Nov. 21, 1950 S. J. LAKOTA ET AL 2,530,827

ELECTRIC IGNITER FOR GASEOUS FUEL

Filed May 1, 1945

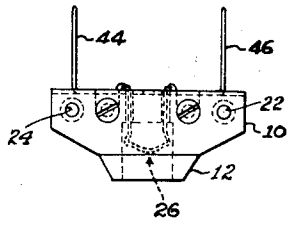


Fig. 1.

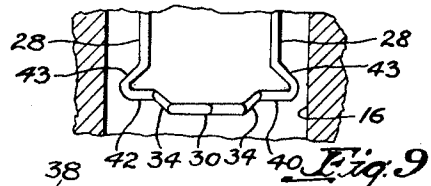


Fig. 9

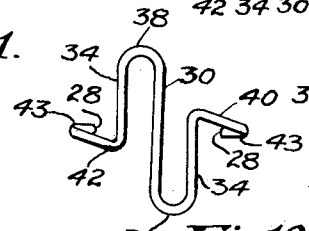


Fig. 10

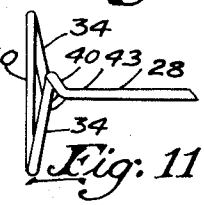


Fig. 11

Fig. 2.

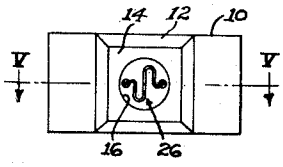


Fig. 3.

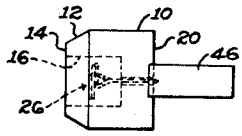
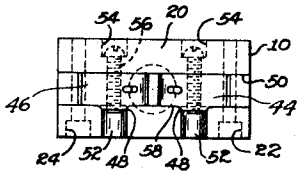


Fig. 4.



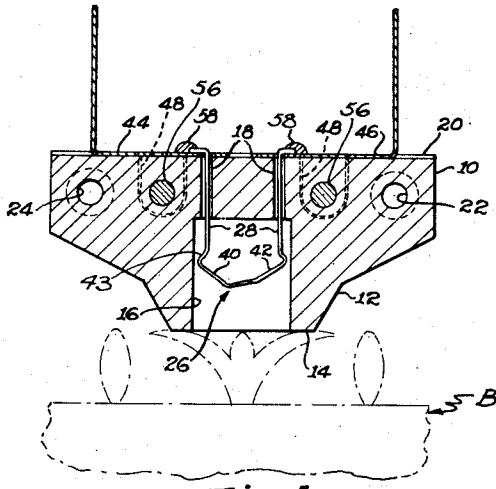


Fig. 5.

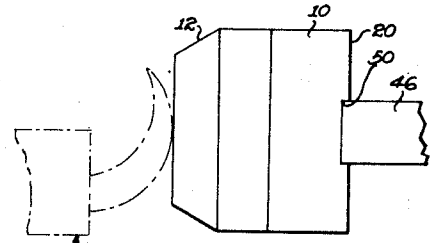


Fig. 6.

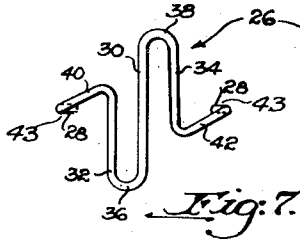


Fig. 7.

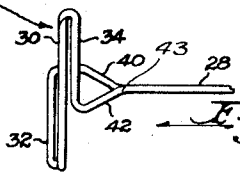


Fig. 8.

INVENTORS.
STANLEY J. LAKOTA &
THEODORE E. RUDISELLE.
BY Albert J. Henderson
their ATTORNEY.

Patented Nov. 21, 1950

2,530,827

UNITED STATES PATENT OFFICE

2,530,827

ELECTRIC IGNITER FOR GASEOUS FUEL

Stanley J. Lakota, Pittsburgh, and Theodore E. Rudiselle, Greensburg, Pa., assignors to Robertshaw-Fulton Controls Company, a corporation of Delaware

Application May 1, 1945, Serial No. 591,388

12 Claims. (Cl. 219—32)

1

This invention relates to electric ignition devices for gaseous fuel burners and, more particularly, to electric resistance igniters.

Resistance coils brought to incandescence by the passage of electric current therethrough have been used extensively to ignite flowing combustible fuel such as gas-air mixtures. Such igniters have been supported in housings of various types for protecting the coil and facilitating ignition. It has been pointed out that helical coils are subject to various objections which can be avoided by flattening the helix so that the turns of the wire all lie in a plane parallel to the axis of the flame. An embodiment of this practice may have the helix turns strung between mica plates carried by the housing.

The wire material of which electric resistance igniters are made may be catalytic or non-catalytic. An example of the former is platinum-iridium alloy which displays a high minimum life and uniform ignition performance from day to day as well as ability to ignite a wide variety of gas-air mixtures when the wire is brought to suitable temperature. Combustion occurs on the surface of this metal catalytically with the evolution of gases which exert a quenching effect tending to prevent ignition. This accounts for the relatively high ignition temperatures required with catalytic metals in general.

It is apparent that the evolved gases would tend to concentrate in the spaces between the coil turns and become trapped therein. Such effect is particularly pronounced in the case of helical coils and is not avoided by the proposed flattening of the helix due to the presence of a number of spaces between turns along the axis of the coil. A straight wire would avoid the difficulty pointed out in regard to coils but such an expedient is impractical owing to the extremely high temperature required for ignition in the presence of the cooling effect of the flowing gas-air mixture on the small mass.

In addition to the drawback relating to trapped gases, the coil comprising a multiplicity of turns is subject to other disadvantages. After repeated use the coil becomes distorted and the turns draw closer together. This decreases the rated resistance value of the coil and the operating temperature thereof falls below that required to ignite the fuel mixture. It is evident that a safety hazard is thereby created due to the escape of unburned fuel. A further disadvantage is the large amount of wire required to form the coil which involves considerable expense in the case of costly metals such as platinum and iridium.

2

An object of this invention is to ignite a fuel mixture consistently over a long period of time.

Another object is to eliminate injurious distortion of the igniter element when operated at igniting temperature.

Another object of the invention is to reduce the operating temperature of the igniter while rendering it capable of satisfactory performance.

Another object of the invention is to reduce the catalytic effect of the igniter.

Another object of the invention is to render the igniter capable of withstanding high inrush currents.

Another object of the invention is to avoid gradual decrease in igniter performance up to the time that actual fracture occurs.

Another object of the invention is to decrease the cost of igniters while retaining the advantages of expensive materials.

Another object of the invention is to simplify the design of igniters and thereby reduce the cost of manufacture, installation and replacement.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing, wherein—

Fig. 1 is a plan view of the improved electric ignition device;

Fig. 2 is a front elevation of the same;

Fig. 3 is a side elevation;

Fig. 4 is a rear elevation;

Fig. 5 is an enlarged cross section taken on the line V—V of Fig. 2 and showing the device positioned relative to a burner;

Fig. 6 is a side elevation of the device as shown in Fig. 5;

Fig. 7 is a front elevation of the igniter wire separated from the housing;

Fig. 8 is a side elevation of the igniter wire shown in Fig. 7, and

Figs. 9, 10 and 11 are plan, front and side elevations respectively of a modified form of igniter wire.

Referring more particularly to the drawing, the housing 10 is preferably formed of ceramic material and is genearlly rectangular in shape having a beveled nose portion 12 located on the front face thereof. Extending axially through the nose portion 12 from the front face 14 thereof and terminating in a closed end within the median portion of the housing 10 is a chamber 16, preferably of cylindrical form. A pair of spaced apertures 18 extend rearwardly from the bottom of the chamber 16 through the housing 10 to the rear face 20 thereof. The apertures 18 are preferably located

on either side of the axis of the chamber 16 and extend substantially parallel therewith. The housing may be secured to a support, such as a portion of a stove, by bolts or screws (not shown) extending through spaced perforations 22 and 24 formed in the median portion of the housing 10 substantially normal to the axis of the chamber 16.

The fuel igniting means of this invention comprises a platinum-iridium alloy wire designated generally by the reference numeral 26. A suitable alloy is 80 per cent platinum, 20 per cent iridium. The wire is of generally U-shaped configuration and has its free ends projecting through the apertures 18 and the closed end positioned in the chamber 16. Thus, the free ends of the wire 26 project substantially parallel with the axis of the chamber 16 and rearwardly therefrom to the exterior of the housing 10.

The closed end of the wire 26 is preferably positioned substantially midway of the ends of the chamber 16 and provides an igniter portion of particular form to achieve the objects of this invention. This igniter portion, as shown in Figs. 1–8 inclusive, consists of an upright center leg 30 and a pair of side legs 32 and 34 in substantially parallel spaced relation thereto on either side thereof. Preferably, the side legs 32 and 34 are offset forwardly and rearwardly respectively from the plane of the center leg 30 by an amount slightly greater than the thickness of the wire to avoid contact with the center leg or with each other should the igniter become laterally distorted. The side legs 32 and 34 are connected to opposite ends of the center leg 30 by arched portions 36 and 38 respectively and terminate substantially midway between the arched portions to form lateral portions 40 and 42 which diverge from the side legs 32 and 34 respectively downwardly and upwardly relative to the axes thereof. The lateral portions 40 and 42 then converge as connecting portions 43 for the free ends 28. The junctions of the side legs 32 and 34 with the connecting portions 40 and 42 and the latter with the free ends 28 are all formed on a radius to avoid sharp bends in the structure. In the event distortion of the wire occurs, then contact with the chamber wall will be only at the points of junction of the lateral portions 40 and 42 with the connecting portions 43.

It will be understood that the center leg 30 and the side legs 32 and 34 extend in substantially the same plane as the offset arrangement is hardly perceptible with the relatively thin section wire used. Moreover, these three legs are located substantially at right angles to the axes of the free ends 28 and face the open end of the chamber 16 while being located rearwardly thereof as described. In Figs. 9, 10 and 11 both the side legs, which are designated 34, extend rearwardly from the center leg 30 which is thus slightly closer to the open end of the chamber 16 than either of the side legs 34. This modification illustrates that the offset arrangement shown in the previously described embodiment is not essential and that, as stated, all the legs are in substantially the same plane regardless of which arrangement is used. Moreover, the direction of curvature of the wire can be varied from left to right-hand as shown in the alternate forms of Figs. 1–8 and Figs. 9–11.

The ignition device of this invention is completed by the provision of a pair of terminal elements 44 and 46 in the form of angle plates each having a lug 48 projecting outwardly from the one edge thereof. The housing 10 may be provided on its rear face 20 with a longitudinal slot 50 into which the terminal elements 44 and 46 may be inserted in spaced relation from opposite ends. A pair of additional slots 52 may be formed in the rear face 20 and extending laterally from the slot 50 to the adjacent edge of the body 10 for the reception of the lugs 48. A pair of apertures 54 extend through the housing 10 at right angles to the slot 50 and communicate with the slots 52 to receive screws 56 by which the terminal elements 44 and 46 are secured in position.

The free ends 28 of the resistance wire 26 project through suitable apertures therefor in the terminal elements 44 and 46 and are turned outwardly to overlie a portion of the adjacent face of each element. Suitable securing means, such as solder or the like indicated at 58, serves to secure the projecting portion of each of the free ends 28 to its adjacent terminal plate 44 and 46 and provides good electrical connection therewith. In addition, it is apparent that such securing means serves to support the resistance wire 26 rigidly in the housing 10.

In the operation of the device the housing 10 is preferably supported as illustrated in Figs. 5 and 6 with the axis of the chamber 16 substantially parallel with the path of a flowing gas-air mixture as from a burner port indicated in broken lines in these figures of the drawings. The open end of the chamber 16 faces the burner port so that the flowing combustible fluid can enter the chamber and impinge on the igniter wire 26. It will be observed that in side elevation, the axis of the burner port is shown as slightly below the axis of the chamber 16 as better results have been secured by this arrangement. When an operating current of approximately 12½ amperes is applied to the resistance wire 26, by connection of the terminal elements 44 and 46 to a source of current, it will become incandescent and ignite natural or artificial gas or mixtures of the same flowing from the burner port. The flame thereafter burns outside the chamber as indicated in Figs. 5 and 6.

As the resistance wire 26 is formed from a catalytic metal there will be copious amounts of CO_2 and H_2O evolved on the surface of the wire 26 where combustion occurs. However, there is no opportunity for these gases to concentrate around the wire 26 due to the lack of enclosed spaces such as are found in the usual helical coils, either cylindrical or flat. The igniter consisting of the resistance wire 26 operates at a lower igniting temperature than is obtained with igniters in the form of coils, due to the absence of reradiated heat from one coil to the next and from the opposite inner surfaces of the helix.

The device of this invention will ignite a flowing fuel, such as a gas-air mixture, consistently at a relatively low temperature over a long period of time. Only slight distortion of the igniter will occur and these changes in shape produce no injurious results shortening the life of the igniter. Moreover, after the useful life of the device has elapsed a complete fracture of the wire occurs without any previous gradual decrease in the ignition performance. Consequently, the device may be operated in safety without possibility of the escape of unburned fuel. The igniter can be subjected to relatively high currents for a short period without injury,

probably due to the fact that the heating up period is slightly slower than that of a helical coil and also due to the absence of reradiated heat as described which prevents the temperature from building up rapidly. It is apparent that this feature will allow operation of the igniter over a wider range of primary voltage variation.

In addition to the advantages previously pointed out, it is possible to construct the igniter of the expensive platinum-iridium alloy much more economically than in the case with the helical type of igniter. This economy is due to the great reduction in the length of the wire required to form the improved igniter with its absence of multiplicity of turns. The device is, moreover, economical to produce by reason of the simple design and can therefore be replaced upon fracture without excessive cost. While the precise shape of the igniter and the form of housing therefor have been particularly described and illustrated, it is apparent that slight variations can be made in the details of construction and arrangement of parts without departure from the spirit of the invention as set forth in the appended claims.

We claim:

1. An electric ignition device for a flowing fuel comprising a housing having an open-ended chamber therein, and a resistance wire within said chamber including an igniter portion having a single pair of oppositely disposed turns located adjacent said open end and extending in substantially the same plane normal to the axis of said chamber.

2. An electric ignition device for a flowing combustible mixture comprising a housing having an open-ended chamber therein, and a resistance wire within said chamber including an igniter portion having a single pair of oppositely disposed turns facing said open end rearwardly thereof and extending in substantially the same plane normal to the axis of said chamber.

3. An electric ignition device for a flowing combustible mixture comprising a housing having an open-ended chamber therein, and a resistance wire within said chamber including an igniter portion having a single pair of oppositely disposed turns connected by a center leg and terminating intermediate thereof, said portion facing said open end rearwardly in proximate relation thereto and extending in substantially the same plane normal to the axis of said chamber.

4. An electric ignition device for a flowing fuel comprising a housing having an open-ended chamber therein, and a resistance wire within said chamber including an igniter portion having one upright center leg and a single pair of side legs in substantially parallel spaced relation thereto on either side thereof, said side legs being connected to opposite ends of said center leg by arched portions and terminating intermediate said opposite ends, said igniter portion facing said open end of the chamber rearwardly in proximate relation thereto and extending in substantially the same plane normal to the axis of said chamber.

5. An electric ignition device for a flowing gas-air mixture comprising a ceramic housing having an open-ended chamber therein, a platinum-iridium alloy wire of generally U-shape configuration within said chamber and having its free ends projecting substantially parallel with the axis of said chamber and rearwardly therefrom through spaced apertures in said housing to the exterior thereof, the closed end of said U-shape wire providing an igniter portion having one upright center leg and a single pair of side legs in substantially parallel spaced relation thereto on either side thereof, said side legs being connected to opposite ends of said center leg by arched portions and terminating intermediate said opposite ends to form said free ends, said igniter portion facing said open end of the chamber rearwardly in proximate relation thereto and extending in substantially the same plane normal to the axes of said free ends, and terminal elements secured to the projecting ends of said wire and to the exterior of said housing and serving to support said wire in said housing.

6. In an electric ignition device for a flowing combustible mixture, a resistance wire of generally U-shape form having an igniter portion at the closed end extending normal to the free ends thereof, said igniter portion including one upright center leg and a single pair of side legs connected thereto by arched portions and terminating adjacent the medial portion of said center leg to form said free ends, said center and side legs extending in substantially the same plane.

7. In an electric ignition device for a flowing gas-air mixture, a wire of generally U-shape configuration having a forward igniter portion at the closed end extending normal to the rearward extending free ends thereof, said igniter portion consisting of one upright center leg and a single pair of side legs spaced therefrom and connected to opposite ends thereof by arched portions, said side legs terminating substantially midway between said arched portions to form said free ends, said center and side legs extending in substantially the same plane at right angles to the axes of said free ends.

8. In an electric ignition device for a flowing gas-air mixture, a wire of generally U-shape configuration having a forward igniter portion at the closed end extending normal to the rearward extending free ends thereof, said igniter portion consisting of an upright center leg and a pair of side legs spaced therefrom and connected to opposite ends thereof by arched portions, said side legs terminating substantially midway between said arched portions to form said free ends and being offset on opposite sides of the plane of said center leg sufficiently to avoid contact therewith and with each other upon distortion, said center and side legs extending substantially at right angles to the axes of said free ends.

9. In an electric ignition device for a flowing gas-air mixture, a wire of generally U-shape configuration having a forward igniter portion at the closed end extending normal to the rearward extending free ends thereof, said igniter portion consisting of an upright center leg and a pair of side legs spaced therefrom and connected to opposite ends thereof by arched portions, said side legs terminating substantially midway between said arched portions to form said free ends and being offset rearwardly of the plane of said center leg sufficiently to avoid contact therewith upon distortion, said center and side legs extending substantially at right angles to the axes of said free ends.

10. In an electric ignition device for a flowing combustible mixture, a resistance wire having an igniter portion, said igniter portion including one upright center leg and a single pair of side legs connected to opposite ends of said center leg by arched portions respectively and terminating ad-

jacent the medial portion of said center leg, said center and side legs being in substantially the same plane and said side legs being substantially parallel to each other.

11. In an electric ignition device for a flowing combustible mixture, a housing having at least one open side or end, a resistance wire having an igniter portion, said igniter portion including one upright center leg and a single pair of side legs disposed substantially parallel to each other, said side legs being connected to opposite ends of said center leg by arched portions respectively and terminating adjacent the medial portion of said center leg, said center and side legs being in substantially the same plane and being within the housing.

12. An electric ignition device as defined in claim 11 wherein said center and side legs lie in a plane substantially parallel with the plane of said open side or end of the housing.

STANLEY J. LAKOTA.
THEODORE E. RUDISELLE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
235,979	Bancroft	Dec. 28, 1880
252,849	Redding	Jan. 24, 1882
1,118,942	Lyon	Dec. 1, 1914
1,256,571	Kearsley, Jr.	Feb. 19, 1918
1,542,752	Williams et al.	June 16, 1925
2,299,108	Powers	Oct. 20, 1942

FOREIGN PATENTS

Number	Country	Date
249,676	Germany	July 30, 1912
602,237	France	Dec. 21, 1925
648,156	France	Aug. 7, 1928