United States Patent

[11] 3,529,562

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[54] **SUBMARINE DISTRESS FLOAT**
13 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **114/16.5**, 9/9
[51] **Int. Cl.** **B63g 8/00**
[50] **Field of Search** 114/16, 16.4, 16.5; 9/9

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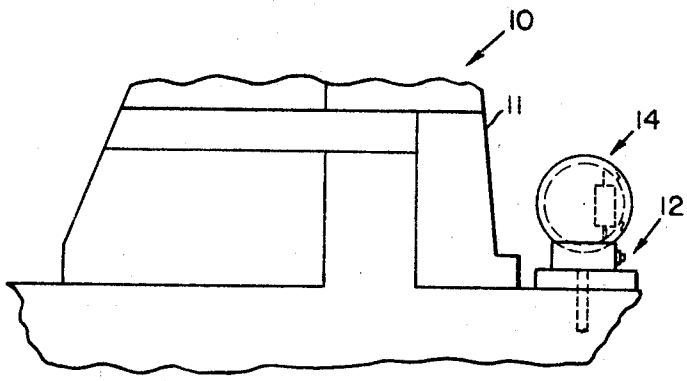
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ABSTRACT: An annular tower is fastened to the deck of a submarine just rearwardly of the sub's conning tower, and its bore is connected to a vacuum supply line. A hollow, buoyant, spherical float of aluminum alloy is releasably held by suction on the upper end of the tower, and contains a transmitter which immediately begins to transmit a distress signal, when the float is released from the tower, either by impact or by venting the tower bore. An adjustable valve in the side of the tower can be set to open and vent the tower automatically by water pressure, when the submarine dives beneath a preselected safe depth. Also, an electrically and/or manually-operated relief valve can be actuated at any time from within the sub to vent the tower and release the float. The transmitter antenna is connected to the float, which operates as an omnidirectional antenna.



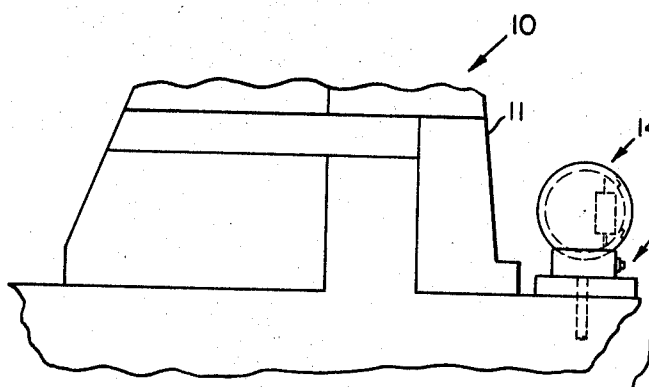


FIG. 1

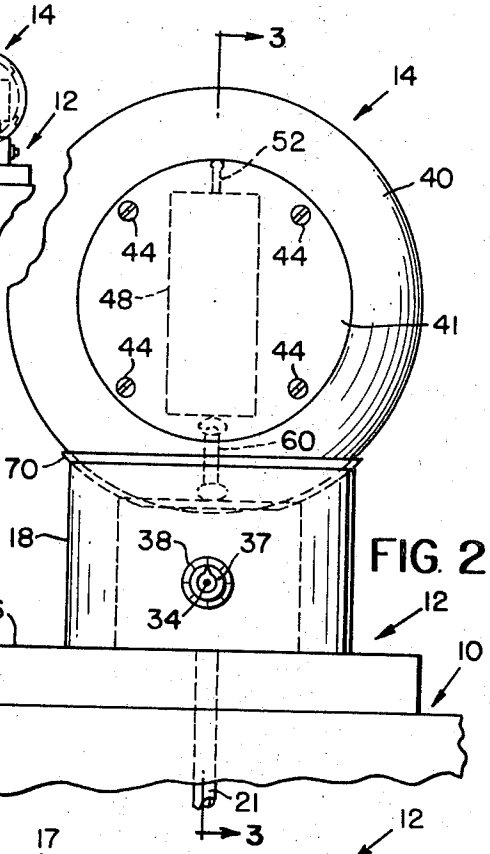


FIG. 2

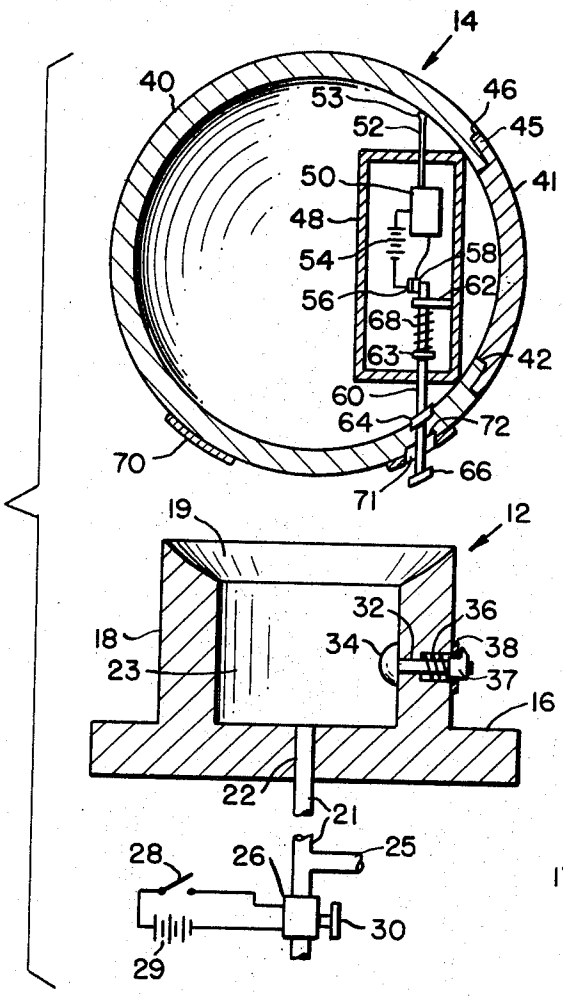


FIG. 3

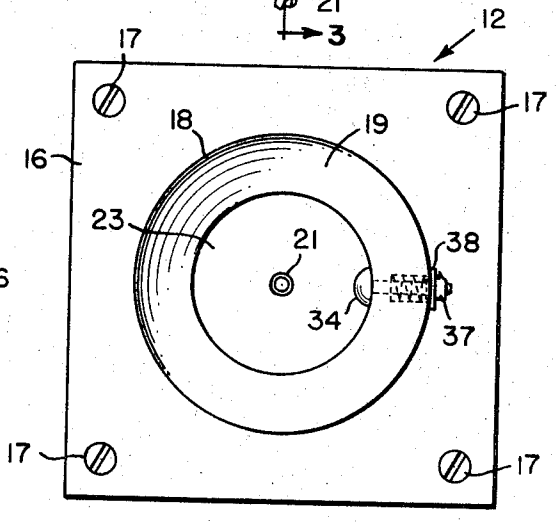


FIG. 4

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SUBMARINE DISTRESS FLOAT

This invention relates to submarines, and more particularly to a novel device for automatically providing a distress signal, when a submarine is disabled. Even more particularly, this invention relates to a buoyant distress float, which is automatically released when a submarine submerges below its safe operating depth.

Unlike the variety of submarines of World War I and II vintage, which had to surface every 24 or 48 hours to recharge their batteries, modern-day atomic submarines are capable of remaining submerged for extremely long periods of time, while travelling vast distances under water. With the increased operational ability afforded atomic-powered submarines, the problem of rapidly detecting the location of a submarine in distress has become more difficult. For example, since submarines often travel under radio silence, it is difficult for authorities to determine the exact location of a cruising submarine at any given instant. If such a submarine should meet with an accident, therefore, valuable time may elapse before the location of the disabled submarine is determined.

It is an object of this invention therefore to provide a novel submarine distress device, which will help to expedite the location of a disabled submarine, and will thus permit authorities to dispatch early aid, and avoid the need for instituting costly searches for the sub.

Another object of this invention is to provide a novel submarine distress device which is actuated automatically when a submarine has submerged below a predetermined safe depth.

A more specific object of this invention is to provide a novel submarine distress float, which is automatically released from a submarine by water pressure, when the submarine submerges beneath a predetermined depth.

A further object of this invention is to provide a novel float of the type described, which can be adjusted for automatic release at any one of a plurality of different, predetermined depths.

A still further object of this invention is to provide a float of the type described, which can be automatically or manually released from the submarine, and which automatically begins to transmit a radio signal upon its release from the submarine.

Another object of this invention is to provide a submarine distress float of the type described, which will be released automatically either when the submarine is involved in a collision, or when it submerges in water beyond a predetermined depth, which is considered safe for the particular craft.

Still a further object of this invention is to provide for a submarine a buoyant, surface marker, which is automatically releasable from a submarine in distress, and which transmits radio signals detectable by surface craft and aircraft alike.

Another object of this invention is to provide a distress float of the type described, which will record on a moving target indication (MT) radar.

Still a further object of this invention is to provide a novel float of the type described, which is compact, and easily adaptable to existing submarines.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims, particularly when read in conjunction with the accompanying drawing.

In the drawing:

FIG. 1 is a fragmentary side elevational view of a submarine having mounted thereon a distress float made in accordance with one embodiment of this invention;

FIG. 2 is an enlarged, fragmentary front elevational view of this float, and the mount therefor, as viewed when looking from the right end of the submarine as illustrated in FIG. 1;

FIG. 3 is an exploded, fragmentary sectional view taken along the line 3—3 in FIG. 2 looking in the direction of arrows, and illustrating schematically an electrical circuit for releasing the distress float from its mount on the submarine; and

FIG. 4 is a plan view of the cradle or mount which is used for releasably securing the float to the submarine.

Referring now to the drawing by numerals of reference, **10** denotes generally a submarine. Mounted on the deck of the submarine just rearwardly of its conning tower **11** is a novel distress device, comprising a stationary cradle or carriage **12**, and a buoyant distress float **14**, which is releasably supported on top of cradle **12**. Both the cradle **12** and float **14** are exposed to sea water, when the submarine **10** is submerged.

The cradle **12**, which is made from an aluminum alloy, has a rectangular base portion **16**, that is fastened to the hull of submarine **10** by bolts **17**. Projecting upwardly from the face of base **16** centrally thereof is an integral, annular tower **18**, which has formed on its upper end a segmental-spherical seat or recess **19** for accommodating the float **14** as described below. A pipe **21** is fastened at one end in a central opening **22** in the base **16** to communicate with the bore **23** in tower **18**, and at its opposite end extends into the interior of submarine **10**, where it communicates with a vacuum supply line **25** (FIG. 3), and an exhaust valve **26**.

Valve **26** is of the conventional variety, which can be operated either automatically by an electrical control circuit comprising, for example, a normally-open switch **28** and a battery power supply **29**; or the valve **26** may be operated manually by a conventional knob or handle **30**.

Mounted for movement between closed and open positions, respectively, in a radial port **32** in the annular wall of tower **18** is a conventional, adjustable spring-valve **34**. A spring **36**, which surrounds the valve **34** in a counterbore in the outer end of port **32**, normally maintains valve **34** in its closed position. A knob **37**, which is mounted on the outer end of valve **34** at the exterior of the tower **18**, can be rotated manually to adjust the tension in the spring **36**, and hence the corresponding water pressure that will be necessary to effect the opening of valve **34**. Knob **37** overlies a graduated dial plate **38**, which is fastened on the outside of tower **18** around the valve **34**. The face of plate **38** may be inscribed with indicia (letters or numerals) representing various depths for which the valve **34** can be set to open, and which may correspond, for example, to depths of from 200 feet to 1600 feet in 200 foot increments.

The float **14** comprises a hollow, water tight aluminum alloy sphere **40** having a circular hatch or cover **41**, which is removably and sealingly secured over an access opening **42** in the sphere by a plurality of bolts **44**. Hatch **41**, which is segmental-spherical in configuration, is also made from an aluminum alloy, and has a circumferential flange portion **45**, which seats sealingly in a correspondingly annular recess **46** formed around the outer end of opening **42**.

Bracketed or otherwise secured in any conventional manner in the sphere **40** adjacent opening **42** is a housing **48** containing a short wave signal transmitter **50**. This transmitter has an antenna **52**, which projects out of the top of the housing **22**, and which is connected as at **53** to the sphere **40**. Transmitter **50** is powered by a cadmium sulphide battery **54**, which is connected at one end to the transmitter, and at its opposite end to a stationary contact **56** in housing **48**. The transmitter **50** is also connected to a movable contact **58**, which is fastened to the inner end of a reciprocable plunger or trigger rod **60** for movement thereby into and out of electrical contact with the stationary contact **56**.

Rod **60**, which is mounted intermediate its ends to reciprocate in registering openings in the housing **48** and the sphere **40**, respectively, is slidably guided adjacent its inner end in a further opening formed in a stationary bracket **62** that projects laterally from the inside of housing **48** beneath the transmitter **50**. Intermediate its ends rod **60** has thereon a pair of axially spaced, circumferential shoulders **63** and **64**, which reciprocate, respectively, in the housing **48**, and in the space between the housing and the surrounding sphere **40**. On its outer end the rod **60** also has formed thereon an enlarged-diameter circular head **66**. A coiled compression spring **68**, which surrounds the inner end of rod **60** between its shoulder **63** and bracket **62**, constantly urges the rod **60** resiliently outwardly toward a signal-transmitting position in which the shoulder **64** engages the inside of sphere **40** (FIG. 3) to

prevent further outward movement of rod **60**. In this position the two switch contacts **56** and **58** are engaged so that the transmitter **50** is energized; and the head **66** on rod **60** is spaced downwardly or outwardly from the outside of sphere **40**.

Fastened to the outside of the sphere **40** to seat in the recess **19** in the upper end of the tower **18** when the float **14** is mounted on the cradle **12** as illustrated, for example, in FIGS. **1** and **2**, is a circular gasket **70**, which may be made of compressible rubber, or other suitable material. As shown more clearly in FIG. **3**, part of the gasket **70** registers with the rod **60**, and for this reason the gasket has therein an opening **71** just large enough to permit the head **66** of the rod **60** to pass through the gasket, and into a registering recess **72** in the outside of the sphere **40**, when the rod has been forced inwardly or upwardly to its retracted position, as described below.

In use, float **14** is lowered upon the upper end of the tower **18** so that the gasket **70** seats sealingly in the recess **19** in the upper end of the tower, as illustrated in FIG. **2**. As the float is lowered, the head **66** of rod **60** engages the upper end of tower **18**, so that the weight of the float causes rod **60** to be urged upwardly, or inwardly, until the head **66** passes through the opening **71** in the gasket **70**, and into the registering recess **72** formed in sphere **40**. This inward movement of rod **60** causes the movable contact **58** to disengage the stationary contact **56**, thereby deenergizing the transmitter **50**.

After the float **14** is seated on the tower **18**, the knob **37** on the spring valve **34** is rotated to adjust the valve setting to a depth corresponding to the maximum allowable depth to which the submarine **10** may safely submerge. Also at this time switch **28** and knob **30** should be inspected to make sure that the exhaust valve **26** is closed. A conventional valve (not illustrated) is then opened to connect the vacuum line **25** to a pump or other source of vacuum, thereby to evacuate air from the chamber formed in the tower bore **23** beneath the float **14**.

The vacuum thus created in bore **23** is sufficient to hold the float **14** releasably on the upper end of the tower **18** during normal maneuvers of the submarine, both above and below water. However, if the submarine should accidentally submerge in water beyond its safe diving depth, which is a depth greater than that for which the valve **34** has been previously set, then the pressure of the water at the exterior of the tower **18** will cause the valve **34** to open. This releases the float **14** and permits it to rise to the surface of the water by reason of its inherent buoyancy. When float **14** is released from the tower **18**, the spring **68** will cause the rod **60** to be advanced outwardly (FIG. **3**), thereby closing or engaging the switch contacts **56** and **58**, and energizing the transmitter **50**. Since over one half of its volume rises above the surface of the water, when it is floating, the float **14** is readily detectably by conventional radar; and since the sphere **40** is made of aluminum alloy, it will readily attract attention by reason of its light-reflective qualities. Moreover, since the sphere **40** functions as a conductor, it will act as an omnidirectional antenna, which will continuallly broadcast a distress frequency signal that is audible to ship and aircraft receivers within a radius of over 25 miles.

Although the valve **34** provides automatic means for releasing the float **14**, when the submarine dives below its maximum allowable depth, it may be desirable for the submarine commander, or the like, to effect release of the float at a diving depth other than that for which the valve **34** is set. Under such circumstances, either the switch **28**, or the manually operable knob **30**, may be used to open the exhaust valve **26** to vent the chamber **23** in the tower **18** beneath the float **14**, thereby to release the float. Both the switch **28** and knob **30**, of course, may be mounted in any convenient location either inside or outside of the submarine, as desired.

There is a fourth manner in which the float **14** can be released automatically from the tower **18**, and this may occur when the submarine is involved in a crash stop, as for example, when it is involved in an accidental collision. Under such circumstances, the inertia of the float **14** will cause it to be dislodged from the top of the tower **18**, so that if the submarine should sink as a result of the collision, the float will be free to float on the surface of the water above the site of the sunken submarine.

From the foregoing it will be apparent that applicant has developed a relatively simple, compact and reliable distress float for use in submarines and other like underwater craft. By proper adjustment of the knob **37**, the pressure-responsive spring valve **34** can be set to open at any one of a plurality of different, predetermined depths, to release the float **14**, which will immediately begin to transmit distress signals. Alternatively, the float can be released by electrical or mechanical operation of the release valve **26**; or can be jarred loose from the tower **18** in the event that the submarine is involved in a collision. Moreover, in view of its spherical shape, the aluminum alloy sphere **40** functions as an excellent omnidirectional antenna for the transmitter **50**. Also, the removable hatch or cover **41** provides ready access to the interior of the sphere **40** in order to service or replace any of the parts contained therein.

Although it is possible that, upon being released, the float **14** will be carried by wind and currents away from a point directly above the disabled submarine, the search area nevertheless can be accurately defined by simple current-wind corrections.

I claim:

1. A submarine distress device, comprising:

a hollow support adapted to be secured to the hull of a submarine, and having an opening in one end thereof;

a buoyant, metal float mounted on said support over said opening;

a radio-transmitter mounted in said float and having an antenna operatively connected to the wall of said float;

means for releasably securing said float on said support, including an adjustable, pressure-responsive valve mounted in the wall of said support and operative in response to the application of predetermined water pressure thereagainst automatically to release said float, when the submarine submerges in water below a predetermined depth; and

switch means on said float positioned for engagement with said support normally to deenergize said transmitter when said float is mounted on said support, and operative automatically to energize said transmitter to commence the transmission of a distress signal therefrom, when said float is released by said securing means.

2. A submarine distress device, comprising:

signal distress means;

means for releasably securing said distress means to the deck of a submarine, and operative automatically to release said distress means, when the submarine submerges in water below a predetermined depth;

means on said distress means operative automatically to commence the transmission of a distress signal, when said distress means is released by said securing means;

said distress means comprising a buoyant float;

said securing means comprising a support adapted to be fastened to the hull of a submarine, and having therein a chamber open at one end;

means for releasably and sealingly mounting said float on said support over the opening in said chamber; and

means for connecting said chamber to a source of vacuum to evacuate air from said chamber, when said float is mounted over said opening, thereby to hold said float on said support by suction.

3. A submarine distress float as defined in claim **2**, including:

a normally-closed, pressure-responsive valve mounted in a port in said support to communicate at one end with said chamber and at its opposite end with the exterior of said support; and

said valve being responsive to the application of a predetermined water pressure on said opposite end thereof to open and vent said chamber.

4. A submarine distress float as defined in claim 3, including means for adjusting said valve to open at any one of a plurality of different pressures.

5. A submarine distress float as defined in claim 3, including a second valve connected with said chamber and operable manually to vent said chamber independently of the first-named valve.

6. A submarine distress float as defined in claim 2, wherein:

said float comprises a hollow, metal body;

said transmission means comprises a radio transmitter mounted within said body; and

switch means on said body is positioned for engagement with said support normally to deenergize said transmitter, when said float is mounted on said support, and to energize said transmitter, when said float is removed from said support.

7. A submarine distress device comprising:

signal distress means;

means for releasably securing said distress means to the deck of a submarine, and operative automatically to release said distress means, when the submarine submerges in water below a predetermined depth;

means on said distress means operative automatically to commence the transmission of a distress signal, when said distress means is released by said securing means;

said distress means comprising a buoyant float;

said securing means comprising a support for said float adapted to be fastened to the exterior of a submarine, and having therein a chamber open at one end;

said float comprising a hollow body mountable on said support over the open end of said chamber to seal the opening therein;

means for connecting said chamber to a vacuum source to evacuate air from said chamber, when said body is mounted on said support, thereby releasably to retain said body on said support by suction;

said signal transmission means comprising a radio transmitter mounted in said body; and

a switch connected in circuit with said transmitter, and engageable with said support to deenergize said transmitter, when said body is mounted on said support, and disengageable from said support to energize said transmitter, when said body is removed from said support.

8. A submarine distress device as defined in claim 7, including:

a first, normally-closed valve connected to said chamber, and responsive to water pressure at the exterior of said support automatically to open and vent said chamber, when the water pressure exceeds a predetermined value; and

a second, normally-closed valve connected to said chamber and operable manually, and independently of said first valve, to vent said chamber.

9. In combination with a submarine:

a support fastened to the exterior of the submarine, and having therein a chamber open at one end;

a hollow, buoyant float releasably mounted on said support over the open end of said chamber;

means interposed between said support and said float to seal said opening in said chamber, when said float is positioned thereover;

means for connecting said chamber to a vacuum source in the submarine to evacuate air from said chamber thereby releasably to hold said float on said support by suction, when the submarine submerges in water;

a radio transmitter mounted in said float;

switch means connected in circuit with said transmitter and operative to deenergize said transmitter, when said float is mounted on said support, and operative to energize said transmitter, when said float is removed from said support; and

normally-closed, pressure-responsive valve means connected to said chamber and operative, when the submarine dives in water below a predetermined depth, automatically to open and vent said chamber thereby to release said float from said support.

10. The combination as defined in claim 9, wherein:

said float comprises a hollow, metal sphere; and

an antenna on said transmitter is connected to said sphere to transmit signals therefrom omnidirectionally.

11. The combination as defined in claim 10, wherein:

said sphere has a segmental-spherical cover removably and sealingly secured over an opening in the sphere;

said means for sealing said opening in said chamber comprises an annular, resilient gasket secured to the exterior of said sphere; and

said support has a recess formed therein around said opening in said chamber to accommodate said gasket, when said float is mounted on said support.

12. The combination as defined in claim 11, wherein said switch means comprises:

a stationary contact mounted in said sphere;

a rod mounted intermediate its ends in a hole in said sphere for limited reciprocation between a retracted position in which the outer end of said rod is disposed substantially flush with the outer surface of said sphere, and an extended position in which said rod projects beyond the outer surface of said sphere;

a second contact movable by said rod into engagement with said first contact to energize said transmitter, when said rod is in its extended position, and movable out of engagement with said first contact to deenergize said transmitter, when said rod is in its retracted position;

resilient means urging said rod toward its extended position; and

said rod being positioned to have its outer end engage said recess in said support, thereby to be urged into its retracted position by said support, when said sphere is mounted on the support.

13. The combination as defined in claim 10, wherein said valve means comprises:

a valve mounted in a port in said support to communicate at its inner end with said chamber and at its outer end with the exterior of said support;

a spring interposed between said valve and said support normally to hold said valve resiliently in its closed position; and

a knob adjustable from the exterior of said support to adjust the tension in said spring, thereby to adjust the water pressure necessary to open said valve.