# United States Patent

[11] **3,562,590**


[72] Inventors **Richard K. Mitts**
**Fullerton;**
**Wilbur F. Jackson, Rolling Hills; James R. Willson, Garden Grove, Calif.**



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[73] Assignee **Robertshaw Controls Company**
**Richmond, Va.**
**a corporation of Delaware**


[54] **ELECTRIC IGNITER CONSTRUCTION**
**12 Claims, 7 Drawing Figs.**


[52] **U.S. Cl.** ..... **317/98,** 219/270; 431/260, 431/263
[51] **Int. Cl.** ..... **F23g 7/10**
[50] **Field of Search** ..... 219/260, 270, 267, 347—9; 317/79, 98; 123/145A; 431/254, 263, 258



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*Primary Examiner*—Volodymyr Y. Mayewsky
*Attorney*—Christen, Sabol & O'Brien



**ABSTRACT:** An electric igniter assembly including a hollow casing in which the major length of the igniter element is enclosed so that only a small portion is disposed in proximity to a gas burner; the electrical connectors for the igniter element and the electrodes that are attached to power leads are disposed remote from the flame issuing from the gas burner as well as being fixedly supported in the casing which includes shock absorbent material to reduce possibilities of breakage of the igniter element.

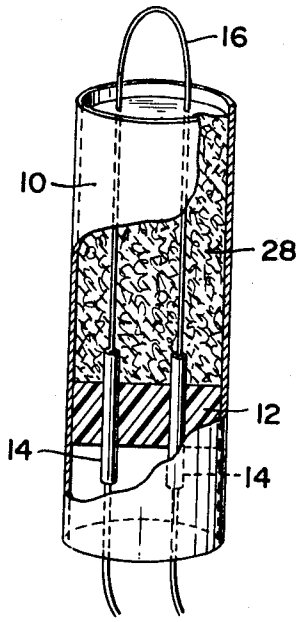



FIG. 1

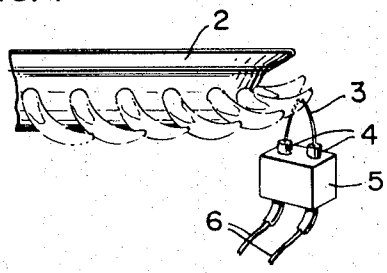



FIG. 2

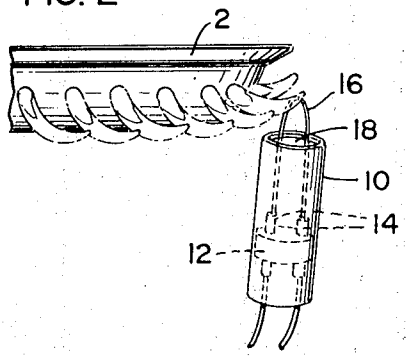



FIG. 3

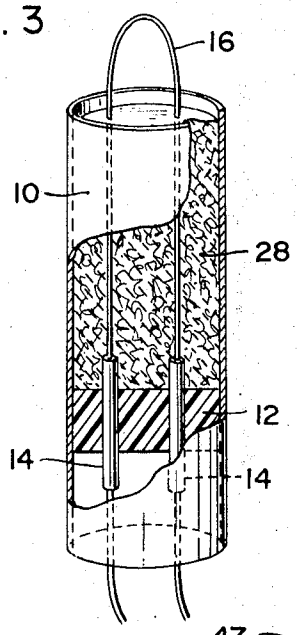



FIG. 4

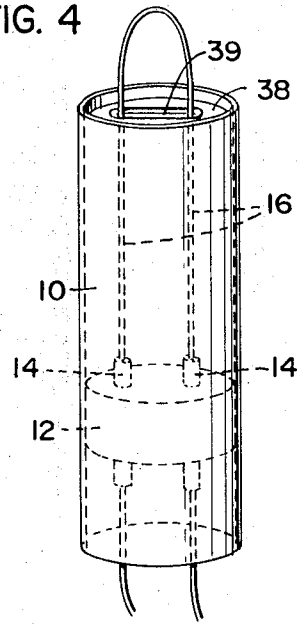



FIG. 5

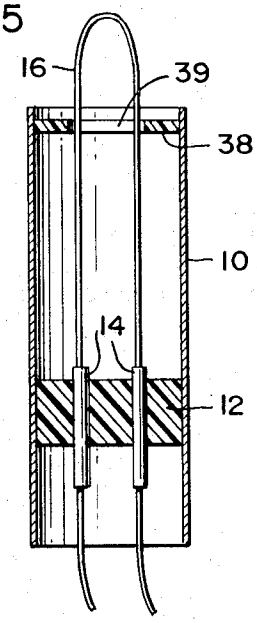



FIG. 6

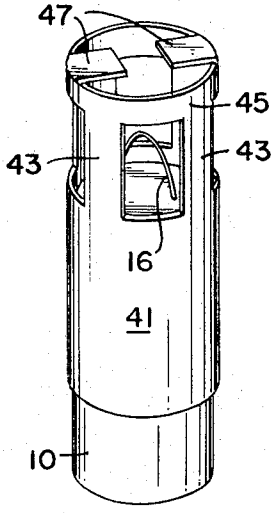
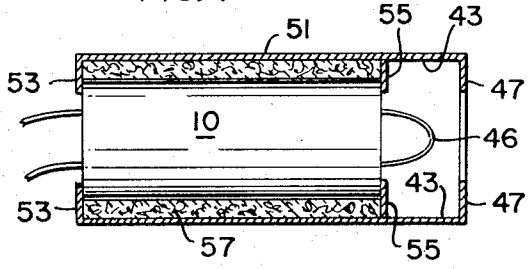



FIG. 7




INVENTORS,
Richard K. Mitts
Wilbur F. Jackson
James R. Willson

BY
Christen, Sabol & O'Brien ATTORNEYS

# ELECTRIC IGNITER CONSTRUCTION

## BACKGROUND OF THE INVENTION

This invention relates generally to the construction of an igniter device of the type that would be used to light the burner of a gas-burning appliance.

Certain materials are particularly suited for use as these igniters due to the excellent resistance to oxidation, resistance to thermal shock, resistivity, coefficient of thermal resistance and a high melting temperature. Among such materials are molybdenum disilicide, tungsten disilicide and silicon carbide. Igniter wires made out of such a material have certain defects because of their fragility of the material making it susceptible to breakage. Another defect resides in the face that an igniter wire made of such a material required support from the electrodes so that the length of the igniter wire was limited resulting in the connection between the igniter wire and the electrodes being in close proximity to the flame issuing from the gas burner.

## SUMMARY OF THE INVENTION

It is therefore an object of the present invention to construct an igniter assembly that will overcome the foregoing defects and at the same time have the desirable features of being low in cost, accurate in operation, and simple in design so as to be easy to manufacture and assemble.

Another object of the present invention is to construct an electric igniter assembly with an igniter element that is supported throughout a major portion of its length.

The present invention has another object in that the electric connectors for an igniter element are located remote from the igniter portion which is disposed in the burner flame.

It is another object of the present invention to provide an igniter assembly with a high temperature-supporting material to reduce the amount of igniter material that is susceptible to impact failure.

Another object of this invention is to provide an igniter assembly with a shield and reflective surface in the area approximate the igniter element. A further object of the present invention is to provide an igniter assembly and its shield with a resilient layer of material therebetween to absorb impact shock.

The present invention is characterized in an electric igniter construction including a hollow casing, an electric element having an igniting portion extending out of the casing and a supportable portion disposed inside the casing, electrical conductor means connected to the supportable portion of the igniter element, a plug carrying the electrical conductor means being fixed inside the casing intermediate its ends so that such conductor means are remote from the igniting portion, and support means inside the casing for the supportable portion of the igniter element.

These and other objects and advantages of the present invention will become apparent from the following detailed description viewed in conjunction with the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial schematic view showing the positioning relationship of an electric igniter to a gas burner;

FIG. 2 is a partial schematic view similar to FIG. 1 embodying the present invention;

FIG. 3 is an isometric view with parts in section of an electric igniter construction forming a second embodiment of the present invention;

FIG. 4 is an isometric view of an electric igniter forming a third embodiment of the present invention;

FIG. 5 is a longitudinal cross section of FIG. 4;

FIG. 6 is an isometric view of an electric igniter with a shield thereon; and

FIG. 7 is a cross section of an electric igniter having a shield and a cushioning layer thereon.



## DESCRIPTION OF THE PREFERRED EMBODIMENTS

As is illustrated in FIG. 1, a main burner 2 is supplied with gas from a main supply (not shown) and an igniter 3 is attached to the main burner 2 in igniting proximity thereto. The igniter element 3 is located in the flame issuing from the main burner and is electrically connected to a pair of electrodes 4 that are fixed in a casing 5 of temperature-resistant material such as a ceramic. The other end of the electrodes 4 are connected to a pair of lead wires 6 for connection to an electrical voltage source (not shown).

One of the more desirable materials to be utilized as the electric igniter wire for gas burners is molybdenum disilicide because of its excellent oxidation resistance as well as its high resistance to thermal shock. Of course, other materials may also serve as the igniter element of an electric igniter. While it is possible to utilize a variety of materials as elements for electric igniters in the laboratory and/or on the drawing board, they have a fatal defect in being susceptible to breakage during installation on the gas burning appliances or during subsequent shipment of the appliances. Thus the electric igniter wire 3 as shown in FIG. 1 not only would be susceptible to the problem of breakage but would have a further defect in that reliable electrical connections to the electrode t terminals would be difficult to ensure because of their subsequent exposure to the burner flames. As is illustrated in FIG. 2, the first embodiment of the present invention overcomes the above difficulties without displacing the igniter from the flames of the main burner 2. The igniter construction of FIG. 2 includes an outer cylindrical shell 10 having a support plug 12 in the form of a solid cylinder fixed inside the casing 10 intermediate the ends thereof. A pair of electrodes 14 extend through and are fixedly supported by the support plug 12. The lower ends of the electrodes 14 (as viewed in FIG. 2) are connected to a pair of lead wires which extend out of the open bottom of the casing 10 for connection to a suitable electric voltage source (not shown). The upper ends of the electrodes 14 are electrically connected to an inverted generally U-shaped wire 16 which has its looped end protruding out of the casing 10 to define the igniting portion that is disposed in igniting proximity to the main burner 2. The electric igniter 16 is preferrably made of molybdenum disilicide; however, similar materials exhibiting characteristics of being resistant to oxidation and to thermal shock may also be utilized for the igniter 16.

The space between the top of the support plug 12 and the open end of the casing 10 is filled with a high temperature resistant potting compound 18. Since the potting compound 18 surrounds the lower portion of the igniter wire 16, it acts as an additional supporting structure for the entire igniter wire 16 and substantially reduces the amount of igniter material that is susceptible to impact failure. In addition, the amount of igniter wire that is exposed to the burner flames, is a relatively short length and the connections to the electrodes 14 are remote from the burner flames and are likewise protected by the supporting compound 18.

In the following description of the subsequent embodiments of the invention, the same reference numerals will be utilized for the same structural elements that have been described in connection with FIG. 2 and further description thereof will be omitted for the sake of brevity. For example, the embodiment of FIG. 3 differs from the embodiment of FIG. 2 only with respect to the supporting compound that is used to support the encased ends of the igniter wire 16. Thus in FIG. 3 a high temperature-resistant flexible material 28 is disposed in the space between the upper surface of the support plug 12 and the open end of the casing 10. A particular example of this high temperature-resistant flexible material is glass wool which would not only help to support the igniter wire 16 throughout its length in the casing 10 but would also help to absorb shock loads imparted to the casing 10.

In the embodiment illustrated in FIGS. 4 and 5, the open end of the casing 10 is provided with a support disc 38 having

a central slot **39** through which the looped end of the igniter wire **16** protrudes. The support disc **38** is fixed to the interior of the casing **10** in any suitable manner and is located adjacent to the open end thereof so as to provide an upper support for the igniter wire **16**. The support disc **38** may touch the igniter wires at each end of its slot or may be merely positioned in close proximity thereto to prevent excessive movement of the igniter wire **16**. The support disc **38** may be made of any suitable temperature-resistant material such as a thermosetting resin. As is illustrated in FIG. **5**, the space in the casing between the upper surface of the support plug **12** and the support disc **38** is not filled with any supporting material; however, if desired this space could be filled with glass wool or the like as similarly described in connection with the embodiment of FIG. **3**.

A desirable feature in the design of an electric igniter assembly is to construct a device with a current drawing of less than 5 amperes under all conditions of primary line voltage change. The 5 ampere maximum current draw is necessary in order to stay within the limits of a Class II transformer as defined by Underwriters' Laboratories. The maximum current draw of an igniter assembly is found by first determining the minimum current necessary to ignite a burner. This minimum current is found at the minimum primary voltage. The maximum current draw is found then under the same conditions, but with maximum primary voltage. Three things influence the maximum current draw of the igniter: the first is lighting efficiency; the second is the amount of self-heat received by the igniter material; and the third is the temperature coefficient of resistance of the material.

With the igniters utilizing a material, such as molybdenum disilicide, having a positive temperature coefficient of resistance, i.e., the resistance increases with an increase in temperature, any means of increasing the heating efficiency of the igniter will in turn effect a resistance increase of the igniter and thus increase the voltage and decrease the current draw. It has been found by experimentation that the current draw of an igniter can be substantially reduced by means of a properly designed igniter shield. The igniter shield helps to increase the lighting efficiency of the igniter; i.e., the igniter will effect ignition of a burner at a reduced temperature because it spoils the cooling effect of the gas. The shield also reflects heat back to the igniter, thus increasing the igniter temperature for a given power of current draw, and thus raising the resistance of the igniter and reducing the maximum current draw of the assembly.

As is illustrated in FIG. **6**, an igniter shield **41** has a lower portion fixed in any suitable manner to the exterior of the igniter casing **10**. Even though the igniter casings **10** as shown in FIGS. **2—5**, have a circular configuration they are not necessarily limited such a shape but may take any other cross-sectional configuration as desired. Accordingly, even though the shield **41** of FIG. **6** is in the form of a hollow cylinder the lower portion thereof need not have any particular shape but need only be of sufficient dimensions to be fixed to the casing **10** and to protect the flame side thereof. The upper end of the shield **41** includes a plurality of arcuate surfaces **43** (in this instance a plurality of **4**) which are arranged in opposing pairs on opposite sides of the igniter wire **16**. An annulus **45** joins the upper edges of the reflecting surfaces **43** and has a pair of inwardly bent tabs **47**. The tabs **47** provide additional reflective surfaces for the igniter wire **16** and further protect the same from coming in contact with any foreign object.

The shield **4 1** with its reflective surfaces **43**, annulus **45** and tabs **47** may be constructed as a single unit as is illustrated in FIGS. **6** and **7** or may be constructed as separate elements secured together in any suitable manner.

As is illustrated in FIG. **7**, the shield **51** is substantially the same as that shown in FIG. **6** except that it has dimensions greater than the igniter casing **10** both in length and width. The lower end (or left end as viewed in FIG. **7**) of the shield **51** has a plurality of inwardly bent tabs **53** being of sufficient dimension to engage the bottom of casing **10**. A plurality of similarly inwardly bent tabs **55** are located near the opposite end of the shield **51** in order to engage the upper end of the casing **10**. With the casing **10** being so held between the tabs **53** and **55** the space between the outer wall of the casing **10** and the shield **51** is filled with a layer of resilient material **57** that will absorb impact between the shield **51** and the igniter casing **10**. For example, if the assembly shown in FIG. **7** should be dropped, the shield **51** will first receive the impact but the shock will be reduced by the resilient material **57** before being transmitted to the igniter casing **10**.

In all of the above embodiments the shape of the igniter assembly is described as having a cylindrical configuration and it is recognized that other particular shapes may be utilized. However, the cylindrical shape provides an advantage over previous igniter assemblies when the igniter is being used to light main burners directly; prior art igniters have been previously designed so as to ignite a pilot burner rather than a main burner. The cylindrical shape of this igniter makes it easier to position the igniter in a burner flame for good ignition while keeping the electrical connections and mounting means at a cooler position away from the main burner flame. The cylindrical shape also enhances the flexibility of this igniter assembly in that it makes it possible to mount the assembly on a greater variety of burners from a greater number of locations.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim:

**1**. An electric igniter assembly for a fuel burner comprising:

a non combustible hollow casing;

a continuous electrical igniter element having an igniting portion extending out of said hollow casing and adapted to be disposed within igniting proximity of the fuel burner, connectable portions disposed inside of said hollow casing, and supportable portions disposed inside of said hollow casing and extending between said connectable portions and the ends of said igniting portion;

electrical conductor means fixedly connected to the connectable portions of said igniter element;

means secured within said hollow casing for fixedly supporting said electrical conductor means with said igniter element suspended therefrom partially within said hollow casing; and

high temperature-resistant support means mounted in said hollow casing in spaced relation to the igniting portion of said igniter element for supporting the supportable portions of said igniter element adjacent the ends of the igniting portion of said igniter element to protect the same from breakage.

**2**. The invention as recited in claim **1** wherein the supportable portions of said igniter element are greater in length inside of said hollow casing than the igniting portion is outside of said hollow casing.

**3**. The invention as recited in claim **1** wherein said support means includes a high temperature resistant potting compound surrounding the supportable portions of said igniter element.

**4**. The invention as recited in claim **1** wherein said support means includes glass wool material surrounding the supportable portions of said igniter element.

**5**. The invention as recited in claim **1** wherein said support means includes a plastic plate element secured to said hollow casing in spaced relation to said electrical conductor means and having a centrally aligned slot within which the supportable portions of said igniter element are freely disposed.

**6**. The invention as recited in claim **1** wherein shield means is exteriorly secured to said hollow casing to shield the same from flames of an igniter burner.

**7**. The invention as recited in claim **6** wherein said shield means includes reflector means disposed around the igniting portion of said igniter element.

8. The invention as recited in claim 6 wherein said shield means includes a housing surrounding said hollow casing, and wherein shock absorbing material is disposed between said housing and said hollow casing to absorb shock loads between said housing and said hollow casing.

9. The invention as recited in claim 6 wherein said shield means includes a housing attached to said hollow casing, and said housing is provided with reflector means disposed adjacent the igniting portion of said igniting element.

10. The invention as recited in claim 9 wherein said reflector means includes a plurality of arcuate surfaces oppositely disposed to each other.

11. The invention as recited in claim 10 wherein said housing comprises a hollow cylinder and said arcuate surfaces are extensions of said cylinder, and wherein an annulus joins said extensions.

12. The invention as recited in claim 11 wherein said reflector means further includes tab means bent inwardly from said annulus to overlie the igniting portion of said igniter element.