# United States Patent [19]

**Das et al.**

[11] **3,871,814**

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[54] **ELECTRIC IGNITION SYSTEM**


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[73] Assignee: **Raytheon Company,** Lexington, Mass.



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[52] **U.S. Cl.** ..... **431/66**

[51] **Int. Cl.** ..... **F23n 5/14**

[58] **Field of Search** ..... 431/66, 67; 317/98



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*Primary Examiner*—Edward G. Favors

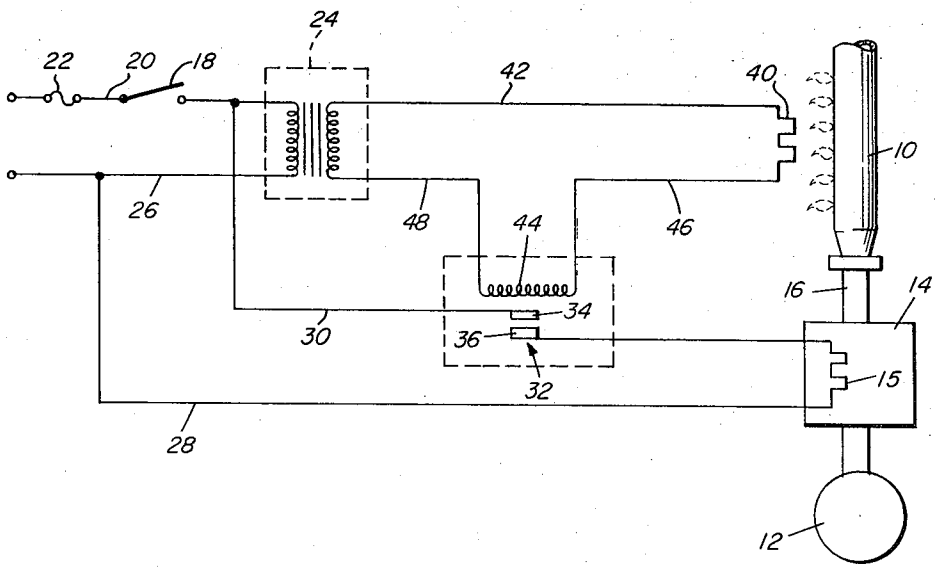
*Attorney, Agent, or Firm*—Harold A. Murphy; Joseph D. Pannone; John T. Meaney



[57] **ABSTRACT**

An electric ignition system which employs as a key element a thermal relay which is responsive to electric current from an ignition coil only when the current equals or exceeds an established minimum whereby resultant opening of a valve will occur to supply fuel to a burner only when the supply voltage is sufficient to provide the minimum current through the coil.


**6 Claims, 2 Drawing Figures**



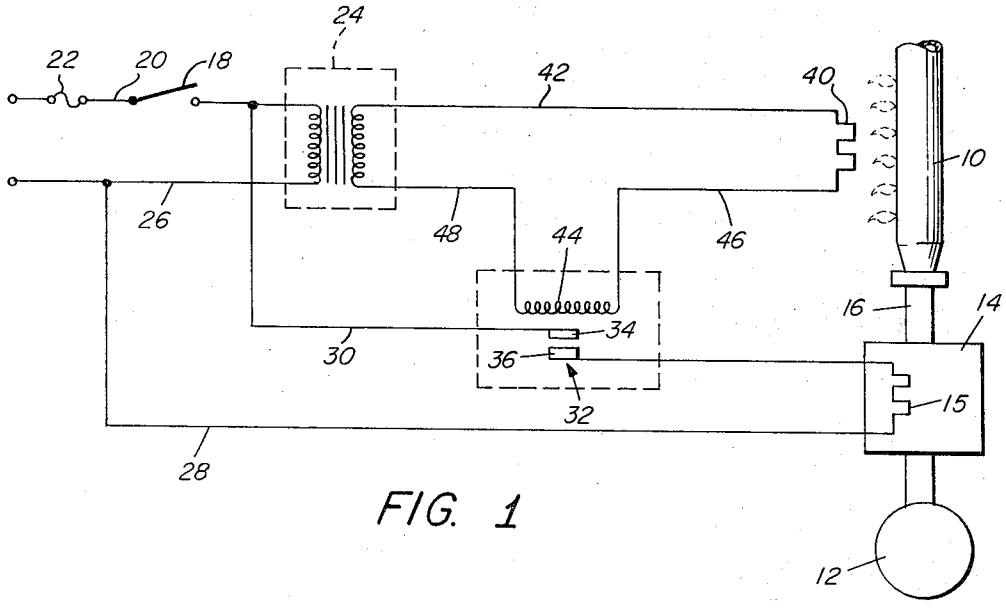

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FIG. 1

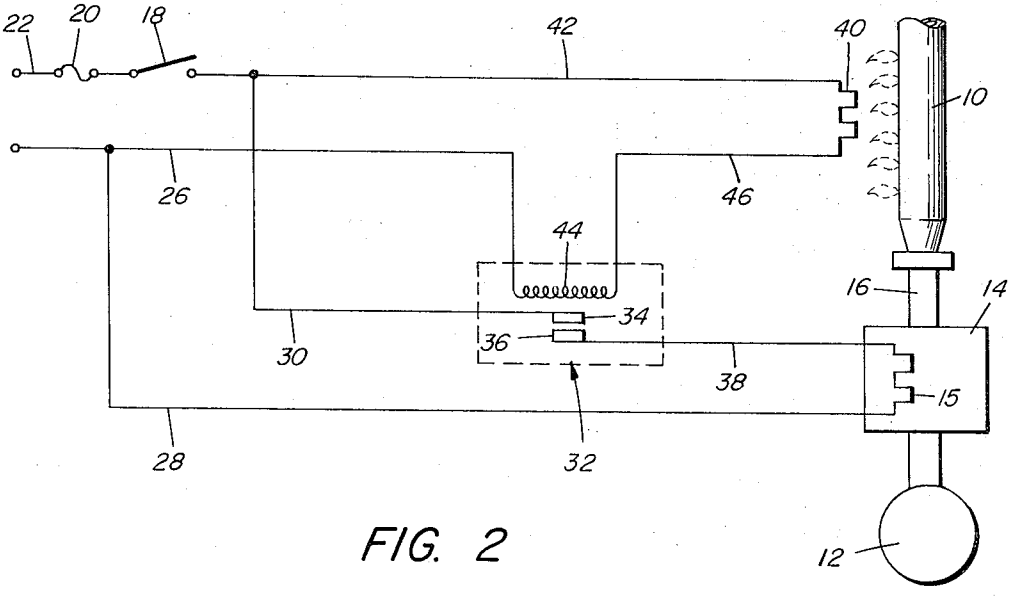

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FIG. 2

# ELECTRIC IGNITION SYSTEM

## BACKGROUND OF THE INVENTION

Burners utilizing fluid fuel have conventionally employed ignitors in the form of fluid-fueled pilots which are undesirable for many reasons. For example, pilot outage can occur by drafts, lack of air, and the like. Pilot ignitors also have the disadvantage of fuel wastage because of the necessity that conventional pilots must be constantly burning, consequently also creating unnecessary heat.

Various kinds of ignition systems have been tested and used by different appliance industries but many of them have proved to be unreliable, and others are too expensive for incorporation in most household gas ranges, for example.

## SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a novel electric ignition system which is completely reliable, which is completely fail-safe, and which can be made and installed at a cost comparable to a standard pilot ignition system.

The inventive system employs an ignition coil in the form of a high resistance wire which glows when electric current is applied to it. The coil is connected to the low voltage secondary of a transformer in series with the heater element of a normally open thermal relay. The contacts of the relay are series-connected between a thermostat and gas valve to the power supply.

The thermal relay is a current activated relay designed specially to work with the ignition coil whereby the contacts will close if the current through the ignition coil is approximately equal to or greater than a required minimum such as about **3.5** amperes, for example.

Closing of the thermostat in a conventional manner causes current to flow through the ignitor coil and the relay heater coil. After a predetermined time interval the relay contacts will close, supplying power to the gas valve, which will open to allow gas to flow to the burner, whereupon the burner gas will be ignited by the ignitor coil. After the thermostat is satisfied, it will open, terminating the flow of power to the ignitor coil, relay heater coil, and gas valve, whereupon the gas valve will close and the burner will be extinguished.

Such an ignition system is safe, reliable, and economical in both manufacture and use.

## BRIEF DESCRIPTION OF THE DRAWINGS

Referring more particularly to the drawings,

FIG. **1** is a schematic diagram of an ignition system embodying the invention; and

FIG. **2** is a diagram similar to FIG. **1** showing a modification of the ignition system of the invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, the ignition system of FIG. **1** may be used with a burner **10** of any type suitable for use in a fluid-fueled appliance such as a cooking range, furnace or the like. Flow of fuel, such as gas, from a supply indicated diagrammatically at **12** is controlled by a conventional electric valve **14** which is inserted in a line **16** leading from the supply **12** to the



burner **10.** The valve **14** has a coil **15** which is connected into an electric circuit, as will be described, so as to automatically open when electric power is supplied to it and to automatically close when the power is disrupted. In this manner gas or other fuel may be supplied to the burner on demand.

A thermostat **18** is connected to one side of a source of AC power via line **20** which also contains a fuse **22.** Line **20** is connected to a low voltage step-down transformer **24,** as is a line **26** which constitutes the second side of the power source. Line **26** is also connected to the transformer **24** as shown.

Power is supplied to the coil **15** of valve **14** by a lead **28,** which is connected to line **26,** and by a second lead **30** which is connected to line **20** at one end and to one contact **34** of a thermal relay **32** at its other end, the other contact **36** of the relay being connected via lead **38** to the valve **14.**

It will be obvious that since the relay contacts **34–36** are normally open, no power at this time is being supplied to the valve coil **15.** Therefore, valve **14** is closed. In order to ignite burner **10** it is first necessary to supply it with fuel from supply **12.** This requires that the contacts of relay **32** be closed to supply power to the valve coil. It also requires that an ignition coil **40** be heated to incandescence or radiation in the vicinity of the burner **10.**

In order to achieve these functions in a fail-safe manner, the ignitor coil **40,** which may be an electrically conductive high-resistance wire, is connected at one side to one side of the low voltage secondary winding of the transformer **24** by a lead **42,** and is connected at its other side to the transformer secondary through the heater coil **44** of the relay **32** via leads or conductors **46** and **48.**

The heating coil **44** and the contacts **34–36** of the relay are designed to cooperatively function to close the contacts only if an amount of current flows to the heater coil **44** which is equal to or greater than a predetermined valve such as **3.5** amperes, for example. Thus, if the supply voltage is too low to maintain the required minimum current through the ignitor coil **40,** the contacts **34–36** of the thermal relay **32** will not be closed and the gas valve **14** will not be energized. The required minimum current through the ignitor coil **40** to successfully ignite the gas in the burner **10** thus has to be the required minimum current through the heater coil **44** of the thermal relay which will effect closing of contacts **34–36.**

It will be apparent that an open circuit caused by any defect in the ignitor coil **40** or in the heating element **44** of the thermal relay **32** will keep the contacts **34–36** open, preventing the valve **14** from being energized.

It will also be apparent that once sufficient heat has been supplied to satisfy the thermostat **18,** the thermostat will disrupt the supply of power to the system. Upon resultant deenergization of the valve **14,** the valve will close, discontinuing the supply of fuel to the burner **10.**

Referring to the diagram of FIG. **2,** it will be noted that the transformer **24** has been eliminated. Otherwise the system is similar to that of FIG. **1** with the line **26** being connected directly to the heater coil **44** of relay **32** and with the thermostat being connected directly to ignitor coil **40** by lead **42.** This system may be used when the ignitor coil **40** is of a type which can adequately and efficiently handle power directly from the

source. This permits the transformer to be eliminated.

From the foregoing it will be apparent that a novel, efficient, safe and economical electric ignition system has been produced in accordance with the objectives of this invention. It is to be understood, however, that various changes may be made in the system shown and described and in its manner of operation without departing from the spirit of the invention as expressed in the accompanying claims. Therefore, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

We claim:

**1.** An electric ignition system for a fluid-fueled burner comprising an electrically operable valve for controlling flow of fuel to the burner, an electrical resistance type ignition wire for igniting fuel at the burner when at least a predetermined minimum amount of electric current is passing through it, and a current-activated relay connected directly to said wire and said valve, said relay being sensitive to current passing to it from said ignition wire and being operable to energize said valve only when at least said predetermined minimum amount of current is passing through said ignition wire.

**2.** An electric ignition system as set forth in claim **1** wherein said relay includes a pair of normally open contacts electrically connected respectively to said valve and a source of electrical power, and a heating element electrically connected at one end directly to said ignition wire and at its other end connected to a source of power and operable to close said contacts only when at least said predetermined minimum amount of current is passing through the wire.

**3.** An electric ignition system as set forth in claim **2** wherein a thermostat is located in the system for controlling flow of current to the wire and relay.

**4.** An electric ignition system for a fluid-fueled burner comprising an electrically operable normally closed fuel supply valve for controlling flow of fuel to the burner, an electrical resistance wire which assumes ignition temperature when a predetermined minimum current passes through it connected at a first side to a source of electrical power, and a current-activated thermal relay having a heater element and first and second normally open contacts, said heater element having one side connected directly to a second side of the wire and its other side connected to the power source, said first contact being connected to the power source, the fuel supply valve being connected to said second contact and to said power source, said relay heater element being operable only when the current passing through the wire is of an amount at least equal to said predetermined minimum.

**5.** An electric ignition system as set forth in claim **4** wherein a thermostat is located between the source of power and the wire and relay.

**6.** An electric ignition system as set forth in claim **5** wherein a low voltage step-down transformer is provided with a primary winding connected to said power source and with a secondary winding connected at opposite ends respectively to the ignition coil and the heater element of the relay.

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