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W. B. SMITS

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BUSHING FOR SPARK PLUGS

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Fig. 1.

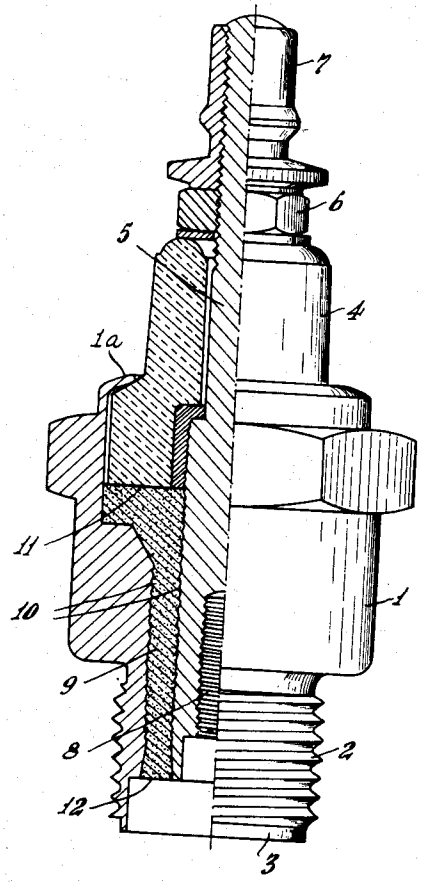


Fig. 2.

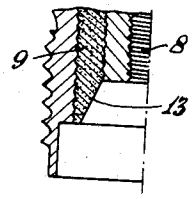
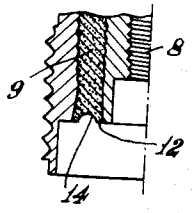


Fig. 3.



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BUSHING FOR SPARK PLUGS

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3 Claims. (Cl. 123—169)

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The invention relates to low tension spark plugs and more particularly to the construction and composition of the bushing therefor.

The bushing for a spark plug according to the invention is to be distinguished from that for use with the usual high tension spark plugs. With these high tension spark plugs the gas tightness is obtained by enclosing the unitary insulating member between elastic rings or by using pure polished conical packings. Either the packing must be elastic or the sealing of the bushing to the metallic inner element must be obtained by polishing these elements on each other, after which the insulating member is cemented in a special way.

The difficulties resulting from the requirements of insulation and spark over, which must be met by these plugs, are such that the diameter of the insulating member and the body become larger and the differences in expansion are more noticeable. The insulator must be so bulky that at the highest temperature no electrical leakage between the centre pole and the outer body may appear.

The requirements of insulation and spark over in plugs working with a low voltage and condenser discharging are very much lower so that a quite different construction can be used.

The invention, however, relates to a low voltage plug, consisting of a body plug and a center pole. According to the invention a material is supplied between the plug body and the center pole in the pores of which very finely divided particles are movably introduced. These particles act to seal the pores and render a gas-tight connection between the pole and the body. The material consists of a mixture of very fine powders. A vitreous powder of low melting point may be added, thereby permitting the ends or other desired portions of the pulverized material to be solidified by heating or other appropriate treatment. If a pressure, for example the explosion pressure, is applied to the material, this powder will be pressed in the possible little air channels, still present in the material, which channels are thereupon clogged. The entire material functions as a labyrinth sealing and the gas tightness therefore is assured. The material may be such that by the pressing in between the plug body and the center pole a firm connection is obtained, which is augmented at every occurring pressure and mechanical load.

To satisfy to the requirements of insulation the pressed in material must have a sufficient electrical resistance and dielectric strength at all

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mechanical and thermic loads so that lateral discharges and ruptures will not result.

In practice the plugs may be exposed to a very high temperature, especially in air cooled motors. The pressed in material must be able to resist to this temperature so that neither deformations of this medial layer can appear nor changes in the texture, the gas tightness being preserved.

However, it is also possible that this action at higher temperatures is wished, to wit, that by chemical reactions of the components, forming the material or melting together of these components, there is formed such a material, which is harder and which forms a very mechanically firm connection between the bushing and the centre pole, provided the gas tightness remains preserved.

If the material by only pressing in is mechanically not firm enough at the free ends of the plug there may be created by adding of certain materials in these places or by local heat treatment such properties that the material is considerably hardened so that it functions in a satisfactory manner.

With this construction it is possible, with the low voltages at which these plugs are operated, to utilize a wall thickness which would not be possible in a high voltage plug. In the plugs according to the invention the difference in the coefficient of expansion is of relatively little importance, as there is formed a sort of elastic connection between the center pole and the bushing, which connection absorbs the appearing dimensional changes.

To increase the insulation creepage distance to prevent spark over, the end of the pressed in powder body which is exposed to the ignition space may be provided with an indentation, for example of a rounded form, or the end may be conical and in this case the ignition cartridge proper may be in engagement with this conical surface.

The invention will be more fully and clearly understood from the following description and from the accompanying drawing which shows by way of example a preferred embodiment of the invention.

In the drawing:

Fig. 1 shows partially an elevation and partially a cross section of a plug embodying the invention.

Figs. 2 and 3 are two cross sections of the bottom end of the pressed in powder body.

The plug according to the invention comprises the usual plug body 1, which at the bottom end is provided with a thinner projection 3 with a

screw thread 2, which can be threaded in the motor block. At the top the plug body 1 carries the usual porcelain insulating cap 4, which is fixed, for example, on a vertically extending axial member 5 and under the retaining rim 1a; the axial member 5 carries at its upper end a nut 6 and a clamp 7 for the electric conductor. The internal screw thread 8 in axial member 5 serves, for example, to connect a spark element (not shown).

A free space is provided between the spark body 1 and the axial member 5, which according to the invention is filled with a pressed in powder material 9, which attaches to the walls by reason of the fact that these are provided with grooves 10 or other irregularities.

The pulverized material 9 may consist of feldspar of a relatively coarse grain mixed with very finely divided steatite and mica powders, to which a vitreous powder having a low melting point is added. Other well known materials of similar properties may also be used.

The upper side 11 and the under side 12 of the pulverized material 9 can be hardened by a local heat treatment or by the adding of certain materials, so that the enclosing of the powder mixture is assured with absolute certainty.

From frequent experiments it is evident that the plugs according to the invention remain satisfying the most rigorous requirements of gas tightness during the whole lifetime. The spark over resistance may be increased by arranging the underside 12 as illustrated in Figures 2 and 3. According to Fig. 2 the underside is a conical surface 13, while according to Fig. 3 the underside 12 is provided with an excavation 14 or the like. With either of these constructions the electrical creepage distance over the insulation between the axial member 5 and the plug body 1 is greatly increased so that electrical failure is prevented.

Since according to the invention only low voltage is used, the insulating layer 9 may be thin and it is not necessary to use mica or similar materials for such thin insulating layers. This layer need not to exceed a thickness of about 1.5 mm.

I claim:

1. In a spark plug for low tension ignition, comprising a hollow electrically conductive body member and an electrically conductive axial member disposed within and spaced from the body member, a gas pressure resistant filling disposed in the space intermediate the body and the axial member, said filling comprising tightly packed pulverized electrically insulative material of relatively coarse grain mixed with a comparatively finely divided insulative powder, whereby upon application of gas pressure to the filling, the powder will tend to block the interstices between the relatively coarse grains thereby providing a labyrinth sealing effect and a low melting point vitreous material for melting only at the outer surfaces to retain the filling.

2. A spark plug as in claim 1 in which the filling comprises a powder capable of being hardened by subjection to a treatment which differs from conditions likely to be encountered in operation of the spark plug, said treatment having been applied to the filling to provide hardened portions therein at surface areas thereof.

3. A spark plug according to claim 2 in which the powder is a vitreous material of low melting point and the treatment includes heating to a temperature above the melting point.

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