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SILICON CARBIDE IGNITER

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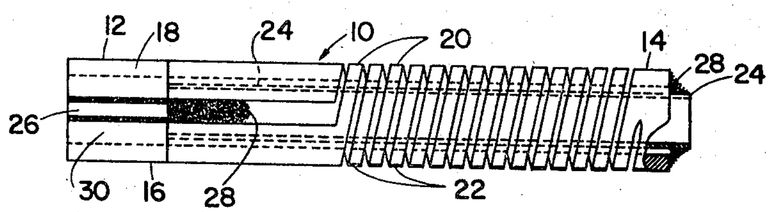


FIG. 1

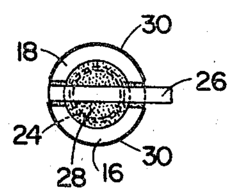


FIG. 2

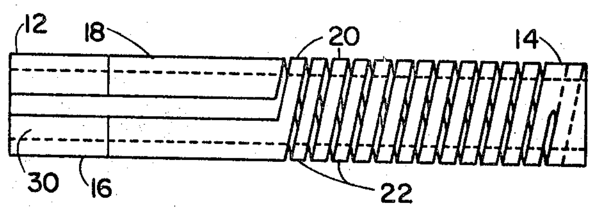


FIG. 3

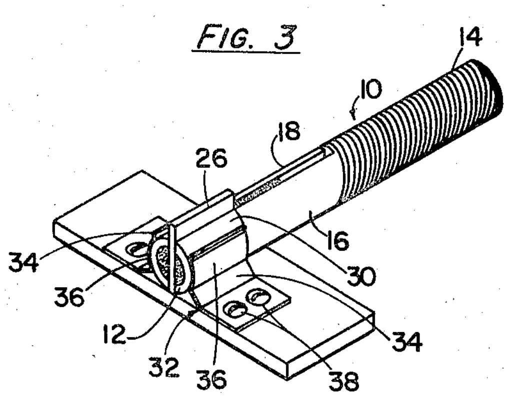


FIG. 4

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## SILICON CARBIDE IGNITER


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7 Claims. (Cl. 317—98)


This invention relates to igniters and more particularly to a new and improved silicon carbide igniter element employed in fuel oil and gas ignition systems.

In the manufacture of igniter devices for fuel burning systems, it has been known to employ high tension spark-gap types of igniters which require a high voltage and therefore step-up transformers. Another known type of igniter is a low voltage platinum coil which is not only very fragile, but also requires a step-down transformer.

It has also been known to employ silicon carbide igniters because of their desirable characteristics such as their ability to withstand exceedingly high operating temperatures without disintegration or material deterioration. Furthermore, they are non-corrosive and substantially inert to the destructive effects of fuel combustion products.

Although such prior known devices have served the purposes for which they were designed, they have not been entirely satisfactory under all conditions of operation due to the fragility, non-dependability, and excessive costs.

The general purpose of the present invention is to obviate the above disadvantages by providing an igniter which is more dependable, more readily reproduced, costs less, is physically strengthened due to its construction, and requires only a common line voltage.

It is therefore an object of this invention to provide a new and improved silicon carbide igniter.

It is another object of the present invention to provide a new and improved silicon carbide igniter incorporating miniaturized elements.

It is still another object of the present invention to provide a new and improved silicon carbide igniter having novel support means.

It is a further object of the present invention to provide a new and improved silicon carbide igniter having novel support means cemented to the igniter body to provide overall igniter strength and ruggedness.

It is still a further object of the present invention to provide a new and improved silicon carbide igniter having novel means for attaining desired igniter orientation.

It is yet a further object of the present invention to provide a new and improved silicon carbide igniter having novel termination means cooperable with a new and improved electrical contact means.

These and other objects of the present invention will become more apparent upon consideration of the following detailed description thereof when taken in conjunction with the following drawings, in which:

FIG. 1 is a top plan view of a silicon carbide igniter element constructed in accordance with the principles of this invention with a portion thereof broken away to more clearly show the structure thereof;

FIG. 2 is an end elevational view of the igniter element as shown in FIG. 1;

FIG. 3 is a top plan view of the resistance body per se, showing an electrical conducting metal coated adjacent one end thereof; and

FIG. 4 is a perspective view of the assembled igniter element shown mounted in a split-clip type contact.

Referring to the drawings in detail, it will be seen that a silicon carbide igniter element constructed in accordance with the principles of this invention comprises an

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elongated, hollow, tubular, resistance body, generally designated **10**, having opposite end portions **12** and **14** respectively, said body composed of a non-metallic resistance material such as a very dense, recrystallized silicon carbide by way of example.

Utilizing a unique cutting technique, a pair of diametrically opposed slots are cut through the radial wall thickness of body **10** extending from the face of end portion **12** and terminating substantially midway of the length of said body to form two substantially semi-circular, laterally spaced trough members or legs **16** and **18**.

Utilizing the same unique cutting techniques, a pair of closely spaced spiral slots are cut through the wall thickness of body **10** extending from the ends of the legs **16** and **18**, respectively, axially toward end portion **14** to form a pair of helical bands **20** and **22** (see FIG. 3). Helical band **20** extends longitudinally from leg **16** to end portion **14** and helical band **22** extends longitudinally from leg **18** to end portion **14**. It should be appreciated that the principles of this invention contemplate shorter or longer axial lengths of legs **16** and **18** and/or bands **20** and **22**, if desired. It will be seen that a continuous path is provided for electrical current through leg **16**, helical band **20**, end portion **14**, helical band **22** and leg **18**.

For the purpose of physically strengthening the resistance body **10**, a high temperature, ceramic support tube **24**, composed of a material such as alumina or mullite by way of example, is provided within resistance body **10**, said tube commencing inwardly from end portion **12** as shown in FIG. 1, extending axially through the resistance body **10** and terminating slightly beyond end portion **14**. Support tube **24** is secured at either end thereof to the body **10** by means of an adhesive material **28** preferably of a suitable ceramic cement having a high dielectric strength.

A coating of any suitable electrical conducting material **30**, such as aluminum by way of example, is deposited on the exterior of legs **16** and **18** adjacent end portion **12** (see FIGS. 1 and 3) in order to provide terminals for the resistance body **10**. The coating may be sprayed onto legs **16** and **18** or it may be applied in any other conventional manner well-known in the art.

A polarizing key **26** is disposed between legs **16** and **18** adjacent end portion **12**, said key being substantially flush with both the face of end portion **12** and the bottom of the periphery of the resistance body **10** as shown in FIGS. 2 and 4, respectively, while protruding radially beyond the periphery of said body at the top thereof. The terms bottom and top are employed in connection with FIG. 4 and, as used herein, are applied only for convenience of description and should not be taken as limiting the scope of this invention. Of course, key **26** can be extended to protrude radially beyond both the top and bottom of body **10**, if desired. The end face of the support tube **24** adjacent end portion **12** engages polarizing key **26**. As shown in FIG. 1, polarizing key **26** is secured between legs **16** and **18** by means of an adhesive material **28**, such materials preferably being a ceramic cement having a high dielectric strength. It should be noted that the cement encloses that portion of the key disposed within body **10** and extends from said key in the slots defined by legs **16** and **18** for a substantial distance towards the spiral area to provide added strength and adherence qualities to the igniter element.

End portion **12** of body **10** is adapted to be mounted within a split-clip type of contact **32** comprising a pair of resilient, metallic prongs **34** having arcuate shaped portions **36**, respectively, complementary to the outer cylindrical surfaces of the legs **16** and **18**. The clip, which is adapted to be mounted within the combustion chamber of a fuel burning mechanism by means of suitable screws 38, provides a long life electrical connection as well as a mechanical means for maintaining the desired igniter orientation.

The clip is composed of any suitable metal, such as heat treated stainless steel or a high chrome, nickel-base, heat resistant alloy as Inconel® "X" by way of example, so that high temperature strength and compatibility is maintained with the aluminum metallizing on the resistance body 10.

It will be readily apparent to those skilled in the art that the smaller cross sections of bands 20 and 22 relative to legs 16 and 18 form a high temperature or "hot portion" which is the effective heating portion of the element while the remainder of the element remains relatively cool. Due to the positive temperature coefficient inherent in the silicon carbide resistance body at elevated temperatures, the igniter element exhibits a temperature limiting feature which allows for a steady state operation over a prolonged period of time.

In certain applications, if desired, upon attainment of a predetermined temperature in the "hot portion" beyond the igniting temperature, a switch may be activated to prevent any further heating of the igniter element. Also, various control arrangements may be designed to provide refinements in energizing and controlling the igniter element in a timed relationship in conjunction with a fuel supply means in fuel burning mechanisms.

As a result of this invention, a new and improved silicon carbide igniter is provided for fuel combustion systems, said igniter being provided with termination at one end only to appreciably shorten and miniaturize the length thereof, thus keeping the critical working or "hot portion" only within the area of the flame.

Cool termination is desirable to preclude oxidation of the electrically conductive sprayed end and the electrical contact. By the provision of a polarizing key, proper orientation of the termination end is insured and shorting out by careless installation is prevented. By the provision of the support tube, a more reliable and durable igniter is obtained. A further advantage is the bonding of the support tube to the resistance body with a ceramic cement which is also deposited in the diametrically opposed slots of the resistance body to improve the overall unit strength and ruggedness.

A preferred embodiment of this invention having been described and illustrated, it is to be realized that modifications thereof may be made without departing from the broad spirit and scope of this invention as defined in the appended claims.



I claim:

1. An igniter element comprising: an elongated hollow body composed of a non-metallic resistance material having a first portion comprising a pair of laterally spaced elongated members having outer surfaces and a second portion comprising a pair of spaced helical bands connected to and extending longitudinally from said elongated members, respectively, and terminating in an end portion; an elongated support member disposed within said body and secured adjacent the opposite ends thereof to said body with adhesive material; a coating of electrical conducting material deposited on said outer surfaces of said elongated members adjacent the ends thereof remote from said helical bands; and a polarizing key secured with said adhesive material between said elongated members adjacent the ends thereof remote from said helical bands.

2. An igniter element as defined in claim 1 in which said adhesive material is a ceramic cement having high dielectric strength.

3. An igniter element as defined in claim 2 in which said adhesive material surrounds at least a portion of said polarizing key and extends longitudinally inwardly therefrom a substantial distance toward said helical bands.

4. An igniter element as defined in claim 2 in which the ends of the elongated members remote from the helical bands having said electrical conducting material thereon are engageable with an electrical contact.

5. An igniter element as defined in claim 4 in which said electrical contact comprises a pair of resilient metallic prongs.

6. An igniter element as defined in claim 5 in which said outer surfaces of said elongated members are arcuately shaped and said metallic prongs have inner arcuate surfaces complementary to said outer surfaces.

7. An igniter element as defined in claim 6 in which said non-metallic resistance material is dense, recrystallized silicon carbide.

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