



EUROPEAN PATENT SPECIFICATION

Date of publication of patent specification :
31.08.94 Bulletin 94/35

Int. Cl.⁵ : **F02P 1/08**

Application number : **89906191.5**

Date of filing : **23.05.89**

International application number :
PCT/IT89/00039

International publication number :
WO 89/12745 28.12.89 Gazette 89/30

CAPACITIVE DISCHARGE IGNITION SYSTEM FOR ENDOTHERMIC ENGINES, PREFERABLY LOW-POWERED ONES.

Priority : **20.06.88 IT 8342288**

Date of publication of application :
17.04.91 Bulletin 91/16

Publication of the grant of the patent :
31.08.94 Bulletin 94/35

Designated Contracting States :
AT BE CH DE FR GB LI LU NL SE

References cited :
US-A- 3 545 420
US-A- 3 835 830
US-A- 3 941 110
US-A- 4 611 569
See also references of WO8912745

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EP 0 422 023 B1

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Description

The subject of the present invention is a capacitive discharge ignition device for endothermic engines, preferably low-powered ones according to the first part of claim 1.

Such a device is known from US-A- 3 545 420.

The invention has a particular although not exclusive application for motor saws, lawn mowers, and all those small engines, generally low powered, which have a particularly small ignition system. However, this does not exclude application in various sectors in the ambit of the above-mentioned title, and is therefore not limited to low powered engines as this sector is only the preferential one.

The capacitive discharge ignition systems commonly developed on two-pronged or three-pronged statoric irons and permanent magnet rotors are known in the present state of art, and these foresee a circuit of the type having three distinct windings:

- a recharging winding of the ignition capacitor
- a primary winding
- a secondary winding.

The object of the present invention is to eliminate one of said windings in order to further simplify the device and reduce the overall dimensions in particular.

US-A-3545420 discloses an ignition device, using a high-voltage generator device of the type having at least two inductive windings paired together which can be actuated by magnetic flow variation, of which at least one is a recharging winding system for capacitor means of the ignition system, and in which the charging voltage of said capacitor is induced by the flow variation provoked by the relative movement of magnetic means,

- said recharging winding system alternatively carries out the function of secondary winding for high voltage, thus becoming substantially a twin-function, recharging winding system which exploits the respective inversion of polarity in a block diode by means of an associated circuit (PV) which includes at least another paired winding system,
- said paired winding system is coaxially disposed,
- being the terminations of said recharging winding system further connected to a separate capacitor means This solution being clearly complex and expensive.

Another object of the invention is to improve the efficacy of the ignition system avoiding complexity.

These and other objects are achieved by the present invention, according to the characteristics given in the attached claim, which solves the given problems by an ignition device, using a high-voltage generator device of the type having:

- at least two inductive windings paired together

which can be actuated by magnetic flow variation, of which at least one is a recharging winding system for capacitor means of the ignition system, and in which the charging voltage of said capacitor is induced by the flow variation provoked by the relative movement of magnetic means,

- said recharging winding system alternatively carries out the function of secondary winding for high voltage, thus becoming substantially a twin-function, recharging winding system which exploits the respective inversion of polarity θ in a block diode by means of an associated circuit which includes at least another paired winding system,
- said paired winding system is coaxially disposed, and further realizes a capacitor means;
- "TRIGGER" means associated to resistive means which control a respective SCR; characterized by the fact that said circuit means (PV):
 - are able to provoke the discharge of the capacitive means on the primary inductance through an "SCR", thereby inducing on the recharging winding a potential with polarity opposite to that necessary for the charging of the capacitive means;
 - include "TRIGGER" means associated to resistive means which control a respective "SCR", and the whole of it being controlled by inversion of polarity through a recycling diode of said inductive means.

The advantages of this solution derive from:

- the minimum overall dimensions of the ignition, in that the bulky secondary winding is eliminated
- the improved efficiency of the ignition, because there is no more dissipated power on the capacitor's recharging winding which feeds the sparking phase as there are only two windings (the recharging one carries out the function of primary and secondary winding), as the present solution pairs the primary winding with the recharging winding having a twin function, contrary to what occurs in the conventional capacitive discharge ignitions which pair two windings during the sparking phase i.e. secondary one and recharging winding.

The auxiliary circuitry to be connected with the diode which can also operate on high voltage, at the winding of said recharging coil which also has the function of secondary winding, will be such as to polarize said diode:

- directly when the capacitor is charged, and
- inversely when the capacitor discharges and the sparking instant occurs.

A possible diagram for said auxiliary circuitry may utilize a capacitor element wound with controlled impedance as described in the Italian patent applications (IT-83490A/87-IT-83491 A/87) in the name of DUCATI ENERGIA, corresponding to the application for international "PCT" patent (PCT/IT88/00039), which however does not prevent the use of traditional components in said circuiting, that is to say, the use of adequate separate inductance and capacitive elements.

These and other advantages can be seen in the following detailed description of preferential solutions of realization, together with the help of the attached drawings, the execution details of which are not to be held as limiting but only as examples.

Figure 1 gives a view of one circuit of the invention, using the device as in the above-mentioned "PCT/IT88/00039".

Figure 2 gives a view of an alternative less preferable circuit realized with separate, adequate elements of inductance and capacity used in the traditional techniques.

With reference to the above figures, it can be seen that the spark plug's ignition system is marked with "C", the twin-function, recharging induced winding is marked with "1", the diode which is also able to operate on high voltage is marked with "2", and the respective circuitry which is able to carry out the inductance function is marked with "PV" and includes the primary winding marked with "3-4-5-6/6" and capacity "7".

In Figure 1 said circuitry (PV) foresees the inclusion of a sole integrated device which carries out a triple function:

- primary inductance and capacity (I=3-4-5-6-7)
- with a "TRIGGER" terminal (8) associated to the pair of voltage dividing resistors (11-12) which control the "SCR" (11) which therefore acts substantially as a circuit breaker.

All the above works with the presence of a current re-cycling diode (9).

The circuitry solution (PV) in Fig.2 is substantially similar to that in Fig. 1, but has a different design.

It is understood that the recharging winding (1) shall be preferably coaxial to the primary one (3-4-5-6/6), thus forming a sole coil with several coaxial windings.

Operation is as follows:

- the rotation of the magnet/s which are solid with the rotor causes a variation of the flow linked together with the winding having a twin function (1) so as to originate on said winding a potential which directly polarizes the diode which can also operate on high voltage (2) with consequent charge of the capacitive means (7);

- the continuation of said rotation causes the inversion of the potential on said winding, thus inversely polarizing the block diode (2); as this inversion is simultaneously present on the "TRIGGER" winding (8,...) too, it causes the start of the "SCR" by the corresponding resistive divider (11-12) in such a manner as to determine the discharge of said capacitive means (7) on the primary inductance (3-4-5-6/6);
- in these conditions the twin-function, recharging winding is magnetically paired with the primary winding system (3-4-5-6/6), which therefore has the function of secondary winding in this phase, and consequently a high potential sign is created which is such as to inversely polarize said block diode, which is also able to work on high voltage (2), in agreement with what has already been done by the potential induced in said winding by the flow variation provoked by the rotation of one or more magnets which are solid with the rotor.

Claims

1. An ignition device, using a high-voltage generator device of the type having at least:
 - two inductive windings paired together which can be actuated by magnetic flow variation, of which at least one is a recharging winding system (1) for capacitor means (7) of the ignition system (C), and in which the charging voltage of said capacitor is induced by the flow variation provoked by the relative movement of magnetic means,
 - said recharging winding system (1) alternatively carries out the function of secondary winding for high voltage, thus becoming substantially a twin-function, recharging winding system which exploits the respective inversion of polarity in a block diode (2) by means of an associated circuit (PV) which includes at least another paired winding system (3-4-5-6/8),
 - said paired winding system (3,4,5,6/8) is coaxially disposed, and further realizes a capacitor means (7);
 - "TRIGGER" means associated to resistive means which control a respective SCR; characterized by the fact that said circuit means (PV):
 - are able to provoke the discharge of the capacitive means (7) on the primary inductance (3-4-5-6/8) through an "SCR" (10), thereby inducing on the recharging winding (1) a potential with polarity opposite to that necessary for the charging

of the capacitive means (7);

- include "TRIGGER" means (8) associated to resistive means (12-11) which control a respective "SCR" (10), and the whole of it being controlled by inversion of polarity through a recycling diode (9) of said inductive means (3-4-5-6/8).

Patentansprüche

1. Eine Zündvorrichtung mit Hochspannungsgenerator mit mindestens:

- zwei zusammengekoppelte Induktionsspulen, die durch Veränderung des Magnetstroms betätigt werden können, und von denen mindestens eine ein wiederaufladbares Spulsystem (1) für den Kondensator (7) des Zündsystems (C) ist, und wobei der Kondensator durch die Flußveränderung aufgeladen wird, die von der relativen Bewegung des Magneten hervorgerufen wird,
- besagtes wiederaufladbares Spulsystem (1) hat alternativ die Funktion einer sekundären Hochspannungsspule, so daß es praktisch eine Doppelfunktion besitzt und so die Polaritätsumkehrung in einer Blockdiode (2) ausnützt, mit Hilfe eines angeschlossenen Schaltkreises (PV), der mindestens ein weiteres Spulenpaar umfaßt (3-4-5-6/8),
- das genannte Spulenpaar (3,4,5,6/8) ist koaxial ausgerichtet und umfaßt des weiteren einen Kondensator (7);
- einem "TRIGGER"-Auslöser, der mit Widerständen verbunden ist, die einen Siliziumthyristor kontrollieren; gekennzeichnet dadurch, daß besagter Schaltkreis (PV):
- durch einen Siliziumthyristor (10) die Entladung des Kondensators (7) auf der primären Induktion (3-4-5-6/8) auslösen können (sic!) und so auf dem wiederaufladbaren Spulsystem (1) ein Potential mit einer Polarität induziert, die der zum Aufladen des Kondensators (7) benötigten entgegengesetzt ist;
- einen "TRIGGER"-Auslöser (8) enthalten, der mit Widerständen verbunden ist (12-11), die einen Siliziumthyristor (10) kontrollieren; das Ganze wird kontrolliert durch Polaritätsumkehrung durch eine rezyklierende Diode (9) des genannten Induktors (3-4-5-6/8).

Revendications

1. Un dispositif d'allumage, utilisant une génératrice à haute tension du type ayant au moins:

- deux enroulements inductifs appariés qui peuvent être actionnés par une variation d'écoulement magnétique, étant au moins un des deux un système d'enroulement de recharge (1) pour les condensateurs (7) du dispositif d'allumage (C), et dans lequel la tension de charge dudit condensateur est induite par la variation d'écoulement provoquée par le mouvement relatif des moyens magnétiques,
- dit système d'enroulement de recharge (1) a alternativement la fonction d'enroulement secondaire pour la haute tension, devenant ainsi substantiellement à double fonction, système d'enroulement de recharge qui exploite la respective inversion de polarité dans une diode de blocage (2) à l'aide d'un circuit associé (PV) qui inclut au moins un autre système d'enroulement apparié (3-4-5-6/8),
- dit système d'enroulement apparié (3,4,5,6/8) est disposé de manière coaxiale, et en outre réalise des condensateurs (7);
- des moyens "TRIGGER" associés à des moyens à résistance qui contrôlent un respectif SCR; caractérisé par le fait que les dits circuits (PV):
- peuvent provoquer la décharge des moyens capacitifs (7) sur l'inductance primaire (3-4-5-6/8) à travers un "SCR" (10), de cette manière en induisant sur l'enroulement de recharge (1) un potentiel avec la polarité opposée à celle qui est nécessaire pour la charge des moyens capacitifs (7);
- incluent des moyens "TRIGGER" (8) associés aux moyens à résistance (12-11) qui contrôlent un respectif "SCR" (10), et le tout étant contrôlé par l'inversion de polarité à travers une diode de recyclage (9) des dits moyens inductifs (3-4-5-6/8).

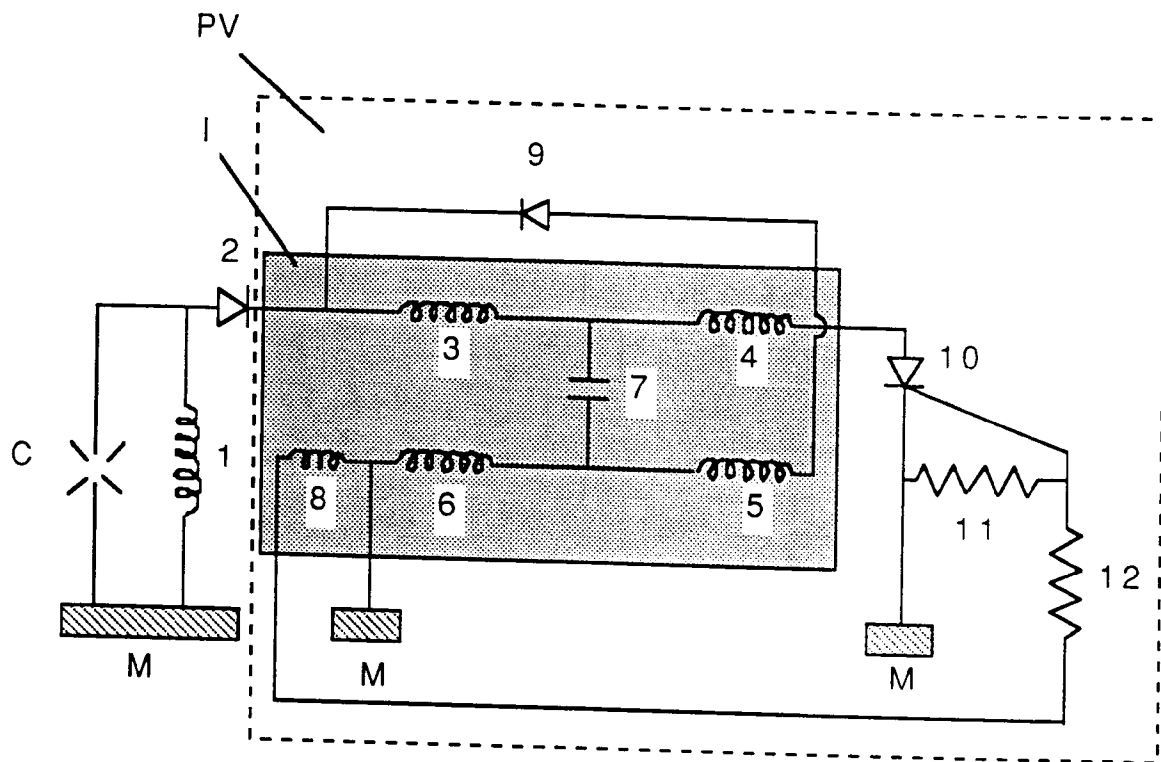


FIG.1

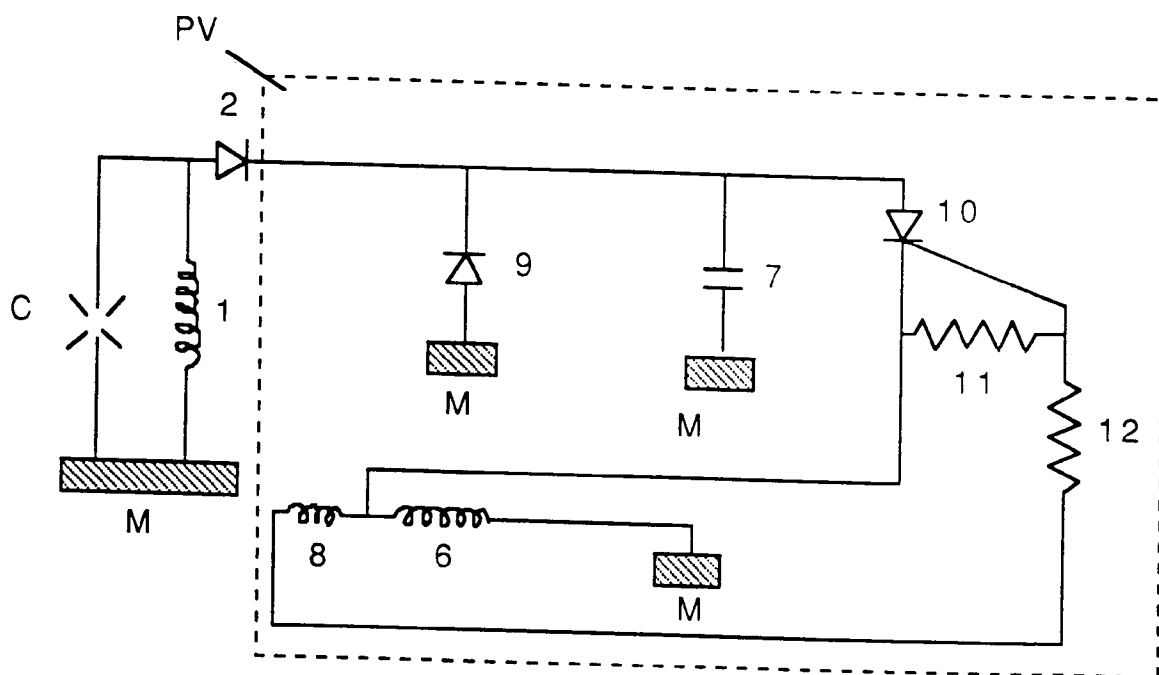


FIG.2