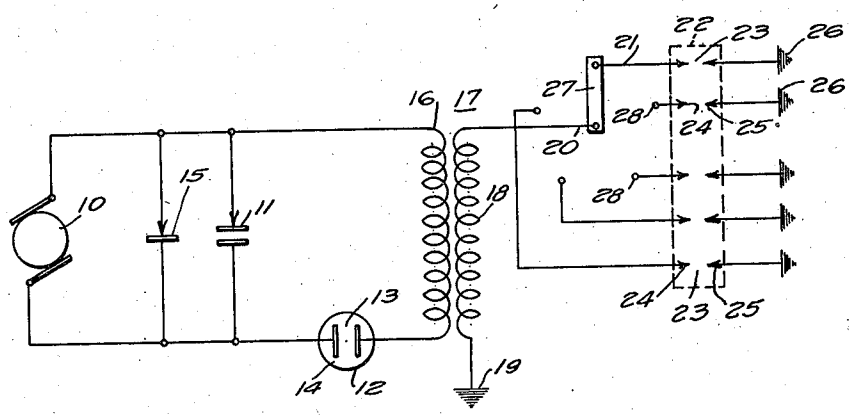
March 28, 1939. J. F. PETERS 2,151,796

DISCHARGE APPARATUS

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DISCHARGE APPARATUS

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6 Claims. (Cl. 123—148)

My invention relates to discharge apparatus and especially to a spark discharge system.

An object of my invention is to provide a spark discharge system that will have uniform timing of the discharge.

Another object of my invention is to damp and suppress oscillations in a spark discharge system that affects the timing for the subsequent discharge.

Other objects and advantages of the invention will be apparent from the following description and drawing in which the single figure is a diagrammatic illustration of a preferred circuit embodying the invention.

In spark discharge systems, especially for airplanes and heavy-duty trucks, considerable difficulty has been experienced with the systems for producing reliable and constant spark discharges for igniting the gasoline in the cylinders.

In order to build up rapidly a sufficient charge for an adequate spark discharge, high frequency magnetos have been used that generate a lot of energy for the spark plugs. It has been found, however, that while these magnetos provide considerable energy, yet this energy has resulted in a rapid burning up of the spark plug tips. I believe the application of the energy to the spark plug tips has been unnecessarily prolonged. I desire to provide a one-cycle ignition without sacrificing reliable operation in order that the spark plug tips may not be damaged.

Another difficulty with this type of discharge system is that uniform timing of the system is very difficult to obtain. After a careful analysis of the circuits in use, I discovered that the difficulty in respect to the timing was caused by oscillations in the discharge system. The capacitor would retain a charge due to the oscillation of the discharge and this retained charge would change the timing for the next discharge. Accordingly, I have devised a system in which one-cycle ignition is obtained for the protection of the spark plug points and also a system in which the oscillations are damped and suppressed.

My invention contemplates placing a rectifier in parallel with the capacitor in order to make the circuits non-oscillatory. The generator would then be run at double speed in order that the proper number of discharges would be obtained. The condenser would become more nearly discharged due to the rectifier and the short circuiting of alternate half cycles of the generator.

The figure illustrates a preferred circuit embodying the invention, in which the reference character 10 is a generator which, as previously stated, would be run at twice the normal speed for this type of service. The alternating current generated by this device charges the plates of the condenser or capacitor 11. Included in the system is a device 12 for holding the charge on the condenser until the capacitor charge reaches a desired voltage. This device preferably comprises a container having a gap 13 in its electrical circuit immersed in the gaseous medium 14. The width of the gap and the pressure and material of the gaseous medium will determine the discharge of the condenser when considered in combination with the other consonants of the circuit because the condenser 11 will not discharge until the gap 13 breaks down.

A rectifier 15 is placed in parallel with the condenser or capacitor 11 to short circuit the alternate half cycles of the alternating current of the generator 10. This rectifier 15 is preferably composed of a plurality of copper plates having one side oxidized to form the well known copper oxide type of rectifier.

In series with the gas-filled gap device 12 and the capacitor 11 is the primary 16 of the transformer 17. This transformer steps up the voltage applied to the secondary 18 which has one end preferably grounded at 19 and the other end connected to a distributor 20. This distributor 20 has a plurality of connections 21 extending to the engine casing 22 and each of these connections terminates at a spark plug gap discharge device 23 having points 24 and 25. The latter points 25 are preferably grounded at 26 for an electrical return through the connection 19 to the secondary 18. The arm 27 of the distributor 20 makes contact with the various points 28 in a manner well known in the art.

The alternate half cycles of the generator 10 rapidly charge up the condenser plates of the capacitor 11 until the gas-filled gap device 12 breaks down and permits the condenser to discharge through the primary 16 in the transformer 17. This charge is passed through the secondary 18 to the appropriate spark gap 23, and the gas in the particular cylinder in which this spark gap is located is immediately ignited. It will be noted that after the condenser 11 is discharged that the next half cycle of the generator 11 will be short circuited through the rectifier 15. This short circuit path to the rectifier 15 will damp out and suppress any oscillations resulting from the discharge. This elimination of oscillations will prevent the variations in the electrical characteristics of the circuit that caused difficulty of

uniform timing in systems which permitted such oscillations. The system accordingly provides a one-cycle ignition that is adequate, that does not apply unnecessary energy to the spark plug tips and that is uniform in its timing.

As a preferred embodiment, the capacitor and gas-filled gap cooperate to produce 150 to 250 volts across the capacitor. The transformer 17 steps the voltage up to a range of 15,000 to 25,000 volts. The rectifier should be capable of handling .2 ampere and the capacitor has a capacitance of 1.5 microfarads.

While I have disclosed a preferred embodiment of my invention, many changes may be made in the form, position, utilization and arrangement of the elements. Accordingly, I desire only such limitations to be imposed on the following claims as are necessitated by the prior art.

I claim as my invention:

1. A spark discharge system comprising a spark discharge device, means for storing an electrical charge for said device, means for generating alternating current for charging said last mentioned means, means for shorting half cycles of said alternating current, and means for holding said charge until said charge reaches a desired voltage.

2. A spark discharge system comprising a spark discharge device, means for storing an electrical charge for said device, means for generating alternating current for charging said last-mentioned means, means for shorting every other half cycle of said alternating current, and means for holding said charge until said charge reaches a desired voltage.

3. A spark discharge system comprising a spark discharge device, means for storing an electrical charge for said device, means for generating alternating current for charging said last-mentioned means, a rectifier shorting said electrical charge storing means from said generating means in one direction and means for holding said charge until said charge reaches a desired voltage.

4. In combination with means for storing an electric charge and means for supplying charging current thereto, a current-path in shunt with the first said means, said current-path including a transformer winding and undergoing an abrupt change of electrical conductivity when the first said means charges to a predetermined voltage, and a current-path possessing substantially unidirectional electrical conductivity in shunt with the first said means.

5. In an electric ignition system having means for storing an electric charge and means for supplying charging current thereto, a current-path in shunt with the first said means, said current-path including a transformer winding feeding energy to an ignition device and undergoing an abrupt change of electrical conductivity when the first said means charges to a predetermined voltage, and a current-path possessing substantially unidirectional electrical conductivity in shunt with the first said means.

6. A spark discharge system comprising a spark discharge device, means for storing an electrical charge for said device, means for generating alternating current for charging said last-mentioned means, a current-path comprising a transformer winding and a discharge-gap in series with each other connected in shunt with said last-mentioned means, and a rectifier connected in shunt with said last-mentioned means.

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