United States Patent

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[33] **Great Britain**
[31] **1637/67**

[54] **SPARK IGNITION SYSTEMS**
5 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** ..... **123/148 E,** 123/146.5
[51] **Int. Cl.** **F02p 7/02**
[50] **Field of Search** ..... 123/146.5 A, 148 E

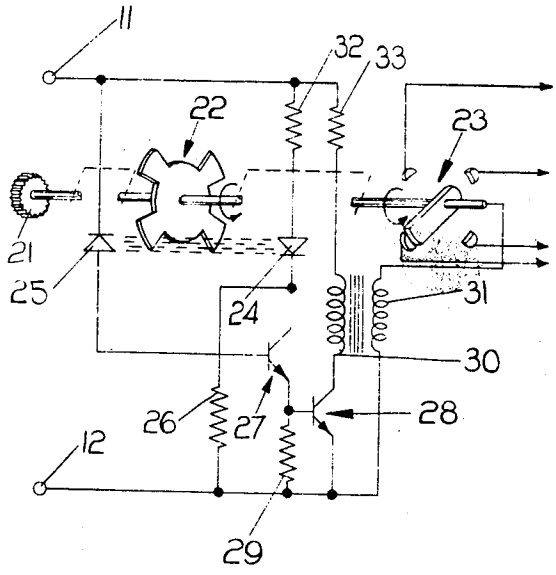
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ABSTRACT: In a spark ignition system for an internal combustion engine there is an electrically powered radiation source and a radiation receiver. The engine drives means for exposing the receiver to the source when a spark is required, and to save power it is arranged that the source is operated at full power only when the receiver is exposed to the source.



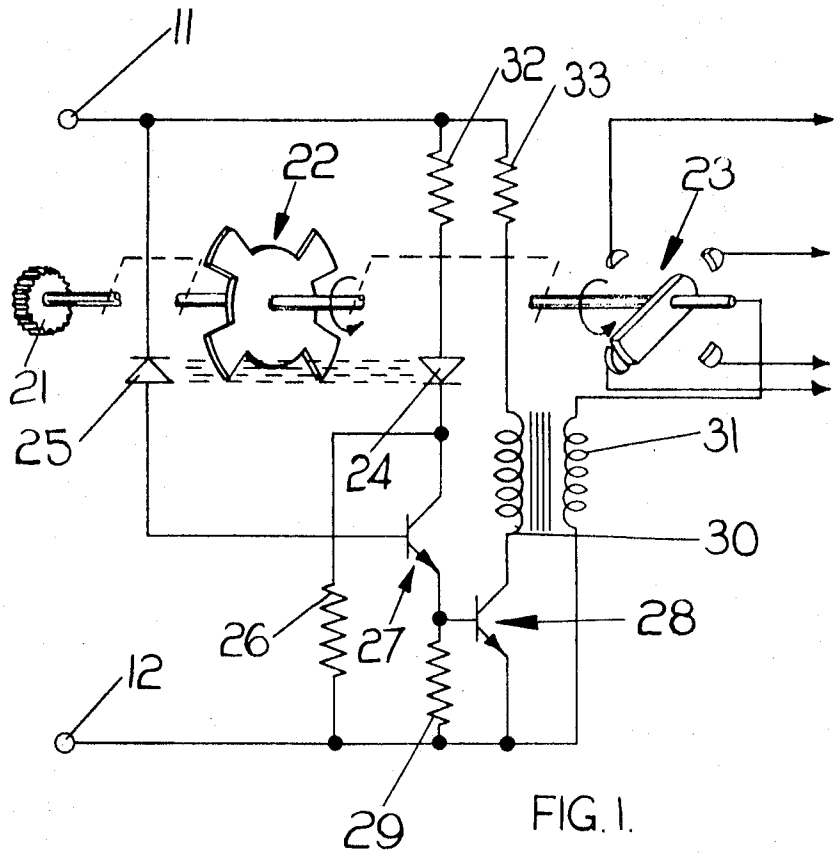


FIG. 1.

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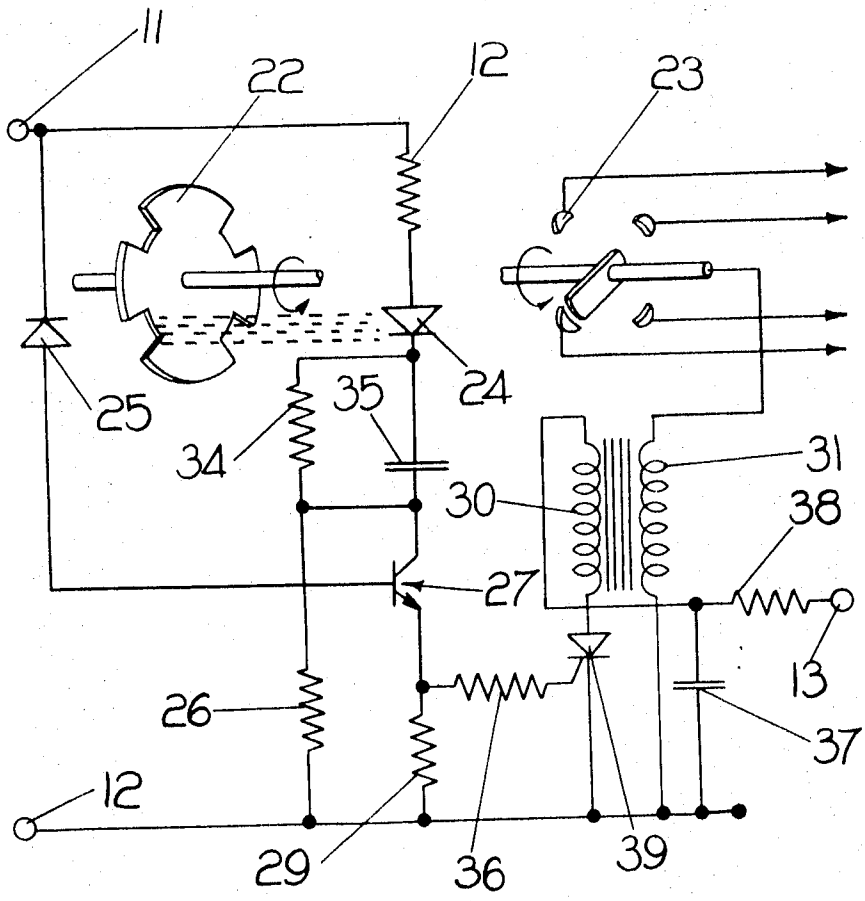


FIG. 2

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SPARK IGNITION SYSTEMS

This invention relates to spark ignition systems for internal combustion engines.

A system according to the invention includes an electrically powered radiation source, a radiation receiver, means driven by the engine for exposing the receiver to the source when a spark is required, means operable when the receiver is exposed to the source for producing a spark, and means for controlling the supply of power to the source so that the source is operated at full power only when the receiver is exposed to the source.

The radiation can be light, but need not be visible radiation.

In the accompanying drawings FIGS. 1 and 2 are circuit diagrams illustrating two examples of the invention.

Referring to FIG. 1, there are provided positive and negative terminals 11, 12 which are connected to the battery of a road vehicle, the terminal 12 conveniently being earthed. The terminal 11 is connected through a resistor 32 and an electroluminescent diode 24 to the collector of an NPN transistor 27, the emitter of which is connected through a resistor 29 to the terminal 12. The base of the transistor 27 is connected through a photodiode 25 to the terminal 11, the collector of the transistor 27 is connected to the terminal 12 through a resistor 26, and the emitter of the transistor 27 is connected to the base of an NPN transistor 28, the emitter of which is connected to the terminal 12 and the collector of which is connected to the terminal 11 through the primary winding 30 of an ignition coil and a resistor 33 in series. The secondary winding 31 of the ignition coil has one end connected to the terminal 12 and its other end connected through a distributor 23 to the plugs of the engine in turn.

When the diode 24 is energized it produces radiation in the form of light, and the physical disposition of the diodes 24 and 25 is such that this light can impinge on the diode 25. However, positioned between the diodes 24 and 25 is an apertured shutter 22 which is driven by a part 21 of the engine. The arrangement is such that when a portion of the shutter 22 between the apertures is in the path of light between the diodes 24 and 25, the diode 25 is nonconductive, so that the transistors 27 and 28 are off. A small current flows through resistors 32 and 26 to the diode 24, which is energized at a level well below its maximum level and so wastes very little power. As soon as an aperture is in the path between diodes 24 and 25, the diode 25 conducts and turns on the transistor 27, so that the diode 24 is energized at full power. At the same time, current flowing through the transistor 27 turns on the transistor 28 so that current builds up in the primary winding 30 of the ignition coil. When light between the diodes 24 and 25 is blocked again, the transistor 27 turns off and removes base current from the transistor 28, the collapse of current in the winding 30 producing a spark in the usual way.

Referring now to FIG. 2, the circuit shown in FIG. 1 is modified in that a resistor 34 is connected in series with the resistor 26 between the terminal 12 and the cathode of the diode 24, and the cathode of the diode 24 is connected to the collector of the transistor 27 through a capacitor 35 which bridges the resistor 34. The transistor 28 is omitted, and the emitter of the transistor 27 is connected through a resistor 36 to the gate of a thyristor 39, the cathode of which is connected to the terminal 12 and the anode of which is connected through the primary winding 30 and the resistor 38 in series to a terminal 13 which is connected through the resistor 38 and a capacitor 37 to the terminal 12. The terminal 13 is connected to a power source which charges the capacitor 37 to a substantial voltage, for example 200 volts. This power supply, which is derived from the battery, can by way of example be a transistor oscillator.

The operation is similar to FIG. 1, except that when the transistor 27 conducts it turns on the thyristor 39 to provide a discharge path for the capacitor 37, discharge of the capacitor 37 through the primary winding 30 producing the spark, after which the thyristor 39 turns off. The capacitor 35 prevents a high current flowing in the diode 24 if the engine stops with the diode 25 exposed.

It will be noted that the apertures in the shutter in FIG. 2 are much smaller than those in the shutter shown in FIG. 1. This is because in FIG. 2 the spark is produced as soon as the diode 25 is exposed to light, whereas in FIG. 1 the transistor 28 must be kept switched on to allow energy to be stored in primary 30.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A spark ignition system for an internal combustion engine, including an electrically powered radiation source, a radiation receiver, means driven by the engine for exposing the receiver to the source when a spark is required, means operable when the receiver is exposed to the source for producing a spark, and means for controlling the supply of power to the source so that the source is operated at full power only when the receiver is exposed to the source.

2. A system as claimed in claim 1 in which the receiver is a photodiode connected in the base circuit of a transistor which controls production of sparks.

3. A system as claimed in claim 2 in which the source is in the collector-emitter circuit of the transistor and is energized at reduced power through a resistor when the transistor is off, the transistor when conductive short circuiting the resistor to energize the source at full power.

4. A system as claimed in claim 1 in which the source is an electroluminescent diode.

5. A system as claimed in claim 1 including means for reducing dissipation of power in said source if the engine stops with the receiver exposed.