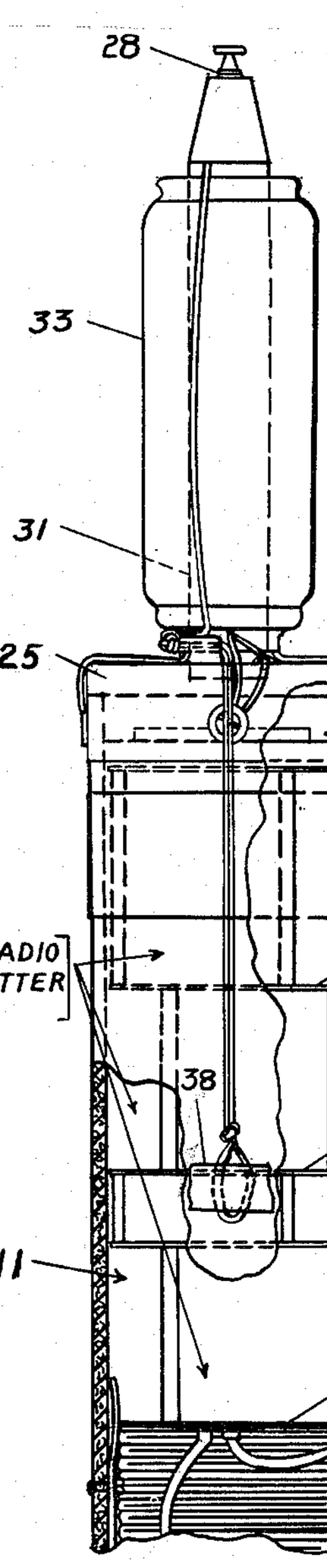

FIG. 1A

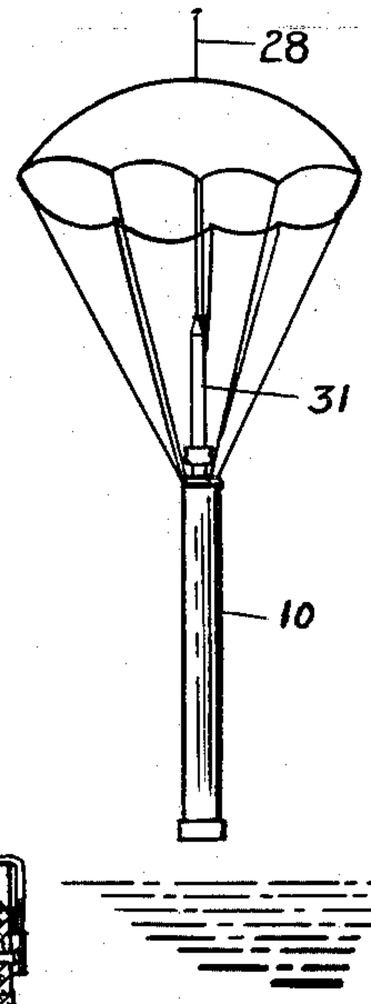

FIG. 5

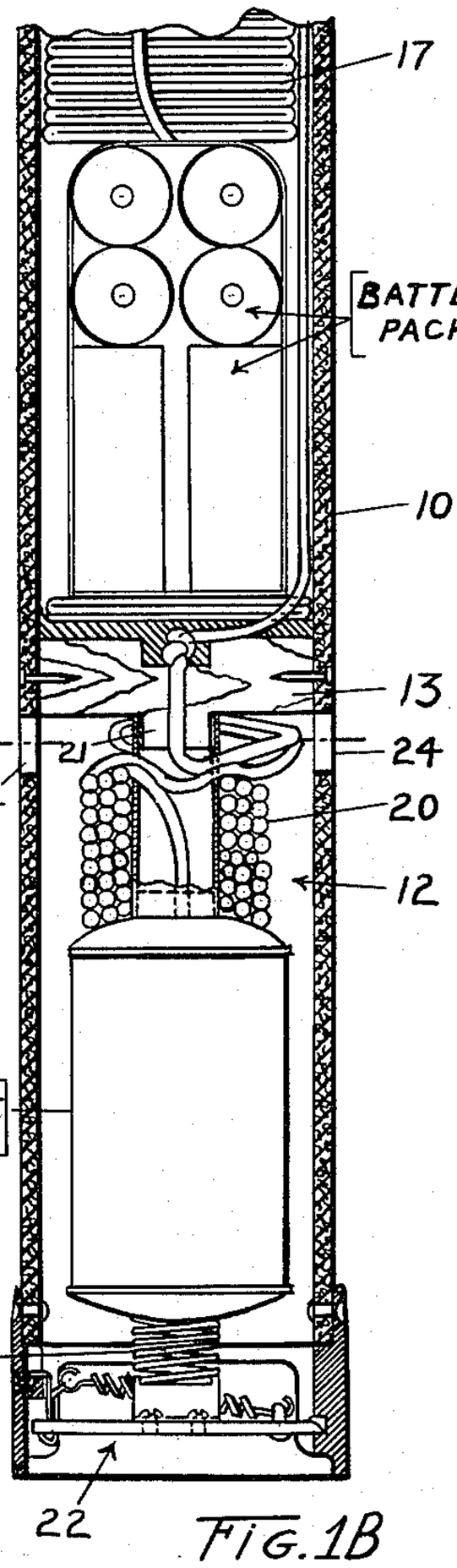

FIG. 1B

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EXPENDABLE RADIOSONIC BUOY

Filed Sept. 21, 1944 2 SHEETS—SHEET 2

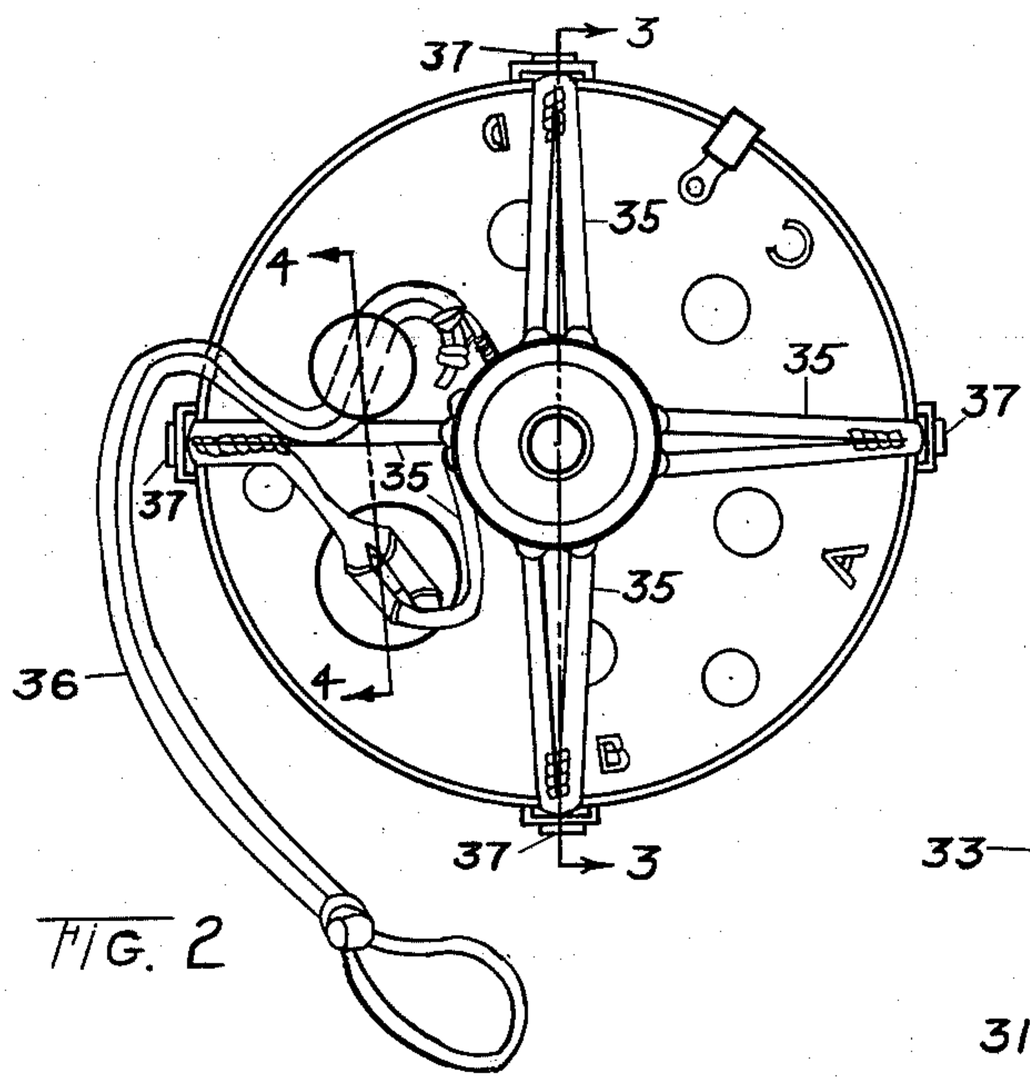

FIG. 2

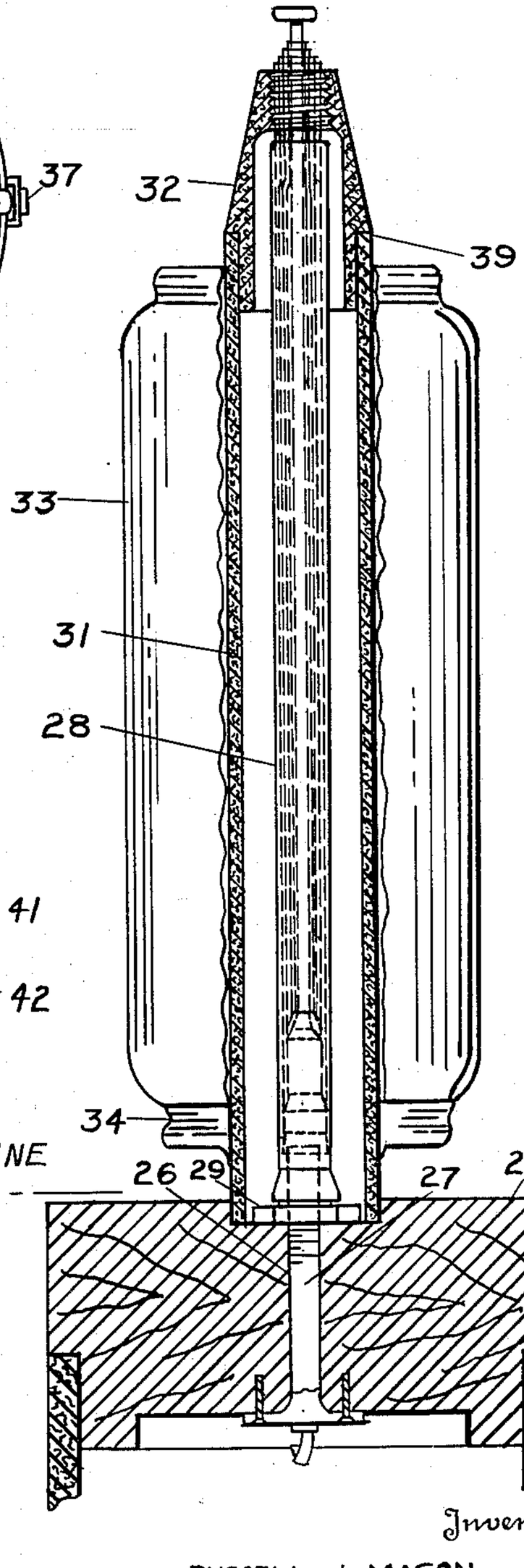

FIG. 3

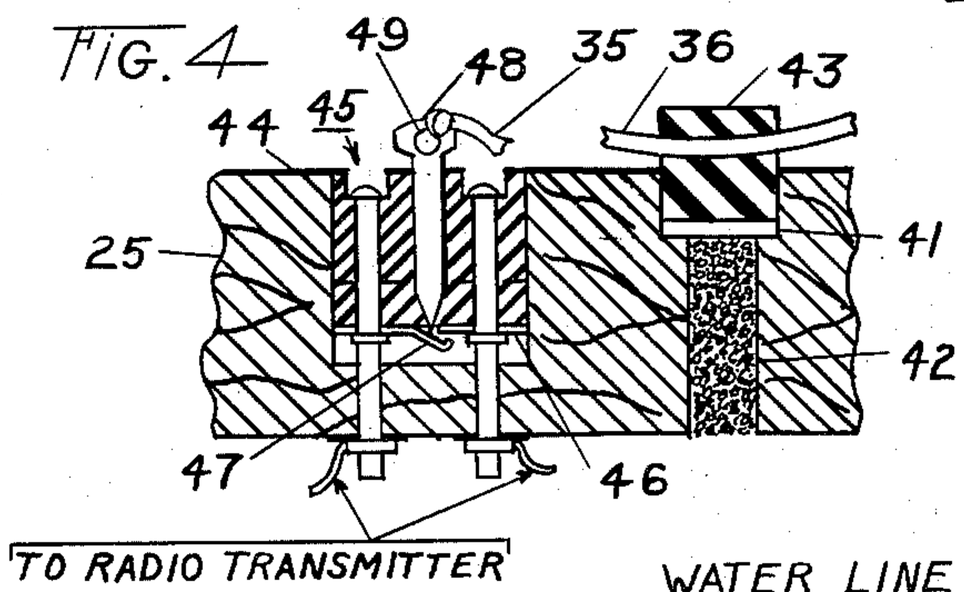

FIG. 4

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UNITED STATES PATENT OFFICE

2,629,083

EXPENDABLE RADIOSONIC BUOY

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Application September 21, 1944, Serial No. 555,154

6 Claims. (Cl. 340—2)

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This invention relates in general to signalling apparatus and is directed in particular to improvements in radio-sonic buoys.

Buoys of the class described are provided with a rather small radio transmitter unit and an antenna. Hung below the buoy in the water is a microphone which is electrically connected to the input of the radio transmitter. Any submarine signals picked up by the microphone function to modulate the radio transmitter and such modulated signals are broadcast to suitable receiver apparatus tuned to the transmitter frequency and located at a suitable station. The station which may be on shore, on aircraft, or on a vessel is thus warned of the presence of the submarine signals. The device has special utility in detecting the presence of submarines by picking up the sounds made by their propellers.

When these buoys are used in naval operations such as for example with convoys, it is highly necessary that steps be taken to prevent them from falling into the hands of the enemy. Accordingly, it has been the practice to provide the buoy with an air filled chamber sealed against the water by a water-soluble plug. Thus after a predetermined time in the water, the plug becomes completely dissolved, allowing water to enter the chamber to replace the air which was in it. The dimensions of the chamber are so selected that when it becomes filled with water, the buoy no longer has a positive buoyancy and consequently sinks to the bottom.

The general object of this invention is to provide a highly improved construction for a radio-sonic buoy of the type described which is particularly adapted to be launched into the water from aircraft by parachute.

One specific object is to provide a construction in which the water soluble plug above described is automatically readied for use when the buoy is launched.

Another specific object is to provide for automatically placing the radio transmitter in operative condition as the buoy is launched.

A further object is to provide a novel construction for cushioning impact of the buoy as it strikes the water.

Still another object is to provide a novel construction for the upper end of the buoy which serves a threefold function of supporting the parachute pack, enclosing and protecting the antenna, and insulating the latter from the water when the buoy is in floating position.

These and other objects of the invention will become more apparent from the detailed description to follow and from the accompanying drawings in which:

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Figs. 1A and 1B are elevation views, partly in section, showing the complete buoy prior to being launched from an aircraft;

Fig. 2 is an enlarged top plan view of the buoy shown in Figs. 1A and 1B.

Fig. 3 is an enlarged vertical section taken on lines 3—3 of Fig. 2;

Fig. 4 is an enlarged section taken on lines 4—4 of Fig. 2; and

Fig. 5 is a view showing the buoy during its descent.

Referring now to the drawings, the radio-sonic buoy includes a casing 10 which is essentially a hollow cylinder closed at the top and open at the bottom. Casing 10 which may be made of thin gauge metal sheeting or pressed paper is divided into upper and lower compartments 11 and 12, respectively by a watertight partition member 13 which may be made of wood.

A plurality of platforms 14, 15 and 16, superimposed upon each other and arranged transversely of the longitudinal axis of buoy casing 10 and located in the upper compartment 11, are adapted to support a radio transmitter unit. The transmitter unit preferred is of conventional construction operating on the well known principle of frequency modulation. The construction details of this unit form no part of this invention and hence in the interest of simplicity, it has not been shown in the drawings. Suffice to say for purposes of this invention, separable component parts of the transmitter unit are supported on each of the transverse platforms. These platforms may be resiliently mounted with respect to the buoy casing 10 by any well known mounting means such as, for example, rubber bushings (not shown).

Also disposed in the upper compartment 11 and located beneath the platform 14 is a considerable volume of crepe wadding 17 which is utilized to provide in part the proper amount of buoyancy for the complete buoy so that the latter will float in a vertical positon in the water with the water line just above the top of the casing 10. Another component of the total buoyant effect is provided by air which is releasably entrapped in compartment 11 by means which will be described hereinafter.

Disposed beneath the crepe wadding 17 is a battery pack 18 which supplies the necessary power for the radio transmitter unit.

The lower compartment 12 contains a hydrophone unit 19 that includes a cylindrical, sound

transparent casing, and within which is located a hydrophone. This hydrophone has an omnidirectional characteristic and hence detects any compressional wave energy which may be incoming from any direction around the underwater horizon.

The hydrophone per se may be of known construction such as, for example, the magnetostriction unit shown and described in application Serial No. 518,447, filed January 15, 1944, by Albert L. Thuras, now Patent 2,472,388.

It will be noted that the upper end of the casing of hydrophone unit 19 is provided with a tubular neck portion around which is coiled a considerable length of conductor cable 20 which electrically connects the hydrophone unit to the input of the radio transmitter unit. This neck portion is received by a centrally located depending boss 21 on partition 13. By this arrangement, the upper end of the hydrophone unit 19 is held firmly in position.

The construction of the casing for hydrophone unit 19 and its associated conductor cable 20 is more particularly described and claimed in application Serial No. 535,170, filed May 11, 1944, by Russell I. Mason et al.

At the bottom of the lower compartment 12 there is located a pressure operated release mechanism 22 which functions upon impact of the bottom of the buoy casing 10 with the water to release the hydrophone unit 19 from the position shown allowing it to drop out of casing 10 and descend through the water until conductor cable 20 has paid out. The pressure operated release mechanism 22 includes a spring 23 which bears against and holds the bottom end of hydrophone unit 19 firmly when it occupies the position shown in Fig. 1B. The details of construction of the release mechanism 22 form per se no part of this invention and are not claimed herein.

It will be noted that buoy casing 10 at the top of the lower compartment 12 is provided with two or more apertures 24. However, one such aperture may be sufficient. Apertures 24 serve as exhaust ports for the air that would otherwise be entrapped within compartment 12 when the buoy strikes the water in its vertical position, thereby reducing considerably the impact forces which are set up at such time.

The top wall of buoy casing 10 may be integral with the side wall but it is preferred that it be constituted by a wooden cap member 25 in which is provided a central opening 26 and through which is secured a threaded stud 27. A multi-seciton telescoping antenna 28 is utilized on the buoy and at the bottom of the outermost section there is welded or otherwise secured thereto a nut 29. The antenna is fixed in position on the buoy by screwing the nut 29 down upon stud member 27 in the manner shown in Fig. 3. A tube 31 of insulating material such as fibre surrounds antenna 28 and fits down into a recessed portion in the top of cap member 25. A much shorter and tapered tubular member 32, also of insulating material, fits within tube 31, and is internally threaded so as to enable it to be screwed down upon external threads provided on the outermost section of the telescoping antenna 28. However, if desired, tubes 31 and 32 may be integrated into a single tube.

Surrounding tube 31 is a parachute pack 33, at the bottom of which is located an annular member 34 which is adapted to make a press fit with respect to tube 31 so that the pack will be

held securely in position on tube 31 when in the position shown in Fig. 3.

The construction of parachute pack 33 per se forms no part of this invention and hence has not been shown in detail. However, it will be seen from Fig. 2 that the pack is provided with a plurality of pairs of shroud lines 35 and a static line 36. Each pair of the shroud lines is secured to cap member 25 by means of screws 37 and the static line 36 may be secured to the wall of casing 10 by gummed tape 38, see Fig. 1A.

To facilitate manufacture, parachute pack 33 and tube 31 may constitute a single unit which is then mounted in the position shown in Fig. 3 by slipping it over the telescoped antenna 28 which has previously been screwed into the position shown and then threading down tube 32 so that an external shouldered portion 39 on tube 32 presses down tightly against the top edge of tube 31. In this manner, antenna 28, tube 31 and parachute pack 33 are all secured firmly in position on cap 25 of the buoy casing 10.

Referring now to Figs. 2 and 4, cap member 25 of the buoy casing is provided with a stepped aperture 41 which is adapted to receive a water soluble plug 42 made of any suitable material such as carbowax. After the buoy has been dropped into the water, its buoyancy is such that it floats in a vertical position with the water line just above the top of cap 25. As the buoy remains in the water, the carbowax plug 42 gradually dissolves and, after a predetermined length of time, which depends upon the cross sectional area and length of plug 42, water will flow into the upper compartment 11 of the casing 10 through the opening 41, displacing the air in compartment 11. The buoy construction is such that this is sufficient to create a condition of negative buoyancy relative to the water with the result that the buoy will sink. This arrangement is provided to prevent the device from coming into the hands of the enemy after it has served its purpose. Prior to launching of the buoy, plug 42 is sealed against moisture by a stopper 43. This stopper contains a transverse opening through which is passed one of the parachute lines, preferably the static line 36. Thus just prior to launching, as the static line is pulled, stopper 43 will be automatically removed, readying plug 42 for its function.

Cap 25 is also provided with a recess 44 within which is received a switch 45. Switch 45 includes a fixed contact member 46, movable contact member 47 and a switch contact operator consisting of a pin 48 which when inserted to the position shown in Fig. 4 separates contact members 46 and 47.

It will be seen from Fig. 2 that one of the shroud lines to the parachute passes through an opening 49 in the pin 44. Consequently, when the buoy is launched and the parachute pack 33 opens, pin 44 will be pulled out from the position shown in Fig. 4 as the shroud line 35 tightens allowing switch contacts 46, 47 to close. This completes a circuit from the battery pack 18 to the radio transmitter unit and places the latter in an operative condition.

It is desired to point out that while in the preferred embodiment of the invention, the static line 36 is passed through stopper 43 and one of the shroud lines 35 is passed through switch pin 48 in order to place the buoy in service with the least possible number of separate operations, the same benefits may obviously be obtained by

using only the static line 36 or the shroud lines 35 for removing the stopper 43 and pin 48.

Operation

When it is desired to launch the radio sonic-buoy, the operator pulls the telescoped sections of antenna 28 outwardly to their extended position. He then breaks loose the static line 36 by tearing off tape 38. As previously explained, a pull on static line 36 removes stopper 43. Continued pull on line 36 then removes an outer protective casing around the parachute which thereby releases about a fifteen foot length of line which theretofore had been coiled within the outer protective casing. Now holding on to the loop at the end of static line 36 or otherwise securing it, the operator launches the buoy, as for example over the side of an aircraft. As the static line tightens, an inner protective cover around the parachute folds is pulled off, after which the static line is broken by means of a "weak link" and the parachute then unfolds to catch the air. As the parachute shroud lines 35 tighten, pin 48 will be pulled out thus automatically turning the radio transmitter on. The buoy then descends in a vertical position as shown in Fig. 5 and, as it strikes the water, the impact forces cause the release mechanism 22 to operate thereby releasing the hydrophone unit 19 from its position within compartment 12 and allowing it to drop down into the water below the buoy casing and there be suspended by the conductor cable 20.

As the buoy casing floats vertically in the water with the water line just above cap member 25, the parachute collapses around the insulator tube 31, the parachute having a central opening therein large enough to permit this.

If a submarine is in acoustic range of the hydrophone 19, the underwater compressional wave energy emitted by the submarine's propellers will be translated into electrical energy by the hydrophone and such energy will then be fed over conductor cable 20 into the input of the radio transmitter unit, causing the latter to send out frequency modulated signals. These signals are then picked up on a suitable receiver carried on the aircraft and the operator will then know that a submarine is located in the vicinity of the buoy.

When plug 42 has dissolved, water will enter the upper compartment 11 and the buoy will then sink leaving no trace.

In conclusion, while the described embodiment of this invention is to be preferred, it is to be understood that various changes may be made in the detailed construction without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus fully described our invention, we claim:

1. A radio-sonic buoy comprising a casing designed to be dropped towards the water in a vertical position, a partition member dividing said casing into upper and lower compartments, a radio transmitter unit in said upper compartment, and a hydrophone releasably supported within said lower compartment, said lower compartment being open at the bottom and being provided with at least one aperture through the casing wall to vent air as said buoy casing strikes the water and thereby lessen impact shock.

2. A buoy device adapted to be launched from aircraft comprising a casing, signalling apparatus in said casing, a parachute pack attached to said casing for dropping it into the water, a water soluble plug sealing an aperture in the buoy casing, said aperture being disposed below the water line of the casing and leading into a compartment normally having a gas entrapped therein, a stopper for sealing the top of said plug, and means connecting said stopper to a line of said parachute pack to effect its removal automatically.

3. A buoy device adapted to be launched from aircraft comprising a casing, signalling apparatus in said casing, a telescoping antenna connected to said signalling apparatus, means securing said antenna on said casing, an insulator tube surrounding said antenna, and a parachute pack surrounding and supported by said insulator tube, and designed so that when it is open and the antenna is extended the latter projects centrally through the opened parachute.

4. A buoy device adapted to be launched from aircraft comprising a casing, signalling apparatus in said casing, a telescoping antenna electrically connected to said signalling apparatus, means securing said antenna on said casing, an insulator tube surrounding said antenna when telescoped, means securing said insulator tube to said antenna, and a parachute pack surrounding and supported by said insulator tube.

5. In a buoy of the class described, a multi-section telescoping antenna the outer section of which is threaded at its upper end, means at the base of said antenna for securing it upon said buoy, an insulator tube surrounding said antenna, said tube being internally threaded for engagement with the threaded portion of said antenna to thereby secure said tube in position, and a parachute pack surrounding and supported by said insulator tube.

6. In a signalling device adapted to be launched from aircraft including a radio transmitter, a power supply unit therefor, and a parachute pack attached to said device, means for placing said radio transmitter unit in operative condition comprising, a switch having contacts connecting said power supply unit to said radio transmitter, a telescopic antenna electrically connected to said transmitter so as to transmit a signal when said transmitter is in operative condition, operating means for said switch contacts, and means connecting said switch contact operating means to a line of said parachute pack to effect automatic operation by opening of the parachute.

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