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HYDROSTATIC PRESSURE SWITCH

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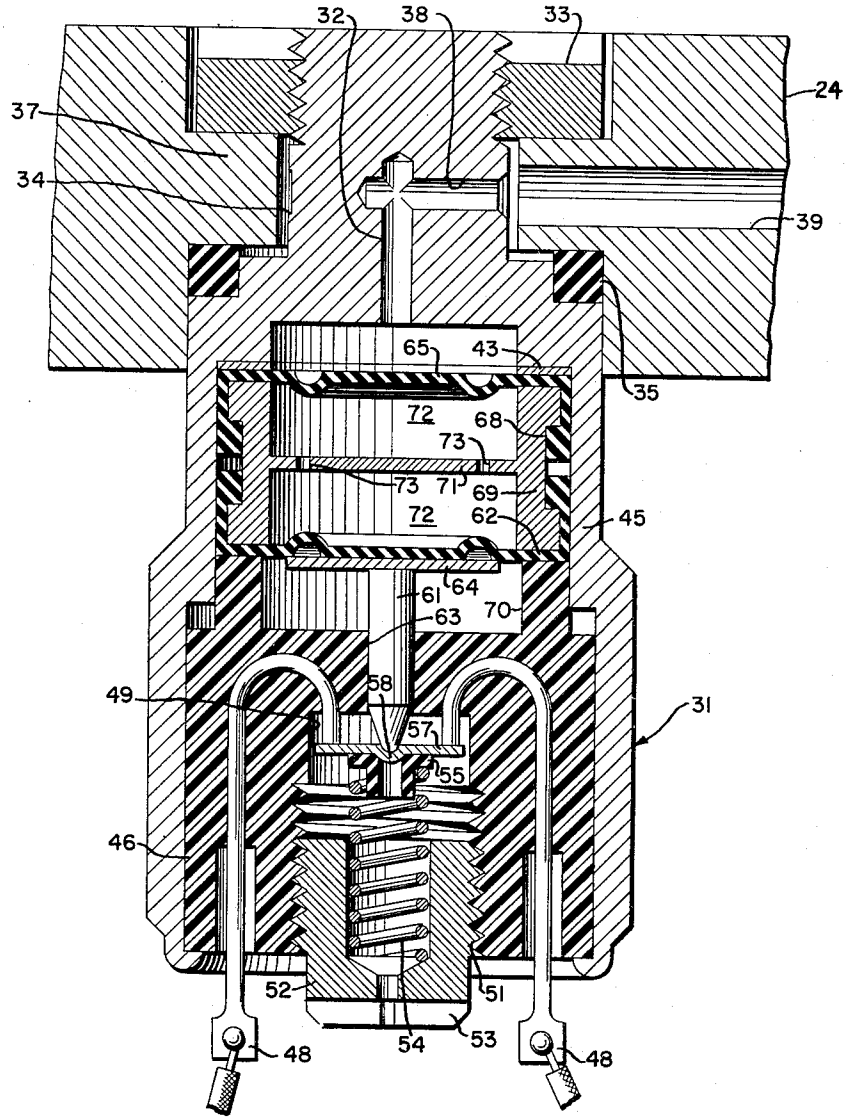

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HYDROSTATIC PRESSURE SWITCH

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Original application October 17, 1947, Serial No. 780,562. Divided and this application September 17, 1954, Serial No. 456,890

1 Claim. (Cl. 200—83)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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.

This invention relates generally to hydrostatic depth responsive switches and more particularly to a switch of this character which is adapted for use with a marine device and further adapted to be actuated in response to a predetermined hydrostatic pressure exerted by the surrounding water.

Such a switch is particularly well adapted for use in an exploder mechanism for a torpedo such, for example, as the torpedo exploder mechanism disclosed and claimed in the copending application of James M. Kendall and George A. Henderson, Serial No. 780,562, filed October 17, 1947, for Torpedo Exploder Mechanism, this application being a division thereof.

The hydrostatic switch of this invention is intended for use in an exploder mechanism for a homing type torpedo where safety considerations require the incorporation of a device to render the exploder mechanism ineffective so long as the torpedo remains below a predetermined depth of submergence. Thus the switch disclosed herein would prevent destruction of an object submerged below a predetermined depth should the torpedo, accidentally or otherwise, home thereon.

It is an important object of the invention, therefore, to provide a new and improved depth responsive switch.

Another object is to provide a new and improved hydrostatic depth responsive switch adapted to be operated in response to a predetermined hydrostatic pressure of surrounding water on a torpedo.

A further object is to provide a hydrostatic depth responsive switch which is adapted to be mounted as a part of an exploder mechanism of a torpedo.

A still further object is to provide a hydrostatic depth responsive switch which has the desired qualities of ruggedness, compactness, effectiveness in operation, simplicity of construction, and with a minimum number of moving parts.

Still other objects, advantages, and improvements will be apparent from the following description taken in connection with the accompanying drawing, which is a sectional view of a hydrostatic depth responsive switch in accordance with the invention and illustrating the manner of mounting.

Referring now to the drawing, a hydrostatic switch in accordance with this invention, generally designated 31, is secured to a supporting base 24, preferably by means of a locking ring 33 in threaded engagement with shank 34 in which shank water inlet port 32 and radial bore 38 are formed, the shank projecting through an opening with a flange 37 in the base and a ring gasket 35 being interposed between the switch and internal flange 37 to form a watertight seal therebetween. Radial bore 38 is in communication with the surrounding water by way of radial bore 39 in supporting base 24.

Shank 34 is integrally formed with an enlarged tubular casing 45 within which is arranged a diaphragm assembly comprising a pair of flexible diaphragms 62 and 65 and a tubular spacing member 69 therefor having a dividing wall 71. The diaphragm assembly is urged against a cushioning gasket 43 by an insert 46, formed of any suitable phenolic material, and secured within casing 45 by crimping the ends thereof, substantially as shown. Bore 49 in the insert forms a chamber into which extend a pair of spaced J-shaped terminals 48 which preferably are molded in the insert. Bore 49 is closed by an adjustable cup-shaped screw 52 which forms a seat for a coil spring 54. Adjustable screw 52 is in threaded engagement at 51 with bore 49 and is provided with a slot 53 in the outer end thereof for conveniently receiving a tool for adjustment.

The other end of spring 54 is seated on a flanged tubular bushing 55 formed of electrical insulating material. The bushing forms an abutting surface between spring 54 and an electroconducting disk 57 which is yieldably urged into contact with terminals 48 by the spring, the disk being adapted to bridge the terminals and connect them together electrically when in engagement therewith. Disk 57 is axially offset as at 58 to provide a seat for the pointed end of a piston rod 61, the projection resulting from the offset forming a means for centering bushing 55 on the disk. Piston rod 61 is slidably supported within a reduced bore 63 in insert 46, and has a head 64 secured thereto at the opposite end thereof, head 64 being arranged in abutting relation with diaphragm 62 whereby the pressure of the surrounding water applied to the diaphragm assembly is imparted to disk 57. The insert is provided with an enlarged bore 70 to permit axial movement of head 64 therein.

Spacing member 69 of the diaphragm assembly is formed with an annular groove 68 whereby diaphragms 62 and 65, which are formed substantially C-shaped in cross section, may be mounted on the spacing member in interfitting and fluid tight relation therewith and form with dividing wall 71 a pair of chambers 72 hermetically sealed from without.

Dividing wall 71 in member 69 is provided with orifices 73 therethrough whereby the flow of fluid between the pair of chambers 72 is restricted as the diaphragms are flexed. This provides a dash pot arrangement which suppresses such movement of parts as would cause opening of the switch in response to sudden shocks resulting, for example, from impact of the torpedo with a target vessel. A suitable fluid having a flat viscosity characteristic with temperature such, for example, as 35 centistoke silicone oil may be employed and may be filled in any suitable manner which renders the fluid free of air bubbles and air pockets.

From the foregoing, it is apparent that surrounding water is free to enter casing 45 by inlet port 32 and thereby apply the ambient hydrostatic pressure to diaphragm 65, causing an inward flexing thereof and transferring the hydrostatic pressure against spring urged piston rod 61 by way of fluid filled chambers 72 and diaphragm 62. Thus, when a predetermined hydrostatic pressure corresponding to a predetermined depth of submergence and determined by initial spring rate of spring 54 and adjustment of screw 52 is applied to diaphragm 65, piston rod 61 is moved against the opposing force of spring 54 to move contact disk 57 out of engagement with terminals 48 and thereby interrupt an electrical circuit including switch 31.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

In a pressure responsive switch of the character disclosed, in combination, a casing, an insert within said casing, a pair of electroconducting terminals fixedly supported in said insert in mutually spaced insulated relation, a movable element of electroconducting material in said insert for bridging said terminals and connecting them together electrically when in engagement therewith, yieldable means operatively connected with said element for holding the element in engagement with said terminals, means forming a hermetically sealed chamber in said casing adjacent said insert, said chamber being filled with fluid and having a pair of spaced diaphragms of flexible material, means for applying pressure to one of said diaphragms to flex the same inwardly, said fluid serving to transmit the pressure and flex the other of said diaphragms outwardly, and force-transmitting means supported for movement in said insert, said last-named means operatively connecting said last-named diaphragm with said movable element and adapted to force the element out of engagement with said terminals in response to outward flexing of the last-named diaphragm and thereby break the electrical connection between the terminals, said force-transmitting means comprising a rod supported for sliding movement in a bore in said insert, said rod

having a pointed end, said element having an axially offset portion which provides a depression on one side of the element and a projection on the other side of the element, the pointed end of said rod being received in said depression, and said yieldable means comprising a coil spring, a flanged bushing in one end of said spring, said projection being received in said bushing, and a cup-like member in threaded engagement with said insert, the other end of said spring being received in said member, turning of said member with respect to the insert providing for adjustment of the spring, and said offset portion serving to hold the element centered with respect to the rod and bushing.

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