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ELECTRIC TERMINAL AND RESISTANCE DEVICE

Filed March 14, 1931

Fig 1

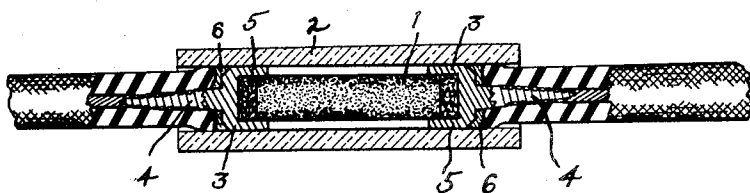


Fig 2

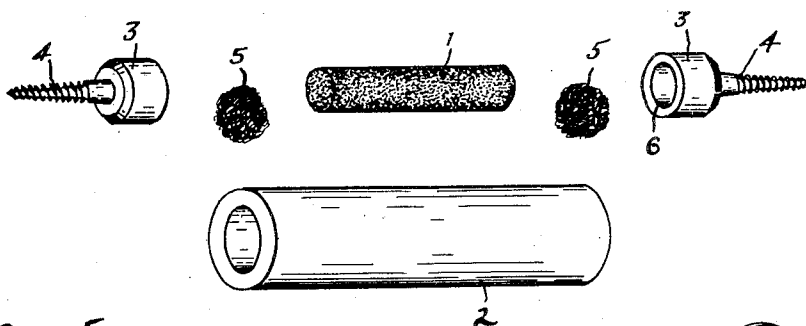


Fig 5

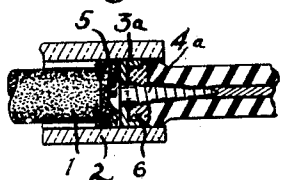


Fig. 8.

Fig 3

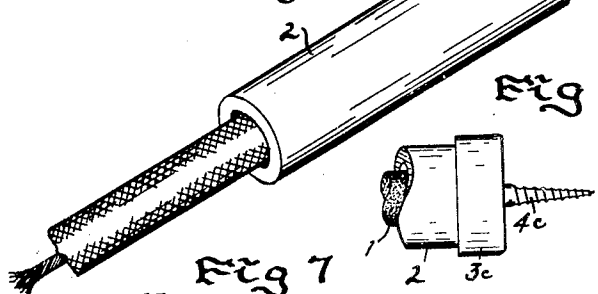


Fig 6

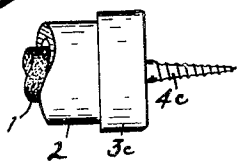


Fig 4

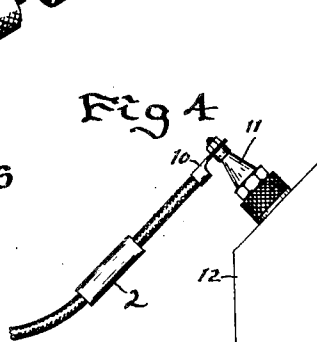
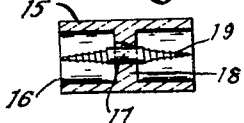


Fig 7



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UNITED STATES PATENT OFFICE

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ELECTRIC TERMINAL AND RESISTANCE DEVICE

Application filed March 14, 1931. Serial No. 522,655.

This invention relates to electrical resistance devices and has for its object the provision of a new, improved, simplified, reliable, and weather-proof resistance element of great cheapness and simplicity; provision of a new resistance element for high tension current combined with new means for connecting the high tension wires thereto so as to make a strong, water-tight, and highly insulated joint; the provision of a new and improved terminal attachment for an electric cord which shall be simple and water-tight; while further objects and advantages of the invention will become apparent as the description proceeds.

In the drawing accompanying and forming a part of this application I have shown certain typical forms of my improved resistance device. Fig. 1 is a longitudinal sectional view through one of the devices completely exemplified and showing the high tension wires attached thereto; Fig. 2 is a perspective view showing the same elements disassembled; Fig. 3 is a perspective view of my improved resistor mounted in an ignition line; Fig. 4 illustrates such a device connected to an internal combustion engine; Fig. 5 is a detail view of a modification; Fig. 6 illustrates another modified form of resistance element provided with my improved connection. Fig. 7 illustrates another modified form of my improved connector; and Fig. 8 illustrates a modified detail of terminal.

Delicately adjusted signal and control systems, such as radio, train-control devices, light-control devices, and the like often require the employment of resistance elements in exposed situations, yet under conditions demanding a high degree of accuracy even in case of high tension current. As an example of such a use, which in addition contains a sharply limited cost-element, I have here selected for illustrative purposes the ignition system of an automobile or an aeroplane which is equipped with radio-receiving apparatus, whether for ulterior use or for mere pleasure. Experience has demonstrated that it is necessary to introduce resistance into the ignition system so as to reduce

the current flow sufficiently to prevent interference with the reception without at the same time rendering the motor inoperative. In view of the high tension current handled and the exposed condition under which such devices operate it is necessary to insulate the devices against current loss even when wet; and due to competitive conditions it is necessary to make the devices very inexpensively. A great many other uses exist but I have merely chosen this as exemplifying the requirements in a popularly known form.

According to my invention I employ a resistance element 1 consisting of a rod made of clay finely ground and mixed with carbon (with or without other substances) and baked to a hard stable condition. The fineness, proportions, and composition of the ingredients and the length and cross-section of the resulting rod determine the resistance, which can be controlled with a high degree of exactness; but the rods tend to be somewhat porous, and also are somewhat fragile, particularly when small, so that it is necessary to shield them from moisture and climatic changes as well as from mechanical breakage. This is accomplished by introducing the rod into a tube 2 of suitable material such as porcelain, and according to my present invention I cement into each end of the tube a metal terminal 3 provided with a tapered screw-threaded projection 4. Electrical contact between the terminals and the rod is assured by interposing an elastic conducting material 5 such as metal wool. In Figs. 1 and 2 I have shown the threaded projections 4 as integral with the terminals and the terminals themselves provided with recesses 6 receiving the wool and also the ends of the rod. This is not necessary, however, since in Fig. 5 I have shown a terminal consisting of a stamped washer 3^a provided with a screw threaded element consisting of a brass screw 4^a received in an aperture therein, the screw and washer being held in place by the cement 6, and the screw head being spaced from the rod 1 by the metal wool 5. Indeed it is not even necessary that the terminal 3^a be of metal, since a perforated lozenge 3^b of porcelain, fibre or other insulating

material can equally well be used, the head of the screw constituting a sufficient conductor. In any case rotation of the screw is prevented by the cement 6 which also prevents the entrance of moisture.

My improved resistance element is attached by screwing the threaded projections 4 longitudinally into the ends of the insulated wires with which it is used. Even when these projections are made integral with the terminals as shown in Figs. 1 and 2, the threads are made tapering and sharp edged as customary in wood-screws so as to be readily introduced into place. Inasmuch as the insulation consists ordinarily of soft rubber or of some material having some of the properties of softness, elasticity and tenacity exhibited by this substance, and inasmuch as the conductive portion generally consists of fine flexible strands of soft copper wire, insertion of the screw is easy, and the endwise engagement of the insulation with the walls of the tube and cement sufficiently excludes moisture, while disconnection is easily accomplished merely by rotating the parts one relative to the other in the opposite direction.

It is also possible to employ this type of screw-threaded attachment with the externally capped tube illustrated in my application filed December 11, 1930, Serial No. 501,579, an example thereof being illustrated in Fig. 6, though this, of course, loses the advantage of shielding the conductive parts from the weather possessed by the other forms of my improved element. Here 3° shows as an external cap and 4° as the screw.

The ends of the wires may be provided with any suitable attaching means. In Fig. 3 one end of the wire is provided with a metal eyelet 10 of customary form which is attached in the customary manner to the spark plug 11 of the internal combustion engine 12. The shank of this eyelet is provided with a tapered, screw-threaded projection which is inserted into the end of the wire as heretofore described. In Fig. 7 I have shown a connector for wires consisting of a waterproof thimble 15 of insulating material having recesses 16 at its ends for the reception of the ends of the insulated cable and an axial metal core 17 carried by the septum 18 and having tapering threaded ends 19 for the purpose described.

Many other modifications of the specific forms herein shown may be made and I do not limit myself except as specifically recited in my several claims which I desire may be construed each according to its own limitations and independently of limitations contained in other claims.

Having thus described my invention what I claim is:

1. A resistance device comprising an impervious tube of non-conducting material, a resistance element in said tube, an insulated

conductor fitted into an end of said tube, metal terminals carried by the tube and in electrical contact with the respective ends of said element, one of said terminals comprising a member recessed to receive an end of said resistance element and having an integral tapering axial projection for engagement with the conducting core of said insulated conductor fitted into an end of the tube, whereby the insulation of said conductor may be wedged against the tube inner wall to form a moisture proof seal therewith.

2. In combination, an electric resistance device comprising an insulating tube, a resistance rod in said tube, end members fitted in the tube for receiving the respective ends of said resistance rod, and a wad of metal wool interposed between each of the end members and the respective ends of the rod, said end members forming as an integral structure a recess, the walls of which are adapted to be pressed over the respective ends of the rod, and a tapered projection extending axially from said end members and adapted to engage in electrical contact with the conducting core of an insulated electric conductor whereby the insulation of said conductor may be wedged against the tube inner wall to form a moisture proof seal therewith.

3. A resistance device comprising an impervious tube of non-conducting material, a resistance element in said tube, an insulated conductor fitted into an end of said tube, metal terminals carried by the tube and in electrical contact with the respective ends of said element, one of said terminals comprising a member recessed to receive an end of said resistance element and having an integral tapering axial projection for engagement with the conducting core of said insulated conductor fitted into an end of said tube to wedge the insulation of the conductor against the inner tube wall to form a moisture proof seal therewith, said metal terminal being cemented into an end of said tube.

In testimony whereof I hereunto affix my signature.

GLEN F. BENKELMAN.