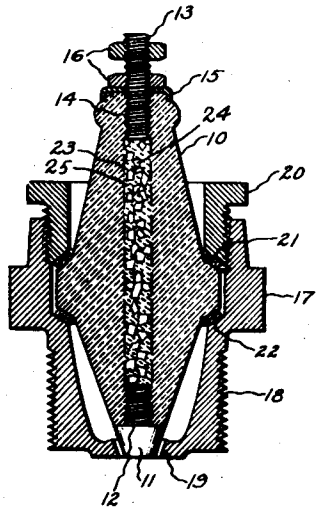
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SPARK PLUG

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SPARK PLUG

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2 Claims. (Cl. 123—169)

My invention relates to spark plugs, such as those employed with internal combustion engines for providing electric ignition.

Spark plugs usually include an insulating body of some material such as porcelain with a centrally disposed conducting member having a high tension electrode at one end and a connection terminal at the other end. A shell surrounds the porcelain body and is adapted to be screwed into a port in a cylinder of an internal combustion engine and the connection terminal is connected to a suitable source of power. It has been found that when conventional spark plugs are employed the differences in thermal expansion between the conventional central conducting metallic member and the surrounding porcelain may loosen the joint therebetween when such plugs become heated during operation of the engine and this may provide a path through which gases from the cylinder may leak.

It is, therefore, an object of my invention to provide an improved spark plug structure which will minimize the possibility of gas leakage between the electrical conductor and the surrounding insulating body.

Another object of my invention is to provide an improved and efficient spark plug structure.

Further objects and advantages of my invention will become apparent from the following description referring to the accompanying drawing, and the fatures of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

The single figure in the drawing illustrates a spark plug which is provided with an embodiment of my invention.

The arrangement illustrated in the drawing includes a high tension terminal and an electrical connection terminal embedded in a fusible or vitrifiable insulating body, the portion of the body between the terminal and electrode having particles of conducting material interspersed among particles of insulating material so as to connect the electrode electrically to the terminal. The body is fused or vitrified to form an integral mass in order to provide a substantially gas tight bond between the conducting particles and insulating material. Thus, when such a spark plug construction is employed in an internal combustion engine the possibility of a passage being formed in the insulating body of the spark plug through which gases from the cylinder may leak is minimized.

Referring more particularly to the drawing, I have illustrated a spark plug including a body 10 formed of any suitable insulating material, such as a fusible or vitrifiable insulating material, such as a ceramic material or aluminum oxide with a suitable binder. When the last-named material is employed, the possibility of reaction between the insulating material and the products of combustion is minimized so that the insulating properties of the body will not deteriorate. A high tension electrode 11 is provided with a portion 12 having a threaded engagement with a complementary opening in the insulating body 10 and is embedded a sufficient amount therein to secure the electrode tightly to the insulating body. A connection terminal 13 is provided with a part 14 extending into a portion of the body 10 remote or spaced from the electrode 11, and this part 14 also threadedly engages an opening in the insulating body 10 and is embedded therein a sufficient amount so as mechanically to hold the terminal 13 rigidly therein. A metal cap 15 is provided over the end of the body 10 and a plurality of nuts 16 are threaded on the terminal 13 so that a conductor may be tightly secured between the nuts to provide an electrical connection between the terminal and the conductor. An electrically conductive metallic shell 17 is provided which surrounds the body 10 and is provided with a threaded portion 18 adapted to be threaded into a complementary bore in an internal combustion engine. The shell 17 is also provided with an electrode portion 19 which is spaced from the high tension electrode 11 to form an air gap between which a spark passes for igniting a charge of combustible materials in an internal combustion engine. In order to secure the electrodes 11 and 19 in the desired spaced relationship a nut 20 is provided with an externally threaded portion in engagement with an internally threaded portion of the shell 17 remote from the electrode 19. Suitable gaskets 21 and 22 are arranged between cooperating portions on the insulating body 10 and the shell 17 and nut 20 so that when the nut is tightly secured to the shell, the body portion 10 will be held through the gaskets 21 and 22 between the nut 20 and the shell 17 and the desired relative relationship will result.

In order to provide an electrical connection between the high tension electrode 11 and the terminal 13 and still minimize the possibility of gas leakage through that portion of the body 10 between the electrode and terminal, particles 24 of suitable size and of suitable electrically conducting material are interspersed with insulating material 25 to form an electrically con-

ductive core in that portion of the body 10 indicated by the numeral 23, which is between the portion 12 of the high tension electrode 11 and the portion 14 of the connection terminal 13. The conducting particles may be of any suitable material such as electrically conductive metallic particles, graphite, or carbon. The body 10 with the conducting particles, high tension electrode, and terminal is solidified, as by fusion or vitrification, by heating to a suitable temperature, or by any other suitable method such as by pressure to form an integral mass. Also, it will be apparent that the body 10 may be formed into an integral mass before the terminals are put in place. In this manner the particles of conducting material are sufficiently closely arranged to form a conductor between the high tension electrode and the connector terminal, but they are surrounded with insulating material having the same physical properties as that of the body portion 10. With this construction varying operating conditions, such as changes in temperature, will not cause the conducting material to move away from the insulating material and no passage will be formed through which gasses may pass through the plug. The conducting material may be formed in the portion 23 in any suitable manner, such as by forming the body portion 10 with a hollow axial portion 23 in which conducting and non-conducting materials of suitable proportions are inserted. With this method of manufacture the non-conducting material inserted in the portion 23 may be the same insulating material as that forming the body portion 10 or may be a different material, provided that it has substantially the same physical properties and particularly substantially the same thermal expansion characteristic as that making up the body portion 10 so that the substantially gas tight seal will be maintained between the body insulating material and the core non-conducting material throughout the normal operating temperature range of the spark plug. In this manner a core is formed of conducting and non-conducting material which is surrounded by a body portion 10 of insulating material having substantially the same physical properties as the non-conducting core material. Also the core and body 10 may be formed in one operation so that a suitable amount of conducting material is interspersed in the portion of the body 10 between the high tension electrode and the terminal. With this method of construction the particles of non-conducting material which surround the conducting particles will be of the same insulating material as that forming the body portion 10. This will insure that physical properties such as thermal expansion will be the same in the core as in the body of the plug.

It is to be understood that any suitable proportion of conducting and non-conducting material may be provided in the core so as to form a suitable electrical connector between the high tension electrode and the connection terminal and still minimize the possibility of gas leakage. It has been the practice with some internal combustion ignition systems to provide a resistance element in the ignition circuit between the spark plug and the distributor to minimize the possibility of oscillations in the circuit and consequent radio disturbance. It is, therefore, possible with my invention to provide the core with suitable conductance or resistance characteristics to obtain a resistance of a suitable value in the circuit between the high tension electrode and the source of power which is connected through the conventional distributor to the connector 13.

Although I have shown and described a particular embodiment of my invention, I do not desire to be limited to the particular illustrated embodiment, and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A spark plug for an internal combustion engine including a core of particles of conducting material interspersed in a vitrifiable insulating material, and a body of material similar to said vitrifiable insulating material surrounding said core so that the body insulating material and the core insulating material will have the same thermal expansion characteristics, said core and body being formed as a vitrified integral mass providing a substantially gas tight bond between said core material and said body.

2. A spark plug for an internal combustion engine including a body of vitrifiable insulating material, a high tension electrode, a connection terminal, said electrode and terminal extending from spaced parts of said body and having portions embedded in said body mechanically securing said electrode and terminal to said body, and conducting particles interspersed in said body between said electrode and terminal portions so as to connect electrically said electrode and terminal, said body being formed as a vitrified integral mass providing a substantially gas tight connection between said electrode and terminal.

ALEXANDER C. WALL.