

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

[75] Inventor: **Peter Lohberg**, Rodheim v.d.H., Germany

[73] Assignee: **Braun Aktiengesellschaft**, Frankfurt/Main, Germany

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Primary Examiner—Roy Lake

Assistant Examiner—James B. Mullins

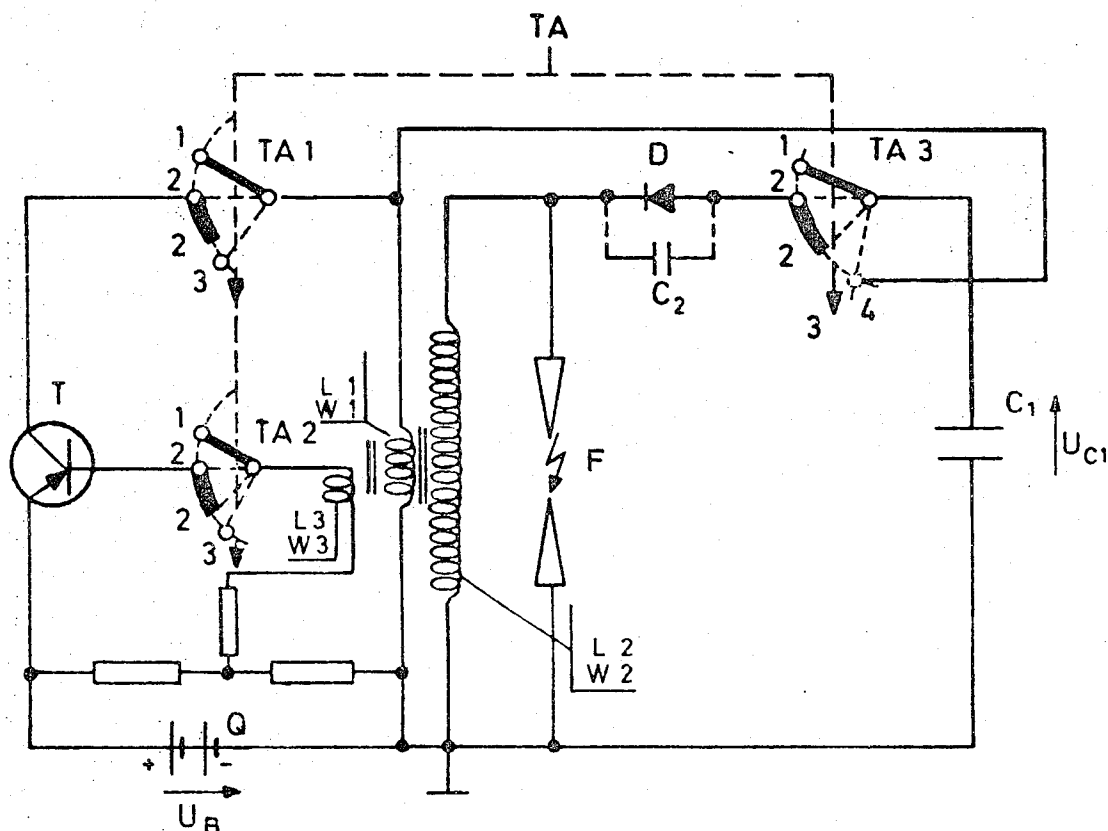
Attorney—Ernest F. Marmorek

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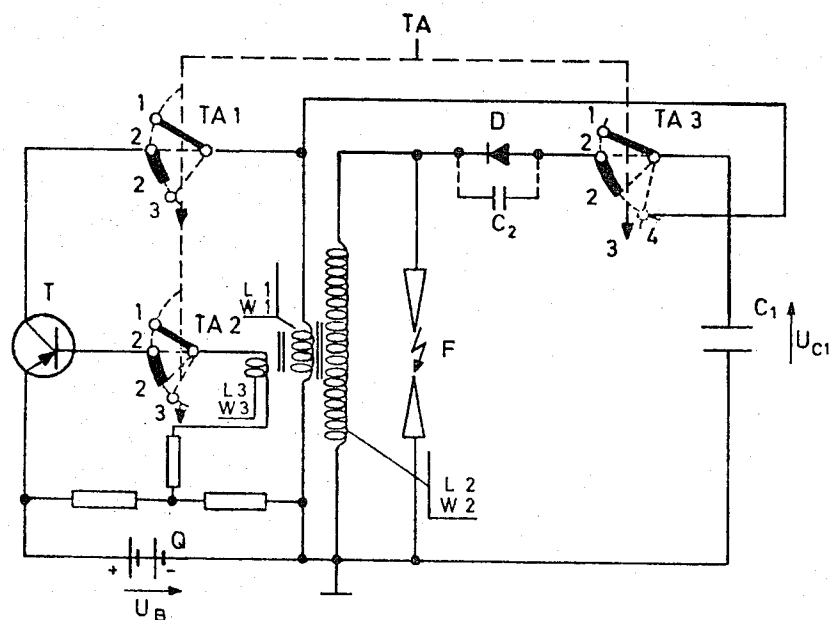
ABSTRACT

A circuit arrangement for producing a high voltage spark comprising a semi-conductor device having a conducting and a non-conducting state, a source of low power unidirectional voltage, such as a battery or accumulator, a feedback coupled transducer means coupled to the source and the semi-conductor device for storing energy from the source during a conduction phase of the semi-conductor device, the feedback transducer device having a primary and a secondary circuit, a diode and a capacitor coupled in the secondary circuit of the transducer device, the stored energy being discharged into the secondary circuit during one of the phases of the semi-conductor device, a sparkgap connected in parallel with the secondary winding of the transducer device, a switching device in the primary circuit of the transducer device for establishing the conducting or non-conducting phases of the semi-conductor device, and a switching means in the secondary circuit for the discharging of the stored energy across the sparkgap, the capacitor being connected in circuit relationship with the primary circuit so that upon switching of the switching device in the secondary circuit, the capacitor discharges over the primary circuit into the transducer and the spark voltage is produced over the sparkgap, the semi-conductor device being isolated from the transducer device electrically or galvanically.

4 Claims, 1 Drawing Figure



IGNITOR FOR USE WITH A POCKET-TYPE OR TABLE-TYPE GAS LIGHTER



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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 by employing the closed or conducting states of a transducer, more particularly in which during the conducting phase of a transistor the energy of a source, such as a low voltage d.c. source, like that of a battery, accumulator, etc., is removed and is stored in a feedback coupled transducer and during the closed or conducting phase of the transistor it is discharged over a diode into a capacitor in the secondary circuit of the transducer and wherein the secondary winding of the transducer a sparkgap is provided in parallel therewith and a mechanical or electronic switching device is provided on the primary and secondary side of the transducer and/or in the base circuit of the transistor.

BACKGROUND OF THE INVENTION

In the known circuit arrangements which produce igniting sparks from the energy of a battery or an accumulator and which are used, for example, with gas lighters, combustion engines having carburetors, or gas stoves, the relatively high voltage for the spark is reduced by means of a transformer which has an appropriately selected transformation ratio.

The above requirement in the case, for example, of gas lighters requires that the transformer is provided on its primary side with six and on the secondary side with 6,000 turns. This has the disadvantage that such transformers are relatively large, expensive and sensitive, since a 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 from 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 becomes very limited due to the space requirement of the ignition circuit.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a circuit arrangement of the above-described type which enables a reduction of the space required thereby when used in the ignition devices of the above types.

According to the present invention after the operation of a switching means in the secondary circuit of the transducer, a capacitor for the producing of the ignition voltage across the sparkgap becomes discharged over the primary circuit of the transducer and wherein the transistor of the blocking oscillator is isolated from the transducer electrically or galvanically.

The circuit arrangement according to the present invention can be applied advantageously especially to ignite the gas of a gas lighter.

The fact that the voltage undergoes a double transformation through the same transducer during the charging and the discharging of the capacitor in the circuit arrangement according to the present invention leads to a reduction of the otherwise required transformation ratio, that is, the number of the turns on the secondary side and, thereby, it leads to a reduction of the

space of the entire ignition arrangement without adding to the overall costs.

In an ignition device made according to the present invention and having the dimensions of a known spark producing or ignition device, the manufacturing costs of the transducer according to the present invention, due to the heavier wire used in the secondary winding, its sensitivity with respect to mechanical or electrical overloads and with respect to material as to manufacturing errors and tolerances, have been greatly reduced.

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 neglecting the copper and switching losses, etc., can have only a 50 percent battery as the energy source, can have considerable advantages.

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 high voltage spark producing device according to the present invention as applied to a gas lighter.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the single FIGURE it is seen that the circuit according to the present invention is in the form of a low voltage blocking oscillator and comprises an energy source Q such as a battery or accumulator, a transistor T, a feedback coupled transformer or transducer U having a primary winding L1 and a secondary winding L2, a rectifier arrangement C2, D in the secondary circuit (secondary winding L2) of the transducer U, a storing capacitor C1 as well as a slider switch TA having three contact arms TA1, TA2 and TA3, of which the contact arm TA3 serves as a separate switch position. The above-mentioned three contact arms of the switch TA can be operated simultaneously.

After closing the slider switch TA, that is, after transferring the contact arms TA1, TA2 and TA3 from the starting contact position 1 into the contact position 2, a conducting phase of the transistor T begins and which is immediately followed, as soon as the feedback transducer U becomes saturated, by a closed or non-conducting phase, during which the energy stored in the transducer U becomes discharged into the capacitor C1 according to the principle of blocking oscillator. The capacitor C1, therefore, is periodically charged to a voltage U_C which is larger than the battery voltage U_B in accord with the transformer ratio $\ddot{u}$.

The following relation holds:

$$U_{C1} = \ddot{u} U_B = \ddot{u}' \ddot{u}'' U_B$$

wherein

U_{C1} = the voltage on the capacitor C1;

U_B = the voltage of the energy source Q;

$\ddot{u}'$ = the transformer ratio $w2/w1$ of the transducer U; and

$\ddot{u}''$ = the voltage increase due to the feedback effect.

By transferring the contact arm of the slider contact TA from the contact position 2' into the contact position

tion 3, the transistor T becomes isolated by means of TA1 and TA2 from the primary and from the feedback windings L1 and L3, and the capacitor C1 becomes isolated from the secondary winding L2 of the transducer U and from the diode D in a galvanic manner.

In the contact position 4 of the slider contact TA3 the capacitor C1 discharges over the primary winding L1 of the transducer, whereby a high voltage will be generated across the sparkgap F lying parallel with respect to the secondary winding L2 and which is sufficient to produce a spark.

The following approximation equations hold:

$$U_z = \ddot{u}' U_{C1}$$

$$U_z = \ddot{u}'^2 \ddot{u}'' U_B$$

Due to the dual exploitation of the circuit arrangement according to the present invention, that is, due to the double voltage transformation following the transformation ratio $w2/w1$ of the transducer $\ddot{U}$, at a certain battery and spark voltage requirement the turn ratio $\ddot{u}' = w2/w1$ is obtained from the following equation:

$$\ddot{u}' = \sqrt{U_z/U_B \ddot{u}''}$$

in contrast to the 'turn ratio of

$$\ddot{u}' = w2/w1 = U_z/U_B$$

which is associated with the ignition transformers of the known ignition devices.

The capacitor C2 which lies parallel to the diode D and which can have a small capacitance when compared with the storage capacitor C1, serves for the protection of the diode D against over voltages.

As it is easily seen from the circuit diagram, the slider contact TA can fully or partially be replaced by an electronic switching device, such as by transistors and/or diodes or similar devices which can be switched by a reference signal such as derived by the charge condition of the capacitor C1 in the present circuit.

From the above, it is apparent that although the invention has been described hereinbefore with respect to a certain specific embodiment thereof, it is evident that many modifications and changes may be made without departing from the spirit of the invention. Accordingly, by the appended 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:

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 and capacitor means connected for storing said transformed higher voltage energy;

sparkgap means connected in parallel with said secondary winding; and

second switching means,

said first switching means having a closed position for connecting said semiconductive device to said primary winding and respectively an open position for disconnecting said semiconductive device from said primary winding;

said second switching means being connected to said capacitor means and having a closed position for connecting said capacitor to said secondary winding during the closed position of said first switching means and, respectively, a switch-over position for releasably connecting said capacitor to said primary winding during the open position of said first switching means, thereby discharging the stored transformed energy from the capacitor means through the primary circuit and simultaneously inducing a high spark voltage in said secondary circuit which produces a spark in said sparkgap means.

2. In a circuit arrangement according to claim 1, said transducer means including a semi-conductive blocking oscillator.

3. In a lighter, fuel igniting means including a circuit arrangement as claimed in claim 1.

4. The circuit arrangement as claimed in claim 1, for use with a pocket or table model type lighter for igniting the fuel of such lighter.

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