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SEALED ELECTRONIC UNIT AS FOR PROJECTILE
DETONATION MEANS, ETC
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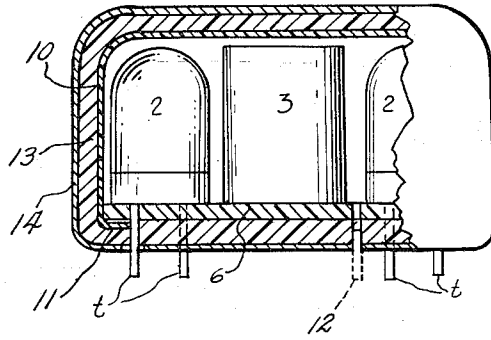


Fig. 1

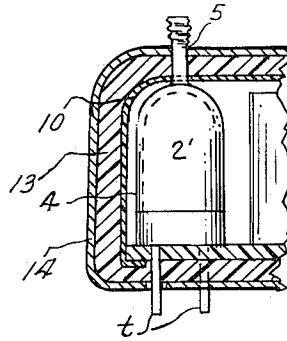


Fig. 2

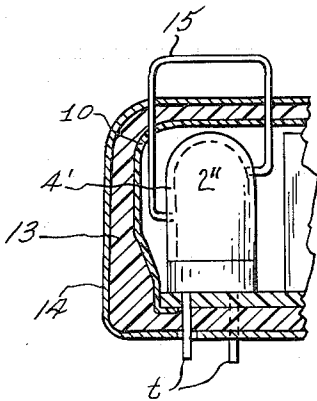


Fig. 3

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SEALED ELECTRONIC UNIT AS FOR PROJECTILE DETONATION MEANS, ETC.

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3 Claims. (Cl. 250-16)

In such devices as proximity fuses, there is involved a radio transmitter and receiver combination which sends out impulses to be reflected back to be amplified and release a condenser discharge to bring about detonation; and the limitations of structure and conditions of usage are extremely drastic. The assembly, carried as it is, in the nose of a projectile must be particularly rugged, and everything depends upon the provision of accurate-working means. A difficulty which has been insistent for devices which are under high temperature operating conditions is the assuring of adequate protection against premature break-down of insulation. By the present invention it now becomes possible generally to provide assemblies requiring electronic tubes and condensers and resistors, as a compact and rugged unit and particularly safeguarded against access of moisture, and insulation break-down. Other objects and advantages will appear from the following description.

To the accomplishment of the foregoing and related ends, said invention, then, comprises the feature hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 shows in side elevation, partly broken, a unit in accordance with the invention; and

Figs. 2 and 3 show modifications.

The component elements, vacuum tubes 2, transformer 3, condenser and resistances are assembled on an insulative base 6, being suitably secured thereto as a compact unit providing impulse transmitting and receiving functions, the condenser accumulating a sufficient charge to be appropriately released, the primary battery current being provided by customary means, such as a stack of electrode plates to be acted upon by an appropriately-released electrolyte. The assembled unit is inserted in an enclosure 10 as a pliant bag, or in some cases a pre-cast shell, of air-impervious material, e. g., polyethylene, or somewhat less desirably polyvinyl compositions and the like. This, conforming closely to the assembled unit is sealed around its edge 11 to the base plate 6. A nipple connection 12 extends through the base plate for connecting to a source of vacuum. The unit is placed in a mold with spacing from the mold walls to receive synthetic resin insulative material in liquid form. Such materials as styrene, phenol-aldehyde compositions, etc., may be employed; and by then heating, e. g., to 100-350° C., the material is set or solidified as an encasing layer 13 about the enclosed unit. The nipple 12 is connected to a source of vacuum and air within the unit is exhausted and the nipple is sealed off. Preferably though with the air exhausted from the unit, the vacuum then is broken by admission, through a valved branch connection in the line to the nipple, of a permanently fluid insulative material, such as helium or other suitable inert gas, or

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transformer oils, and the nipple is then sealed off at the base plate, e. g., by pinching and soldering. Preferably, though not necessary in all cases, the assemblage is subjected to a further encasing treatment with deposited metal 14. This may be applied in some cases by electro-deposition, by plating procedure, but preferably I employ vapor deposition, and for this the unit in a vacuum chamber is exposed to metal vapor produced by electric heating means, depositing as a film up to desired thickness on the synthetic resin casing. To prevent such metal from contacting with the lead-connections of the unit, these are temporarily covered by masking, such as tape, wax, or composition, before placement in the vacuum deposition chamber. And after removal, the masking is taken off, thereby leaving the external metal layer out of contact with the lead-connections where these emerge through the encasement. The technique of vapor deposition of metal is as well known. For instance, "Vacuum Technique" by Saul Dushman (Pub. by John Wiley & Sons, Inc. N. Y. 1949) pages 757-764. And metals which may be applied are for instance aluminum, chromium, titanium, etc.

As an example: Electronic tubes and transformer and condenser elements are assembled compactly on an insulating base plate, and the assembly is enclosed in a bag-enclosure of polyethylene and sealed about the base plate. The assemblage in a mold with cavity space surrounding the assemblage, is subjected to a vacuum in a container chamber while liquid polystyrene is supplied in thin stream in exposure to the vacuum, on the way into the mold. Heat is applied to the mold, about 200° C., to solidify the synthetic resin and form an insulative encasement. On removal from the mold, through a nipple provided in the base plate to the interior then connected to a source of vacuum any air is exhausted from the unit; and then through a valve branch of the connection outside, helium is admitted into the unit. Then the connection nipple is sealed off at the base plate. Masking tape is applied about the terminals where projecting from the base plate, and in a vacuum chamber, the assemblage then has aluminum vaporized and deposited on its surface to a suitably thick layer. On removal of the masking tape, the deposited metal is properly spaced from the terminals.

In some cases where elements such as tubes, resistors, etc., are prone to generate more heat than such a sealed-in electronic unit could safely undergo, I include a heat-radiator, this being associated with the element which generates heat. Thus, for instance as shown in Fig. 2, a unit assemblage including a heat-producing element, such as a tube 2', is provided with a jacket 4 which has an extension 5 to the outside. This jacket and extension contain a heat-transmitting fluid, for example a transformer oil, and the extension 5 may be corrugated or ribbed to increase the radiating surface. About the assemblage there may again be the enclosure 10 and the encasing layer 13 of insulation, such as synthetic resin aforementioned. And preferably deposited metal 14 is provided overall.

In Fig. 3 a slightly different heat-radiator arrangement is shown, in which the jacket 4' about the heating element has a circulating tube 15 which extends from one point on the jacket to the outside and back to another point higher on the jacket, thereby providing a thermosiphonic circulation of the fluid within. In such manner, heat is transferred from within and is radiated off externally. Again, there may be the enclosure 10, and the insulation encasement 13. And, where preferred, deposited metal 14 may cover the whole. It will be understood that in every case where deposited metal is provided on the exterior surface of the unit, it is to be spaced sufficiently from the terminals *t* to avoid short-circuiting.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A unit of the character described, comprising transmitter and receiver electronic tubes and associated elements on an insulation base, a pliant air-impervious bag enclosing the assemblage, a permanently fluid insulative material within, an encasement layer of insulation outside, and deposited metal on the exterior surface of the encasement insulation.

2. A unit of the character described, comprising transmitter and receiver electronic tubes and associated elements on an insulation base, a pliant air-impervious bag enclosing the assemblage, a permanently fluid insulative material within, and an encasement layer of insulation outside.

3. A unit of the character described, comprising an insulation base, electronic tube and associated elements supported on said base and having connector prongs extending therethrough,

a heat-radiator assembly in thermal exchange proximity to said tube, an air-impervious enclosure surrounding said tube and elements and being secured in sealed relation to said base, and an encasement layer of insulation about the enclosure and base, the connector prongs projecting through said layer and said heat-radiator assembly including a portion which likewise extends through the encasement layer for external dissipation of the heat extracted from the tube by the assembly.

References Cited in the file of this patent

UNITED STATES PATENTS

1,924,435	Homer	Aug. 29, 1933
2,511,436	Kauth	June 13, 1950

OTHER REFERENCES

Franklin et al.: "Electronic Preserves," Scientific American, December 1947, pp. 258-260.

Kleiderer: "Proximity Fuse Taught New Techniques," Modern Plastics, November 1945, pp. 133-136, 206.