

[54] **CIRCUIT ARRANGEMENT FOR PRODUCING A HIGH VOLTAGE SPARK**

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Primary Examiner—Roy Lake

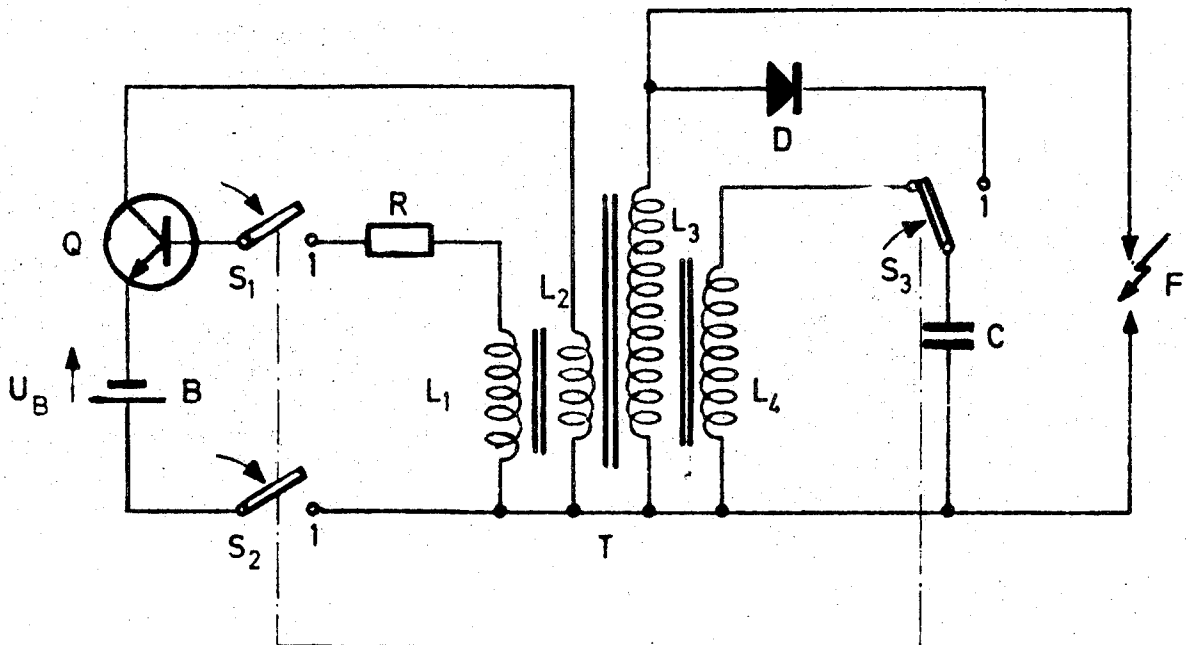
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[57] **ABSTRACT**

A circuit arrangement for producing a high voltage spark comprising a semi-conductor device and a transducer coupled therewith, a source of low power d.c. voltage coupled to the semi-conductor device for supplying power thereto, the transducer having a primary and a secondary circuit, a rectifier and a storage capacitor connected into the secondary circuit of the transducer, a sparkgap device connected in parallel with the secondary circuit of the transducer, a switching device having a plurality of switching positions, the transducer including an auxiliary winding connected in circuit relationship with the storage capacitor in one of the switching positions wherein the storage capacitor is charged to a voltage defined by the transformation ratio of the transducer, and in another position of the switching device the capacitor discharges the voltage thereon across a diode into the sparkgap device connected in parallel with the secondary circuit of the transducer, the transducer including a feedback coupled winding returned to an electrode of the semi-conductor device.

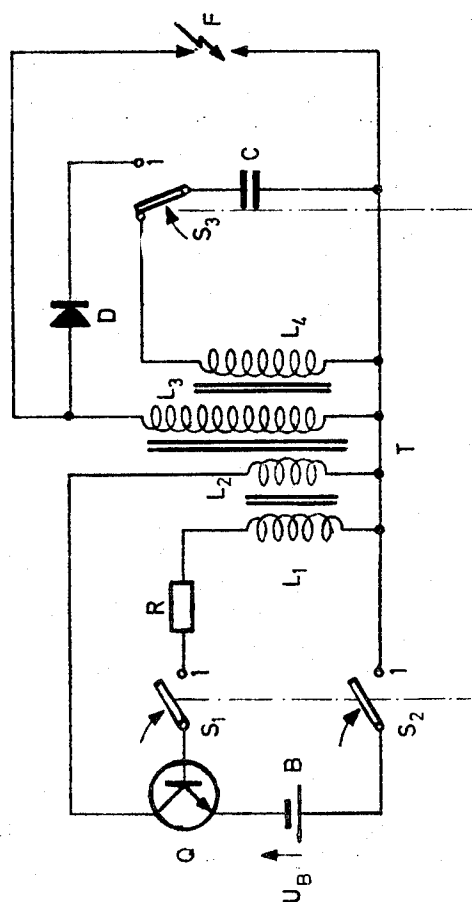
2 Claims, 1 Drawing Figure



IGNITOR FOR USE WITH A LIGHTER

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IGNITOR FOR USE WITH A LIGHTER

CIRCUIT ARRANGEMENT FOR PRODUCING A HIGH VOLTAGE SPARK

FIELD OF THE INVENTION

The present invention relates to a circuit arrangement for producing a high voltage spark which substantially comprises a blocking oscillator or transducer circuit consisting of a transistor and a transducer supplied from a source of low d.c. voltage, such as a battery or an accumulator, and wherein in the secondary circuit of the transformer a diode device and a storage capacitor are connected.

BACKGROUND OF THE INVENTION

There are known circuits for producing the spark voltage or spark in a gas lighter device in which the energy for the ignition spark is taken off from a dry cell constituting the source of low power d.c. voltage. The relatively high ignition voltage is produced by a transformer the turn ratio of which corresponds to the voltage ratio developed.

The above requirement in the case, for example, of gas lighters requires that the transformer is provided on its primary side with 6 and on the secondary side with 6,000 turns, which has the disadvantage that such transformers are relatively large, expensive and sensitive, as heavy insulation is required on them due to the presence of the high secondary voltage.

In known lighter devices the 6,000 turns of the secondary winding are made of a wire having a diameter of 0.05 to 0.02 mm which itself represents a very difficult technological problem and still it cannot be prevented that the space available for the gas tank is very limited due to the space requirement of the ignition circuit.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention substantially to reduce the entire volume and, thereby, the dimensions and the space requirement of such spark producing circuit arrangement.

In accordance with the present invention, a sparkgap means lies in parallel with the secondary winding of the transducer and wherein by means of a mechanical or electrical multi-pole switching means the primary winding and/or the feedback winding of the transducer simultaneously can be disconnected or the storage capacitor can be coupled to an auxiliary winding of the transducer and wherein the voltage of the storage capacitor during its discharge can be stepped up to the spark voltage of the sparkgap means in accordance with the turn ratio of the auxiliary and the secondary winding of the transducer.

Instead of the usual transformers having a number of turns which corresponds to the relationship of the battery voltage and the spark voltage, the present invention proposes a double transformation of the voltage over the feedback coupled transducer and which requires only a relatively low number of turns on the auxiliary winding which is also loaded only for a short time. The additional space required for such winding is very small.

Special advantages flow from the circuit arrangement according to the present invention if it is applied in modern pocket-size lighter devices, as the space available for the ignition circuit in such devices is very limited.

Furthermore, the energy balance is also in favor of the circuit arrangement according to the present invention which, in the ideal case, can have an efficiency of about 100 percent while the known circuit arrangements, also in the ideal case, can have only a 50 percent efficiency. This fact, especially in the case of using a battery as the energy source, can have considerable advantages.

The high efficiency and the double transformation leads to the result that instead of the hitherto used 15V batteries a miniature cell of 1.5V can be used in the circuit arrangement according to the present invention.

A further advantage of the present invention is manifested in that the dimensioning of the transducer, that is, the number of the turns required for the voltage stored on the storage capacitor, is independent from the magnitude of the necessary spark voltage.

BRIEF DESCRIPTION OF THE DRAWING

The invention will become more readily apparent from the following description of a preferred embodiment thereof shown, by way of example, in the accompanying drawing, in which:

The single FIGURE is a circuit diagram of the arrangement for producing a high voltage spark according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the single FIGURE illustrating the preferred embodiment of the present invention, the circuit arrangement comprises a primary circuit which is of the conventional blocking oscillator or feedback transducer type, which substantially comprises a transistor Q, primary and feedback windings of a transducer T and a source of d.c. voltage B having a voltage magnitude U_B . The primary winding of the transducer T is designated by L_2 while the feedback connected winding is designated L_1 . In the secondary circuit of the transducer T a rectifier circuit arrangement is provided consisting of a diode D, a storage capacitor C which is usually an electrolyte-type capacitor, and a sparkgap means F connected parallel therewith.

After turning on the transducer, that is, after closing the contacts S_1 , S_2 and establishing the connection by means of the contact S_3 between the diode D and the capacitor C, the storage capacitor C becomes charged. As soon as the contacts $S_1 - S_3$ are thrown into the position shown in the illustrated embodiment, the storage capacitor C is discharged through the auxiliary winding L_4 , and thereby the voltage necessary for the ignition is produced across the sparkgap F by the stepping-up activity across the windings L_4/L_3 .

The contacts $S_1 - S_3$ are the contact arms of a mechanical multi-pole switch which can be operated simultaneously and which can be replaced by an electronic switching element.

As a result of the discharging of the capacitor C according to the present invention over the auxiliary winding L_4 , the total number of turns when compared with a circuit using a direct stepping-up of the battery voltage to the spark voltage, can be reduced by about 85 percent and thereby the dimensions of the transducer T can substantially also be reduced. The effective total transformation relationship can be described by the following formula:

$$\ddot{u} = W_3/W_2 \cdot W_3/W_4 = W_3^2/W_2 \cdot W_4$$

wherein the indexes relate to the corresponding windings L_1 to L_4 .

From the above it is apparent that although the invention has been described hereinbefore with respect to a certain embodiment thereof, it is evident that many modifications and changes may be made without departing from the spirit of the invention. Accordingly, by the appened claims, I intend to cover all such modifications and changes as fall within the true spirit and scope of this invention.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

I claim:

1. In a circuit arrangement for producing a high voltage spark from a direct current source of a low voltage, in combination: feedback transducer means including a primary circuit and a secondary circuit for transforming energy from said source to a higher voltage,
said primary circuit comprising
a primary winding,
said source,
a semi-conductive device having conducting and non-conducting states, and
first switching means;
said secondary circuit comprising
a secondary winding,

- rectifying means,
capacitor means connected for storing said transformed higher voltage energy,
an auxiliary winding;
sparkgap means connected in parallel with said secondary winding; and
second switching means,
said first switching means having a closed position for connecting said semi-conductive device to said transducer means and, respectively, an open position for disconnecting said semi-conductive device from said transducer means,
said second switching means being connected to said capacitor means and having a closed position for connecting said capacitor means through the rectifying means to said secondary winding during the closed position of said first switching means and, respectively, a switch-over position for releasably connecting said capacitor means to said auxiliary winding during the open position of said first switching means, thereby discharging the stored energy from the capacitor means through the auxiliary winding and simultaneously inducing a high spark voltage in said secondary winding which produces a spark in said sparkgap means.
2. The circuit arrangement as claimed in claim 1, for use with a lighter device for producing the ignition spark for igniting a fuel therein.

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