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SELF-SEALING LANYARD DEVICE

Filed May 3, 1960

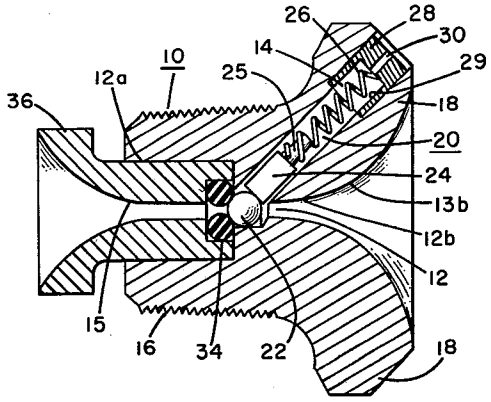

FIG. 1

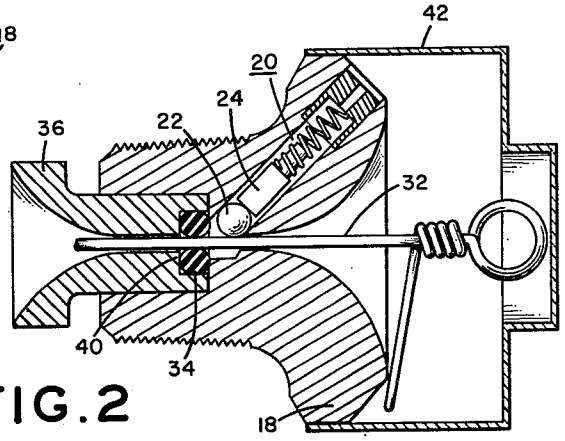

FIG. 2

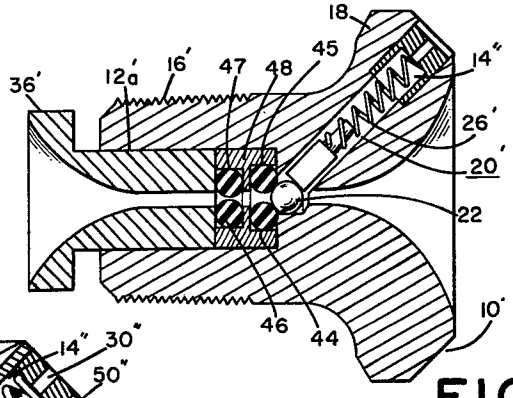

FIG. 3

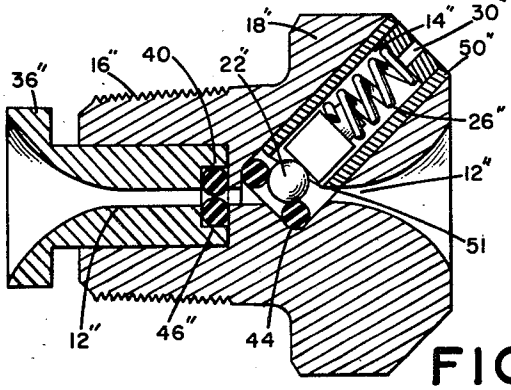

FIG. 4

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SELF-SEALING LANYARD DEVICE

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The present invention relates generally to a lanyard device adapted to be employed in underwater missiles to provide a fluid tight barrier in such missiles. The invention enables a trigger wire to pass through such barrier and into the interior of the missile, while maintaining the fluid tight integrity of the missile system. The trigger wire can be completely withdrawn, for instance while the missile is submerged, without causing ambient fluids to pass through and beyond the fluid tight barrier into the missile.

The device finds application where it is necessary to actuate internal devices within a submerged missile. The withdrawal of the trigger wire imparts a force upon a missile component designed to actuate a sequence of events. For instance, torpedo batteries may be energized by causing the trigger wire to pierce a pressurized gas container connected to an electrolyte container, whereby pressure in the latter container is increased so as to permit the flow of the energizing fluid into the battery to activate the latter.

It is the primary object of this invention to provide a device of the character described adapted to be secured to a missile shell to prevent the penetration of fluid into the interior of the missile while the trigger wire is secured to the missile, or upon withdrawal thereof.

It is another object of the invention to enable a complete disconnection of the trigger wire from the missile shell without affecting the fluid tight integrity of the missile, thereby avoiding disadvantages which commonly arise when the trigger wire is only partly withdrawn and protrudes beyond the missile shell.

The objects of the invention are accomplished by providing a lanyard device, which includes a body having a central hollow passageway and a second hollow passageway extending angularly from and connecting to the central passageway, a trigger wire extends through the central passageway and is at least partly removable therefrom, an annular seal means forms an axially extending aperture and the seal means is disposed within the central passageway and is arranged therein to surround sealingly the trigger wire, plunger means is movably disposed within the second passageway, and spring means pressuringly engages and biases the plunger means toward the central passageway and when the trigger wire is withdrawn biases the plunger means against the seal means and partly into the aperture of the seal means to effect a fluid barrier within the central passageway.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

FIGURE 1 is a longitudinal section of a lanyard device in accordance with the invention;

FIGURE 2 is a view similar to FIGURE 1, illustrating a trigger wire in position; and

FIGURES 3 and 4 are views similar to FIGURE 1, showing a modified sealing arrangement.

Like reference characters refer to like parts in the several figures of the drawings and a prime mark has been added to distinguish same.

Referring now to FIGURES 1 and 2 of the drawing, reference number 10 denotes a body portion forming a

hollow central passageway 12, and a hollow second passageway 14 diagonally extends from and connects to the central passageway 12. The second passageway 14 contains a plunger assembly 20 therein, and a lanyard wire 32 is extended through the central passageway and is sealingly surrounded by an O-ring 34 carried by a retainer 36, the latter being secured to the body portion 10. A rigid ball 22 of plunger assembly 20, is urged against the O-ring seal 34 upon removal of the lanyard wire 32.

The body portion 10 is preferably constructed of stainless steel, or of other suitable materials having non-corrosive qualities. The body portion 10 is substantially cylindrical and an external thread 16 is provided at one end to secure the same to a torpedo body (not shown). The opposite end 18, of the body 10, is outwardly flanged to enable an angular arrangement of the second passageway 14, with respect to the central passageway.

The plunger assembly 20, secured within the second passageway 14, is comprised of a rigid ball 22 preferably made of stainless steel, and a cylindrically shaped piston 24, of stainless steel or other non-corrosive materials such as nylon, is adapted to slide within the second passageway 14. The piston end 25 is recessed to coaxially receive a compression spring 26. One end of the spring 26 engages the piston 24 to bias the latter toward the central passageway, and the opposite end of the spring reacts against a stationary stopper 28 fixedly secured within the passageway by means of a press fit. The stopper 28 is cylindrical and formed of a non-corrosive material and is axially bored to provide an annular chamber 29 to receive spring 26, and a narrow central conduit 30 extends from the annular chamber 29 outwardly to relieve the water pressure that may build up within the second passageway during operating conditions.

The central passageway 12 is formed by bore sections 12*a* and 12*b*, and a retainer 36 is fixedly carried in bore section 12*a* of the passageway by means of a press fit. The retainer 36 is substantially cylindrical and is formed of stainless steel. A central bore 15 of the retainer registers with the bore 12*b* of the central passageway to permit the trigger wire 32 to be inserted therethrough and the retainer provides an axial recess 40 to carry an O-ring 34, of resilient and deformable material such as rubber, therein.

FIGURE 2 illustrates the subject device in assembled condition. Trigger wire 32 is partially carried within the central passageway 12 and O-ring 34 is positioned to sealingly surround the wire 32 to effectively provide a fluid barrier at that junction. While a straight trigger wire 32 is illustrated in the drawing, the flared openings 13*a*, 13*b* provided at opposite ends of the passageway 12, as shown in the drawing, permit bending of the wire without unduly harming the latter by nicking or breaking the same at the edges of the device. A plastic cover 42 may be suitably wrapped around the flanged section 18 of the body portion to protect the device during non-use.

While in assembled condition, as shown in FIGURE 2, the plunger 24, urged by spring 26, forces the ball 22 against the trigger wire 32, it is readily apparent that upon removal of the wire the ball is positioned within the central passageway in such a manner that the axial center of the rigid ball 22 is in substantial axial alignment with the longitudinal center line of the central passageway and/or the axial center of the O-ring 34, as shown in FIGURE 1.

In operation, and more particularly when the missile is substantially submerged in water, forces act upon the rigid ball 22 snugly pressing the same partially into the central opening provided by O-ring seal 34. While the force exerted by spring 26 is sufficient to sealingly detain the rigid ball 22 against the O-ring, the ambient pressure of the water exerts additional force against the ball to

keep the same in place. The exposure of the ball to the water pressure has the advantage, that, as the water pressure increases with increased depth, the ball is biased with a correlative increase in force against and partly into the opening of the O-ring. This occurs because under such operating conditions a pressure differential exists between the water pressure and the pressure in the interior of the device.

In FIGURE 3 there is shown a plunger assembly 20' urging a rigid ball 22' toward and against O-ring 44 carried within axial bore 45 of a cylindrical brass sleeve member 48. Vertically parallel, but in spaced relation to the O-ring 44, there is disposed an O-ring 46 within another axial bore 47, provided in the cylindrical sleeve 48. To secure the sleeve 48, retainer 36' is carried within axial bore 12*a*' of body portion 10' rigidly engaging the sleeve 48. For comparison it should be observed, that the function of O-ring 34, as illustrated in FIGURES 1 and 2, and aforementioned, is to sealingly surround the trigger wire 32 and upon removal of the wire the O-ring sealingly receives the ball 22.

A further modification is shown in FIGURE 4, O-ring 46'' is adapted to sealingly surround the horizontally disposed trigger wire and the O-ring 46'' is carried within the axial bore 40'' of retainer member 36'', the retainer is of similar construction as illustrated in FIGURE 1.

The hollow passageway 14'' is dimensioned to receive the O-ring 44'' therein, and the passageway 14'' extends partially into the central passageway 12'' enabling O-ring 44'' to be angularly seated with respect to the central passageway 12'' and permitting the trigger wire to be horizontally extended therethrough. A hollow cylindrical brass sleeve 50 is inserted into the second passageway 14'' with a press fit to limit the movability of the ball 22'' within the passageway, the wall edges 51 of cylindrical sleeve 50 are machined in a manner so as to align the wall edges 51 with those of the central passageway, to avoid an obstruction to the insertion of the lanyard wire through the central passageway. The O-ring 44'' sealingly receives ball 22'', however, the inside diameter of the O-ring is not adapted to sealingly surround the lanyard wire 32''.

The present invention permits water to flow reasonably freely from the mouth of the central passageway into the second passageway, and vice versa, by by-passing the piston 24'' and flowing through conduit 30'', whereby the pressure is equalized so as not to impede the function of spring 26''.

While there have been described what at present are considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is aimed, therefore, in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim as our invention:

1. A lanyard device comprising in combination, a body having a central hollow passageway and a second hollow passageway diagonally extending from said central passageway; a ball movably disposed within said second passageway; slidable piston means abutting against said ball; spring means within said second passageway pressuringly engaging said piston means to urge said ball into said central passageway; a trigger wire extending through said central passageway and being at least partly removable therefrom; annular seal means within said central passageway constructed and arranged to sealingly surround said trigger wire; and second annular seal means within said central passageway having a central opening to sealingly receive at least portions of said movable ball.

2. A lanyard device according to claim 1, and a retainer means carried at least partly within said body and having a passageway registering with said central passageway, said retainer means securing at least one of said annular seal means within said central passageway.

3. A lanyard device comprising, in combination: a body having a central hollow passageway and a second hollow passageway extending angularly from and connecting to said central passageway; a trigger wire extending through said central passageway and being at least partly removable therefrom; annular seal means forming an axially extending aperture and disposed within said central passageway and arranged therein to surround sealingly said trigger wire; plunger means movably disposed within said second passageway; and spring means pressuringly engaging and biasing said plunger means toward said central passageway and when said trigger wire is withdrawn biasing said plunger means against said seal means and partly into the aperture of said seal means to effect a fluid barrier within said central passageway.

4. A lanyard device according to claim 3, and a retainer means detachably secured to said body and having a hollow passageway registering with said central passageway, one end of said retainer means abutting against said annular seal means.

5. A lanyard device according to claim 3, wherein said seal means is constituted by a first and a second O-ring, said first O-ring being constructed and arranged to receive axially said trigger wire and said second O-ring being adapted to receive axially said plunger means when said trigger wire is withdrawn from said passageway.

6. A lanyard device comprising, in combination: a body having a central hollow passageway and a second hollow passageway extending angularly from and connecting to said central passageway; a trigger wire extending through said central passageway and being at least partly removable therefrom; annular seal means forming an axially extending aperture disposed within said central passageway and arranged therein to surround sealingly said trigger wire; a ball movably disposed within said second passageway; slideable piston means abutting against said ball; spring means pressuringly engaging said piston means to cause said last named means to movably engage the ball and to push said ball toward said central passageway and when said trigger wire is withdrawn biasing said ball against the seal means and partly into the aperture of said seal means to effect a fluid barrier within said central passageway.

References Cited in the file of this patent

UNITED STATES PATENTS

2,264,600	Webb	Dec. 2, 1941
2,610,766	Ogle	Sept. 16, 1952
2,961,959	Van Billiard	Nov. 29, 1960