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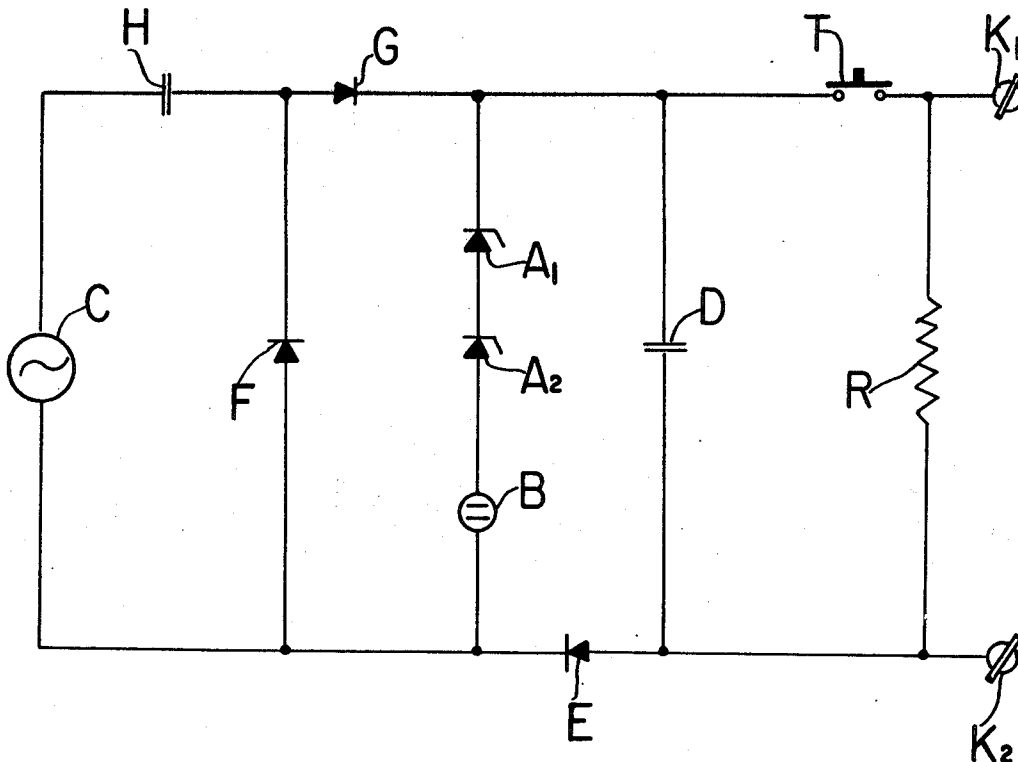
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[54] **CONDENSER-IGNITION DEVICE WITH A VACUUM DISCHARGE TUBE JOINED IN PARALLEL TO THE IGNITION CONDENSER**
3 Claims, 1 Drawing Fig.

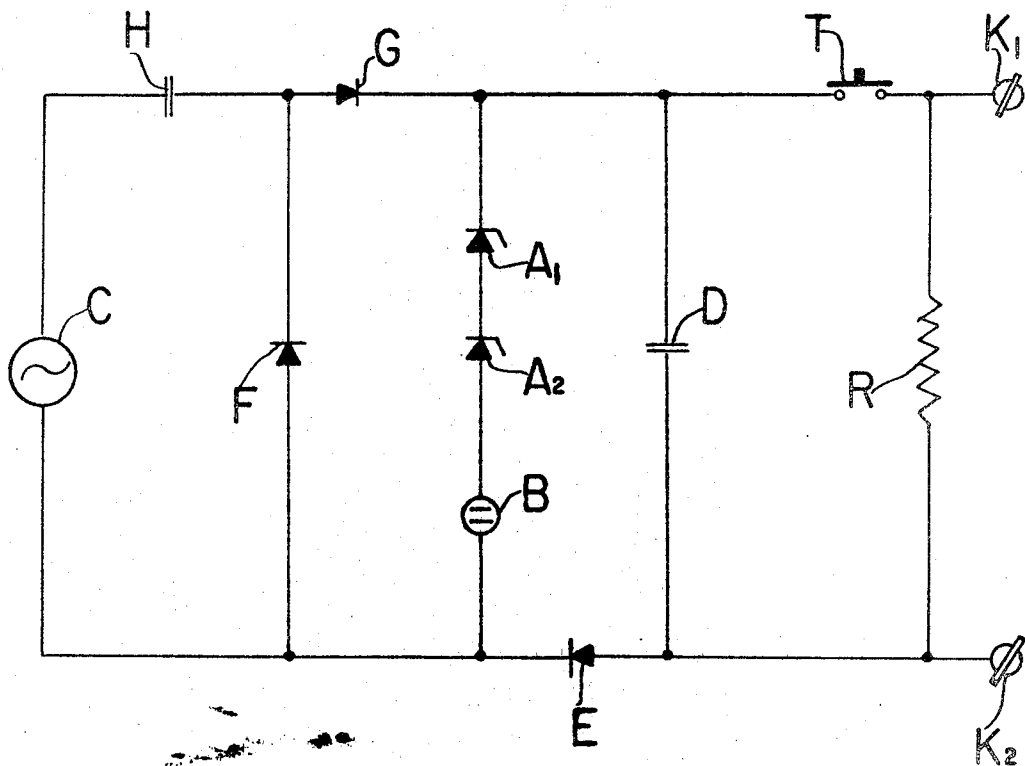
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ABSTRACT: The invention relates to a condenser-ignition device with a vacuum discharge tube which is joined in parallel to the ignition condenser together with, in series, an electrical valve, e.g. a Zener diode or the like, which becomes current conductive the moment the ignition voltage reaches the condenser. The ignition device is provided with a mechanical contact for the firing of shots.



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CONDENSER-IGNITION DEVICE WITH A VACUUM DISCHARGE TUBE JOINED IN PARALLEL TO THE IGNITION CONDENSER

THE PRIOR ART

An electrical ignition device for the firing of ignition circuits of high ignition impulse energy is known (German Pat. No. 1,126,980), in which the ignition condenser is joined in parallel to the terminals of the ignition circuit and where, furthermore, a vacuum discharge tube is joined in parallel to the condenser and the terminals. In this known device the releasing of the shot is caused by the shutting of a contact between the condenser and one of the terminals.

Furthermore, ignition devices are known in which the mechanical contact which causes the release of the shot is operated by a relay (U.S. Pat. No. 2,892,128; German Pat. No. 1,130,745). The disadvantage of such ignition devices with charging voltage limitations and the firing of the shots by means of a relay is that part of the charging energy is used up by the relay. Moreover, the mechanical relays are interference prone. They have a certain weight and require a certain space which again is disadvantageous, particularly in portable condenser-ignition devices which constitute the majority of all the devices.

OBJECTS OF THE INVENTION

An object of the present invention is the obtention of a condenser-ignition device with a vacuum discharge tube joined in parallel to the ignition condenser which is free of the above defects.

Another object of the present invention is the obtention in a condenser-ignition system for detonator ignition of propellant and/or explosive charges, said system comprising a condenser discharge ignition circuit with a vacuum discharge tube joined in parallel thereto, an alternating current source of electrical energy for condenser charging and a mechanical contact for firing the shot, the improvement which comprises an electrical valve joined in series with said vacuum discharge tube, which electrical valve upon the reaching of the ignition voltage on the condenser becomes current conductive, to form a stabilization circuit for the voltage built up in said condenser discharge ignition circuit and at least one rectifier diode joined between said stabilization circuit and the ignition condenser in said condenser discharge ignition circuit.

These and other objects of the invention will become more apparent as the description thereof proceeds.

DESCRIPTION OF THE INVENTION

The invention is an improvement in the condenser-ignition devices of the above-indicated type which are known at present, in such a way that the ignition device can be built lighter, smaller, safer and cheaper.

To solve this problem according to the invention an ignition device of the above-indicated type is provided with an electrical valve in the form of at least one Zener diode or the like in such a way that at least one vacuum discharge tube is joined thereto in series and that the valve and the tube are joined in parallel to the ignition condenser and furthermore that between the thus formed stabilization chain and the ignition condenser, at least one rectifier diode is joined. The Zener diode becomes current conductive after achievement of the ignition voltage across the ignition condenser. The voltage which builds up at the vacuum discharge tube causes the tube

to light up and thus indicates that the ignition device is ready for operation.

If, in spite of the lighting of the vacuum discharge tube, the alternator is further operated, no voltage higher than the predetermined voltage can build up across on the ignition condenser since the stabilization circuit formed by the vacuum discharge tube and the Zener diode effects a voltage limitation. The rectifier diode on its part prevents a reduction of the voltage of the charged ignition condenser through the stabilization circuit.

The drawing shows an example of the circuit system of the condenser-ignition device of the invention.

The alternating current voltage supplied by the alternator C is rectified across a voltage doubler consisting of the condenser H and the two rectifiers G and F. Thereafter, it charges the ignition condenser D. Joined in parallel to this condenser D are two Zener diodes A₁ and A₂ to which is joined in series a vacuum discharge tube B. The vacuum discharge tube B and the Zener diodes A₁ and A₂ are connected in parallel to the condenser D and form a stabilization circuit for the voltage which is to be built up in the ignition condenser D.

In order to prevent the voltage in condenser D from decreasing after reaching the ignition voltage in the condenser D due to the stabilization circuit A₁, A₂, B, a rectifier diode E is provided between this circuit and the ignition condenser D.

A pushbutton T serves for the firing of the shot. This pushbutton T causes the ignition circuit to close the moment this button is pushed. The resistance R which is joined in parallel to the terminals or binding posts K₁ and K₂ serves to discharge the ignition condenser D when the ignition machine is operated with open terminals, that is, when no detonator circuit is connected.

In order to be able to determine the charge condition of the ignition condenser D in the event where a longer period of time elapses between the first actuation of the alternator C and the actual firing of the shot, it is sufficient to operate the alternator C for a short period of time which causes the glow tube B of the stabilization circuit to light up.

The preceding specific embodiment is illustrative of the practice of the invention. It is to be understood, however, that other expedients known to those skilled in the art may be employed without departing from the spirit of the invention.

We claim:

1. A condenser-ignition circuit for detonator ignition of propellant and/or explosive charges consisting essentially of a means for generating high voltage comprising an alternating current source of electrical energy and a rectifying voltage doubler circuit, a series connection having a vacuum discharge tube and an electrical valve joined in parallel to said rectifying voltage doubler circuit, said electrical valve upon reaching of the ignition voltage becoming current conductive and ensuring a constant voltage drop independent of the current flowing therethrough, said series connection predetermining said ignition voltage as a stabilized reference voltage, a discharge condenser connected in parallel to said series connection through at least one rectifier diode, preventing discharge of said condenser through said series connection, discharge terminals, and a mechanical contact for electrically connecting said condenser to said discharge terminals.

2. The condenser-ignition system of claim 1 wherein said electrical valve is at least one Zener diode.

3. The condenser-ignition system of claim 2 wherein two Zener diodes are joined in series with said vacuum discharge tube.