July 30, 1946. L. G. BOSTWICK 2,404,786

MOISTURE CONTROL IN AN ELECTROMECHANICAL DEVICE

Filed Sept. 15, 1942 2 Sheets-Sheet 1

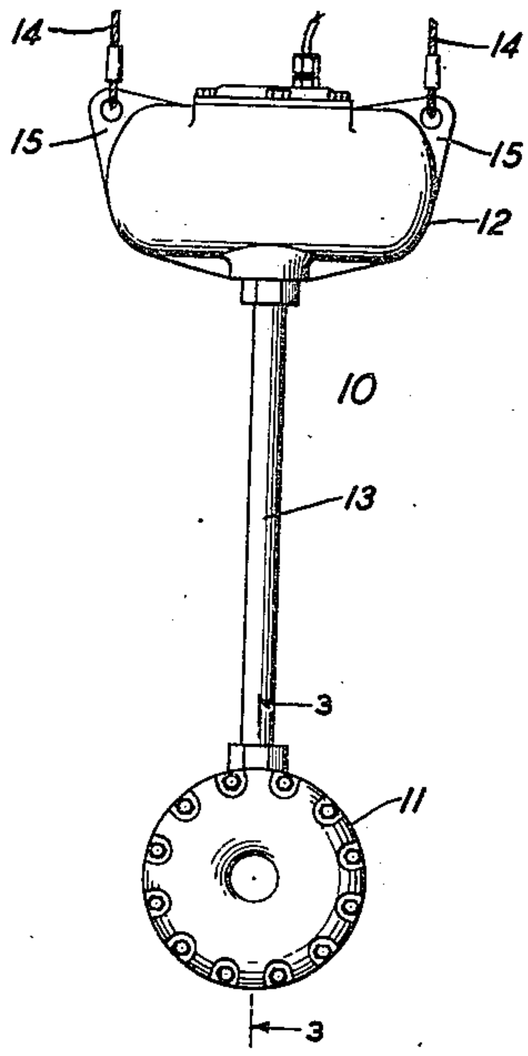

FIG. 1

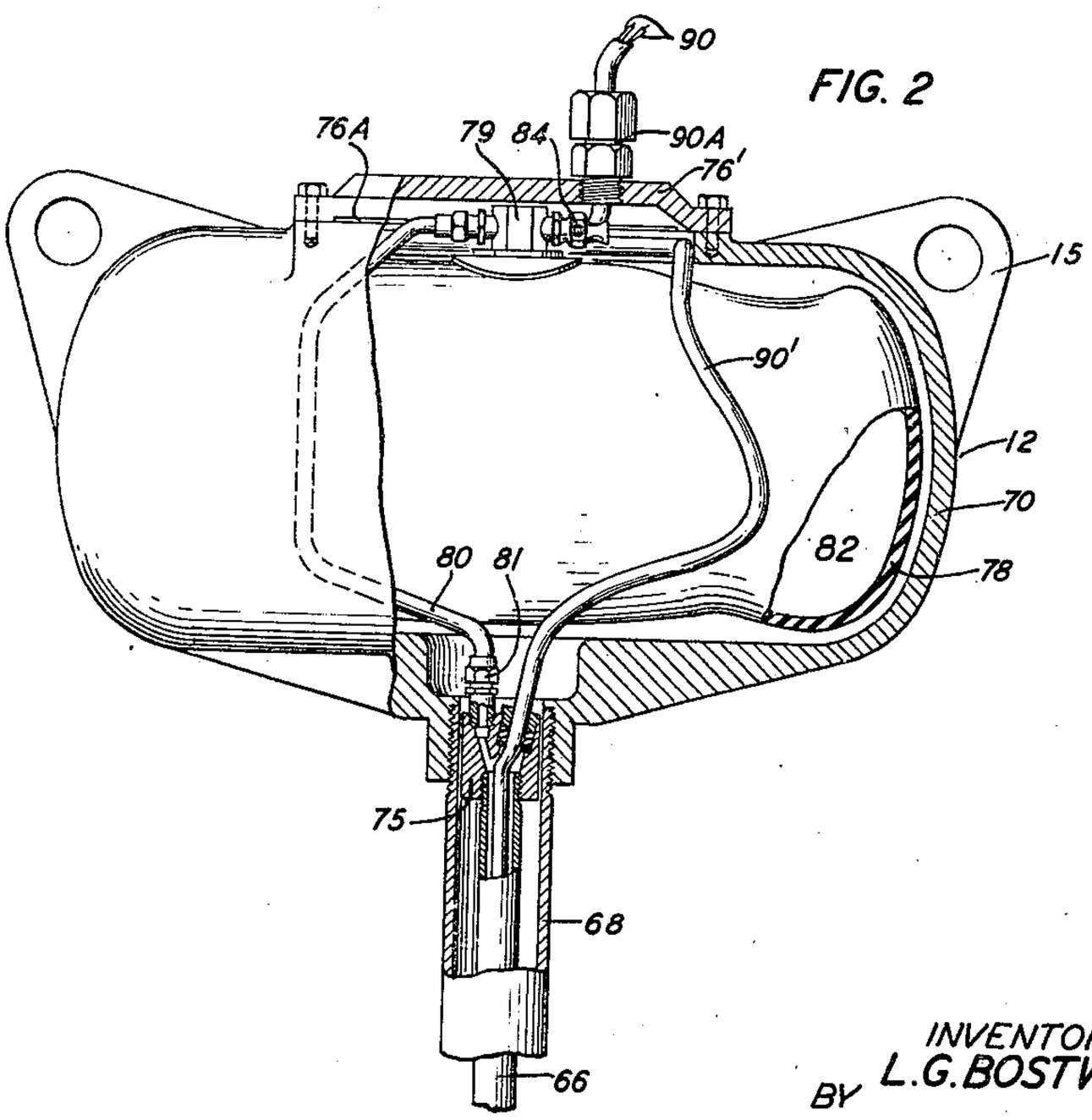

FIG. 2

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FIG. 3

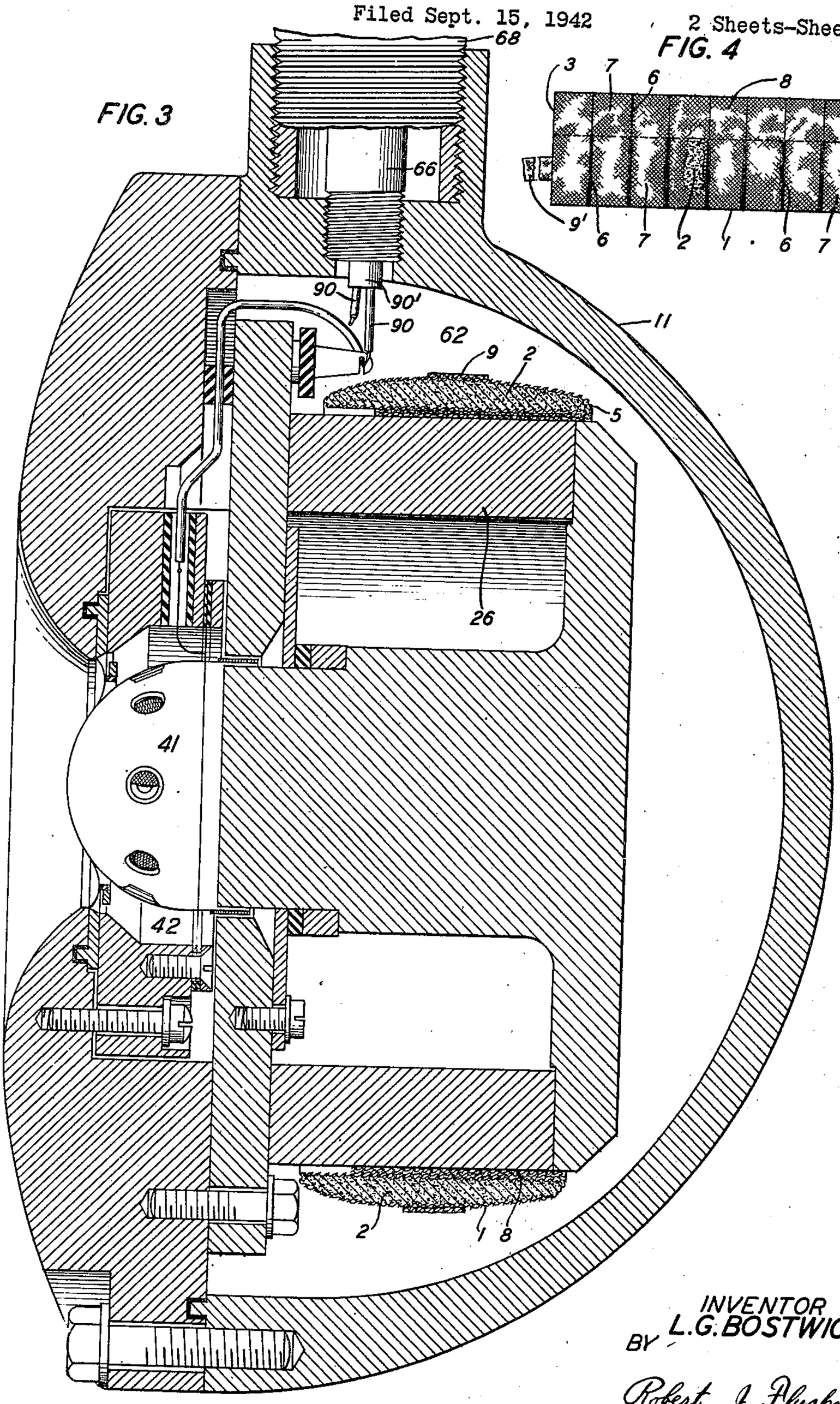

FIG. 4

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MOISTURE CONTROL IN AN ELECTRO-MECHANICAL DEVICE

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Application September 15, 1942, Serial No. 458,421

1 Claim. (Cl. 181—0.5)

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This invention relates to electromechanical devices and, more particularly, to submarine signaling devices.

An object of the invention is to improve the structure of such devices and, more particularly, of submarine signal wave projectors or radiators.

Submarine signal devices are known in which the hydrostatic pressure on the moving system or diaphragm of the device is compensated or balanced in whole or in part, for example, by gaseous pressure on the non-exposed side of the diaphragm. The means enabling such pressure compensation or balancing may involve a compressible member, such as a bellows or a collapsible container or bag, adapted to be exposed in whole or in part to the liquid medium, that is, to the water, the interior of the container being coupled to or connected with the space or chamber adjacent the non-exposed side of the diaphragm. If the material of the compressible member is to any extent pervious to water, there will be a tendency for the water to diffuse or otherwise penetrate therethrough and into the interior of the signal device, with the attendant possibility of corrosive action tending to shorten the useful life of the device, or requiring more frequent removal of the device from the water and its dismantling for inspection. Not only may the liquid medium find entrance into the device in this manner, but the presumably water-tight joints of the structure may in time permit the entrance of some water. In certain devices, also, the pressure balancing action has been obtained by using a flexible or distendable wall portion of a material, such as rubber, through which the liquid medium may in time, even though at a slow rate, find ingress to the interior of the device.

A feature of the invention comprises providing a desiccant or drying agent in signal devices used in a liquid medium.

Another feature comprises employing as a desiccant in such devices a material experiencing substantially no chemical or physical change in the presence of water or water vapor.

A further feature comprises the employment in such devices of a desiccant of the adsorption type.

Still another feature comprises utilizing in such devices a desiccant comprising a finely divided, activated oxide capable of being reactivated and reused repeatedly.

In accordance with this invention, an electromechanical transducer comprising a hollow enclosure for a transducer unit, and which enclosure includes a wall portion through which liquid or liquid vapor, specifically, water or water

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vapor, may diffuse, penetrate, or otherwise have ingress, is arranged to enclose a desiccant or drying agent to deprive or exhaust the interior of the enclosure of liquid or liquid vapor that may find entrance thereinto. The desiccant may be one that experiences substantially no chemical or physical change in the presence of the liquid or liquid vapor, and may be a finely divided, activated oxide that may be reactivated and reused repeatedly. Such a drying agent may have an adsorption characteristic and, specifically, may be silica gel.

A more complete understanding of this invention will be derived from the detailed description that follows, read with reference to the accompanying drawings wherein:

Fig. 1 is an elevational view of a submarine signal source, projector or radiator in which the invention may be embodied;

Fig. 2 is an elevational view of a fragment of the device of Fig. 1, partly broken away and partly in section to show structural details thereof;

Fig. 3 is a cross-sectional view of the signaling device included in the projector of Fig. 1, along the line 3—3 of Fig. 1; and

Fig. 4 illustrates a container or enclosure for a desiccant that has been found satisfactory in practicing this invention.

The present invention is disclosed with specific reference to a submarine signal projector of the general type disclosed in the pending application of L. G. Bostwick and J. H. King, Serial No. 445,974, filed June 5, 1942, for Electromechanical device, and, more particularly, to a projector of the type described in that application with particular reference to Figs. 1 to 6, inclusive, of the drawings thereof.

The signal wave source, projector or radiator 10 illustrated by Fig. 1 of the attached drawings, comprises an energy radiating device or portion 11, a hydrostatic pressure compensating or balancing device or portion 12, and rigid means 13 interconnecting the devices 11, 12, whereby the projector comprises a unitary structure that may be supported under water at the end of suitable wires or cables 14 that may be secured to the projections or ears 15 on the device 12.

Fig. 2 of the attached drawings is an enlarged detail of the device 12, and a portion of the rigid interconnecting means 13, partly broken away and partly in section better to illustrate the structure involved. The arrangement is substantially the same as that of the Bostwick-King application except that in one respect the conductors 90 for connecting the device 11 with other electrical

equipment, are provided through a cable 90'. The cable 90' is brought into the projector through a water-tight gland or stuffing box 90A, which may contain a splice (not shown) a portion of which gland is threaded into the cover member or plate 76'. The cover member is so shaped adjacent the container 70 that a plurality of slits or slots 76A are provided for the ingress of the liquid medium into the interior of the container 70. The concentric inner pipe 66, and outer pipe 68, the rigid casing or container 70, the valve coupler 75, the valve 79, the metallic tubing 80, the union 81, the pet-cock 84 and the compressible member, container or bag 78 may be similar in construction and perform the like function to the corresponding components in the aforementioned Bostwick-King application. The compressible member 78 is of an elastic material, such as rubber, the interior 82 of which communicates through the valve 79, tubing 80, the coupler 75 and the pipe 66 with the chambers 41, 42 and 62 of the device 11. The shape of the member 78 is shown such as it might assume when the projector 10 is submerged under water and the latter has entered through the slits 76A to fill the container space not occupied by the member 78, and to fill the space between the pipes 66, 68. The device 11, as shown in Fig. 3 of the drawings attached hereto, is seen to be substantially the same as the device illustrated in cross section in Fig. 3 of the aforenoted Bostwick-King application, except that it embodies the component 5 of which more description hereinafter.

It has been ascertained that water or water vapor may find entrance to the interior of the projector, particularly by diffusion through the material of the compressible member 78 into the chamber 82 thereof, and through the tubing 80 and pipe 66 into the interior of the device 11. Such moisture may cause corrosion of the device, particularly at the terminals, the coil leads and the diaphragm thereof. Although a certain amount of such corrosion might be sustained by the device without affecting its operativeness, in the absence of any special provision limiting such effect, frequent dismantling and inspection would be necessary, attendant with necessary removal of the projector from its under-water location and the loss of its use during such operation. In accordance with this invention, the aforementioned hazard and precautionary inspections may be negative for the anticipated useful life of the projector, or for the anticipated time of submersion thereof, by including in the projector a suitable desiccant or drying agent.

The desiccant may be of a material having a high coefficient of adsorption and experiencing

substantially no chemical or physical change in the presence of water. It may comprise a finely divided, activated oxide capable of being reactivated and reused repeatedly. Such a material is silica gel. This material may be included in the component designated 5, and shown in Figs. 3 and 4 of the attached drawings. The container, enclosure or carrier 1 for the desiccant 2 may comprise a strip of woven material or fabric, such as muslin, having a multiplicity of apertures or interstices for the ready penetration of liquid or liquid vapor, a portion of the material being folded back on itself and sewed at its edges 3, 4 as well as at a plurality of intermediate portions 6 to define a plurality of pockets 7 to be filled with the desiccant at least to the level indicated by the dotted line. The flap portion 8 is adapted to be folded over the pockets so that it effectively closes the otherwise open ends thereof and, when the component 5 is fitted around the annular magnet structure 26, is adjacent the latter. The desiccant component 5 may be fastened to the magnet structure by a tape or brush 9 secured in or to the woven material, and tied together at its end portions 9'.

Other desiccants, of course, may be used, but silica gel has been found particularly satisfactory with respect to the particular environment involved. Although the invention has been disclosed with reference to a specific embodiment thereof, it will be understood that this is believed at this time to be the best mode of practicing the invention, and is not intended to constitute a limitation upon the scope of the invention.

What is claimed is:

An underwater wave translating device comprising a hollow container, a wave translating unit including a diaphragm mounted in the wall of said container so that the outer side of said diaphragm engages the water, a submersible hollow chamber having an elastic wall pervious to water, hollow means having a wall impervious to water for interconnecting the interiors of said container and said chamber, said container, hollow means and chamber being filled with an inert gas, said chamber changing its volume in response to variations of hydrostatic pressure and thereby varying the gas pressure on the inner side of said diaphragm substantially to compensate for the variations of hydrostatic pressure on the outer side of said diaphragm, and desiccating means positioned interiorly of said container for adsorbing water vapor passing thereinto as a consequence of diffusion through said chamber wall.

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