

Dec. 29, 1942.

J. WHYTOCK

2,306,513

IMPEDANCE DEVICE

Filed April 18, 1941

FIG. 1

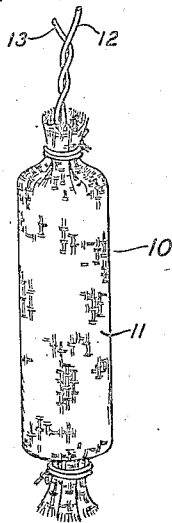


FIG. 5

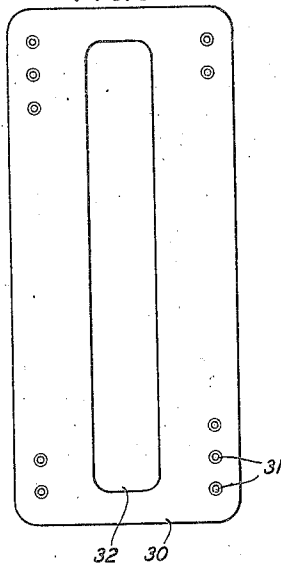


FIG. 6

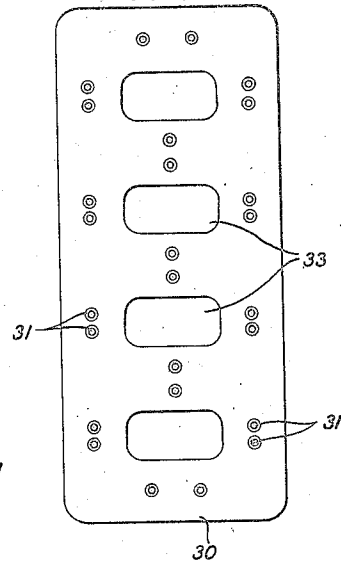


FIG. 2

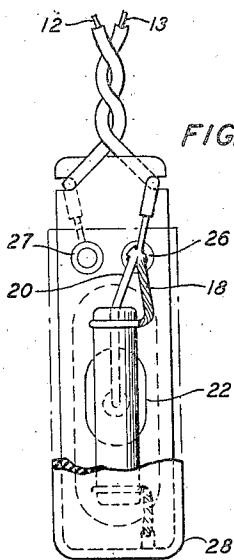


FIG. 3

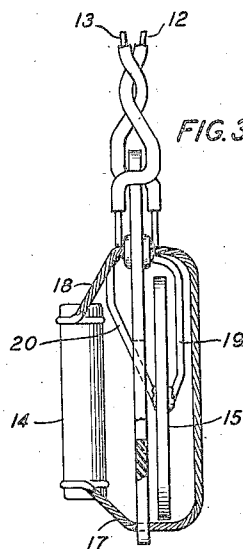
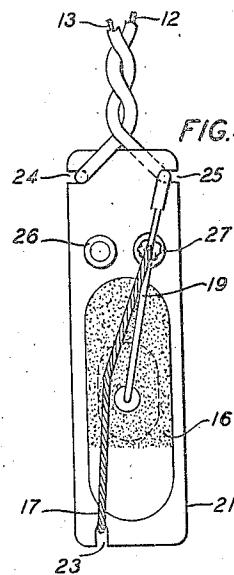


FIG. 4



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2,306,513

IMPEDANCE DEVICE

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Application April 18, 1941, Serial No. 389,208

2 Claims. (Cl. 201—63)

This invention relates to electrical impedance devices and more particularly to such devices comprising a plurality of impedance units interconnected electrically and assembled in a unitary structure.

One object of this invention is to provide an impedance device that is compact, rugged and moisture resistant.

A further object of this invention is to provide an impedance device suitable for inclusion within an enclosed space such as a cable splice or the like.

One feature of this invention resides in the provision of a plate-like insulating support for impedance units, having secured thereto a plurality of metallic elements which serve as both electrical connectors and impedance unit securing means.

Another feature of this invention lies in the arrangement of the impedance units on the insulating support.

Other and further objects and features of this invention will appear more fully and clearly from the following description of an illustrative embodiment thereof taken in connection with the appended drawing in which:

Fig. 1 shows one illustrative embodiment of the invention in completed form;

Fig. 2 is an elevational view of the device of Fig. 1 with part of its protective covering broken away to show interior details;

Fig. 3 is another elevational view taken at right-angles to that of Fig. 2 with the spacing between elements exaggerated for clarity;

Fig. 4 is a further elevational view taken on the opposite side of the device from Fig. 2; and

Figs. 5 and 6 show two different forms of mounting plate suitable for modified embodiments of the invention.

Referring now to the drawing, 10 denotes the impedance device having a protective sleeve 11 of fabric material thereover. A pair of flexible insulated conductors 12 and 13 serve as connecting means to the circuit in which the device is to be used. The device comprises a plurality of impedance units, for example, two as illustrated. These units may be of various types as to form and electrical characteristics. Various combinations of capacitors, inductors and resistors may be used. The two units shown in the drawing are a low positive resistance-temperature coefficient unit 14 of the type commonly called a resistor and a high negative resistance-temperature coefficient unit 15 which may be designated as a "thermistor." The term "thermistor" is a

contraction of the words "thermal resistor" and designates an electrical circuit element whose electrical resistance varies widely and rapidly with change in temperature. The unit 14 may comprise a plurality of turns of resistance wire wound on a form and covered with a protective coating. Unit 15 may comprise a disc of semiconductive material having metallic electrodes 16 on either face. The semiconductive material may be a heat-treated combination of various metal oxides such as the oxides of manganese, nickel and cobalt.

The electrodes 16 may be of silver, gold or other metal applied by vapor deposition or by heating a thin layer of metallic paste applied to the disc faces, or by other suitable methods. As illustrated in Fig. 4, the area of the electrodes may be less than the whole face area of the disc. The electrode area may be varied during manufacturing to give a required over-all resistance to the disc unit.

One way of adjusting the resistance of the disc unit by controlling the electrode area is as follows: The thermistor disc is made so that the over-all resistance of the unit is slightly low when the electrodes cover the disc faces completely. Sufficient electrode material is then ground off to bring the over-all resistance to the proper value.

Connecting leads 17, 18 and 19, 20 are secured respectively to the units 14 and 15 by soldering or by other suitable means.

The units are mounted on a plate 21 of insulating material such as a phenol fabric material. To mount two units of the type previously described, plate 21 is provided with a centrally located opening 22, notches 23, 24 and 25, and connectors 26 and 27 located through orifices in plate 21 and secured in place by upset or riveted flanges. Metal eyelets will serve the purpose.

The illustrated device having been described to have the two units in parallel, means for making such connections will be described. Referring to Figs. 2 and 3, leads 18 and 20 and conductor 12 are brought together on the unit 14 side of plate 21 and soldered within connector 26. Lead 20 passes through opening 22. Referring to Figs. 3 and 4 it is seen that leads 17 and 19 and conductor 13 are soldered in connector 27 entering from the thermistor unit side of the plate. Lead 17 passes around plate 21 through notch 23.

All of the leads are so proportioned that the units lie snugly against the plate 21 on opposite sides thereof. The spacing shown in Fig. 3 is as previously noted for clarity of illustration only. The conductors 12 and 13 after passing through notches 24 and 25 are twisted together. By the

foregoing arrangement the electrical connections are made and the units are secured to the plate providing a substantially rigid self-supporting unit with flexible leads.

To protect the device and further maintain the units in place, a coating 28 of suitable covering material is applied over a portion of the plate, the units, the leads, the connectors and a portion of conductors 12 and 13. The extent of coverage may be as illustrated in Fig. 2. The coating 28 may comprise two layers, e. g., an inner layer of water-proofing material such as a varnish and an outer layer of material such as lacquer for mechanical protection. A piece of fabric sleeve 11 may be placed over the unit and tied in place at the ends.

Other electrical combinations and physical arrangements of units may be made in accordance with the invention. For example, the units of the device described may be connected in series by soldering leads 17 and 20 together preferably in an additional sleeve connector and connecting leads 13 and 19 to conductors 12 and 13. Mounting plates such as illustrated in Figs. 5 and 6 may be provided for making up any of a plurality of different impedance combinations. The plates 30 may be provided with a plurality of rows (Fig. 5) or groups (Fig. 6) of sleeve connectors 31 and an extended opening 32 or a plurality of openings 33. Edge notches may be provided as needed for carrying leads around the plate 30 or for anchoring conductors such as 12 and 13 of Figs. 1 to 4, inclusive. For any given combination of impedance units, all of the connector sleeves 31 will not necessarily be employed but an adequate number and arrangement should be provided for all possible connections that may be made between the number of units that can be accommodated on the mounting plate.

Although the invention has been disclosed with reference to specific embodiments thereof, it will be understood that it is not restricted thereto but limited in scope by the appended claims only.

What is claimed is:

1. A resistor device comprising two resistor units each having a pair of flexible conductive leads, a pair of insulated, flexible connecting conductors, a centrally orificed, marginally notched plate of insulating material between said units, two metallic connecting sleeves supported in openings through said plate, a lead from one resistor passing through said orifice, said lead, one conductor and lead from the other resistor being connected in one sleeve, one lead from said other resistor passing through one of the marginal notches, said lead, the remaining conductor and the remaining lead from the one resistor being connected in the other sleeve, said conductors engaging marginal notches adjacent said sleeves, an envelope of insulating material enclosing portions of said conductors and plate and all of the other elements and a fabric sleeve covering the assembly with said conductors projecting therefrom.

2. An impedance device comprising a plurality of impedance units each having flexible conductive leads, a plurality of flexible connecting conductors, a marginally notched plate of insulating material, a plurality of metallic connecting sleeves supported in spaced openings through said plate, said leads and conductors being connected to interconnect the impedance units in a network, each lead and conductor being secured in one of said sleeves and some of the flexible interconnecting elements passing over the edge of the insulating plate through the notches to aid in securing the impedance units to said plate.

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