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VAPORIZING GLOW IGNITER

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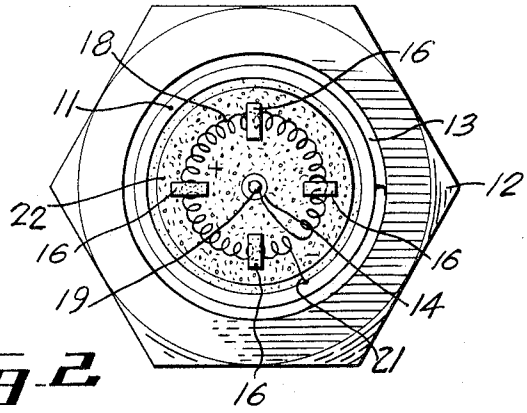


Fig. 2

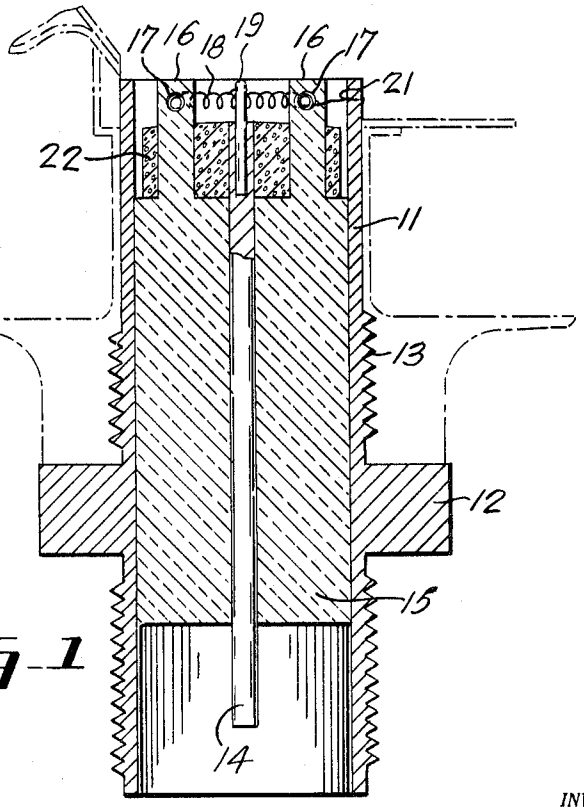


Fig. 1

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VAPORIZING GLOW IGNITER

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This invention relates to igniters, and more particularly to glow plug igniters for use in jet and turbine engines.

The classic igniter for internal combustion engines has been the spark plug which has been used for many years. This is still the major igniter used in gasoline engines. In fact, the large number of motor cars, busses and trucks which have been built and use gasoline engines has encouraged the continuing improvement of spark plugs. Thus, today spark plugs are reliable igniters of gasoline in internal combustion engines all over the world.

However, there are limitations to the abilities of spark plugs to function properly as desired in extreme conditions. At very low temperatures, and at high altitudes, the use of spark plugs for igniting the heavier fuels is not all that is desired. For the newer engines such as jet engines, jet-turbine engines and turbine engines using liquid fuels, the spark plug has not functioned with the necessary reliability for use in aircraft.

Actually, there are several problems involved in igniting fuels in a combustion chamber for a jet or turbine engine. When the engine and the fuel are both cold, there is the problem of initial vaporization of the fuel. For ignition under these conditions, a long lasting, repetitive spark is required. High frequency oscillators for the generation of longer-lived sparks have been tried, but whether the spark is produced by high frequency oscillations or by high voltage A.C. or D.C., a large amount of auxiliary equipment is necessary to produce the spark. Thus, in addition to not being sufficiently reliable under adverse conditions, the use of spark plugs also requires the use of additional auxiliary equipment which occupies space and adds to the weight and expense of the equipment.

Clearly, another form of igniter is needed for the ignition of fuels heavier than gasoline at low temperatures of engine, air and fuel.

Diesel engines use fuels which are heavier than gasoline, and use igniters for starting, particularly when cold. Generally, glow plugs are used in diesel engines to vaporize enough fuel at the start to initiate combustion. Thus, the natural substitute for spark plugs in the combustion chambers of other engines would appear to be the glow plug.

However, in the ignition of cold fuel in a cold combustion chamber of jet and turbine engines, the operating characteristics required are not the same as those for starting diesel or other engines, This is particularly true when the engines are to be started at ambient temperatures of 30° below Fahrenheit or lower. For example, it has been found that some glow plugs which operate suitably at higher ambient temperatures or with lighter weight fuels, would ignite only the small amount of fuel which came directly into contact with the heating element of the plug producing a torch of burning fuel emerging from the mouth of the glow plug, but not readily igniting the rest of the fuel in the combination chamber. Of course, as the combustion chamber heats, combustion becomes general. But often, it is important to have virtually immediate ignition; or ignition in a matter of seconds.

It is the object of this invention to provide new and improved glow plugs adapted to promptly and reliably initiate combustion in a turbine engine combustion chamber.

Further objects and advantages will become apparent as the following description proceeds, which description should be considered together with the accompanying drawings in which:

FIG. 1 is a sectional view through a glow plug according to this invention;

FIG. 2 is a top view of the plug shown in FIG. 1.

Referring now to the drawings in detail, the reference character **11** designates a metal shell of generally cylindrical configuration having an enlarged hexagonal portion **12** and threads **13**. An electrical conductor **14** passes centrally through the hollow interior of the shell **11** and is held in position by a ceramic core **15** extending through a substantial portion of the length of the interior of the shell **11**. At the top portion of the ceramic core (as shown in FIG. 1) are four supporting extensions, each with a perforation **17**. In the cavity surrounding the extensions **16** and immediately above the top of the ceramic core **15** is a block of porous thermally resistant ceramic **22**. A coiled thin resistance wire **18** is supported in the shell **11** by the extensions **16**, the coiled wire **18** passing through the perforations **17** in the extensions **16**. Preferably, the resistance wire **18** is made of a platinum iridium alloy to withstand the possible corrosive properties of leaded fuels. A central conductor **19** connects the conductor **14** with one portion of the coiled wire **18**, and a wire **21** connects another portion of the wire **18** with the shell **11**.

In use, the plug of FIGS. 1 and 2 is inserted into the wall of a combustion chamber by screwing into a suitable opening therein, much in the same manner that a spark plug is inserted into a combustion chamber. The preferred position of the glow plug is with the shell **11** generally horizontal, but with a slight upward tilt so that a little fuel will drip into the open end, but so that the latter will not be flooded. The hexagonal portion **12** serves as a means for applying a standard wrench to the plug for insertion or extraction purposes. The engine is connected to one side of a source of electrical energy, and the other side is connected to the free end of the electrode **14**. When the circuit is closed, current from the source (not shown) flows through the central electrode **14**, the coiled resistance wire **18**, the wire **21** and the engine, back to the source. The current flowing through the fine resistance wire causes it to heat and glow. With the shell **11** generally horizontal, fuel entering the combustion chamber is permitted to drip down into the open end of the shell **11**, wetting the porous ceramic block **22** with fuel. The heat from the glowing resistance wire vaporizes the fuel in the block **22**, and ignites it. In addition, the heat radiating from the hot ceramic block **22** vaporizes the fuel near the open end of the plug, and causes flame propagation in the chamber. After the fuel has been ignited, and combustion is general, the current flow to the glow plug is interrupted.

It has been found that the preheating of the porous core **22** by the glowing coil of resistance wire **18** greatly facilitates the ignition of the heavier fuels, particularly at low ambient temperatures. As the cold fuel is absorbed by the heated block **22**, it is vaporized and ignited by the coil resulting in "torching," to provide a pilot flame for general propagation.

The above specification has described and illustrated a new igniter for igniting the fuel in combustion chambers of jet engines, turbine engines, and the like. The igniter described is particularly reliable when the temperature at which it is required to operate is below zero degrees Fahrenheit. Since it is realized that the above description may indicate to others in the field further ways in which the principles of this invention may be used without departing from its spirit, it is intended that this invention be limited only by the scope of the appended claims.

I claim:

1. An igniter for combustion chambers in which fuel is required to be ignited rapidly at low temperatures, said igniter comprising a hollow housing having an open end adapted for mounting in communication with such combustion chamber, a core of thermal and electrical insulating material extending within said housing and shaped to provide an exposed cavity within said housing at said open end, an elongated igniting element of high temperature electrically conductive material mounted within said cavity so as to be exposed to the atmosphere of such combustion chamber and having one end electrically connected to said housing and its other end connected to an electric conductor extending through said core, and an independent body of fluid-absorbent material positioned within said cavity and spaced adjacent the length of said igniting element, said absorbent material serving to absorb fuel for evaporation and ignition by said igniting element.

2. An igniter for combustion chambers in which fuel is required to be ignited rapidly at low temperatures, said igniter comprising a hollow housing having an open end adapted for mounting in communication with such combustion chamber, a core of thermal and electrical insulating material extending within said housing and shaped to provide supporting extensions and between and about said extensions an exposed cavity within said housing at said open end, an igniting element of high temperature

electrically conductive wire mounted within said cavity upon said extensions so as to be exposed to the atmosphere of such combustion chamber and having one end electrically connected to said housing and its other end connected to an electric conductor extending through said core, and a block of porous, fluid-absorbent thermally resistant material positioned within said cavity in spaced adjacent relationship to said igniting element, said block serving to absorb fuel for evaporation and ignition by said igniting means.

3. An igniter as claimed in claim 2 wherein said igniter coil is in the form of an annular helix arranged in a plane parallel to the floor of said cavity.

4. The igniter of claim 1 in which said igniting element is comprised of platinum wire.

5. The igniter of claim 1 in which said body is ceramic.

6. The igniter of claim 2 in which said igniting element is comprised of platinum wire.

7. The igniter of claim 2 in which said block is ceramic.

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