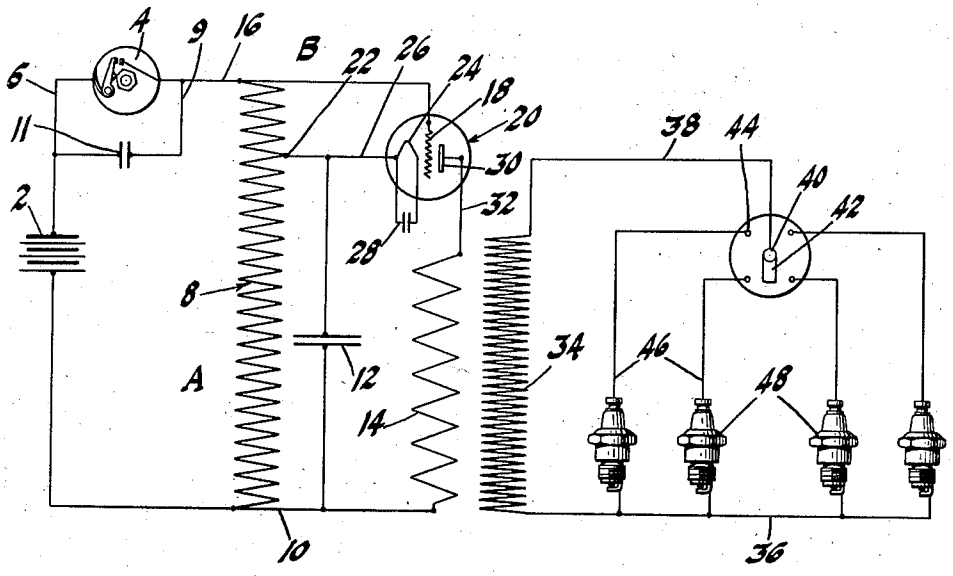
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IGNITION CIRCUIT

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IGNITION CIRCUIT

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8 Claims. (Cl. 123—148)

This invention relates broadly to spark generating systems whose usual function it is to provide ignition for internal combustion engines and is an improvement over the system shown in the copending application Serial Number 668,754, filed May 1, 1933 by Duffendack, Randolph and Wolfe.

The former application discloses several systems in which the current source is a low voltage one such as a car battery which acts to charge a condenser through the medium of the energy stored in the magnetic field of an inductance coil and then discharging the condenser through a different circuit including a transformer primary and an electric valve such as an electrode tube that will break down at a definite voltage. This latter circuit effects a secondary work circuit which includes a spark plug to ignite the fuel.

In a system of this type it is evident that the charging of the condenser will be at a comparatively slow rate but when the charge of the condenser reaches a point where the valve or tube breaks down and allows the condenser to discharge, there will be a sudden rush of current from the condenser of short duration so that this may be termed an impulse spark system. This sudden flow through the primary will of course effect a similar flow in the secondary work circuit and this flow will cause a spark to jump at the spark plug points to ignite the fuel.

There is also disclosed in 688,754 the use of a three element tube which acts as the valve between the condenser and the transformer primary to keep the current from flowing in this circuit until the condenser has received the proper charge. The electron flow, and therefore the point at which the tube would allow flow therethrough, is controlled by the potential of the grid and was shown with a bias furnished by a separate battery. Since the voltage necessary for this bias was found to be approximately 30 volts, this could not be supplied from the storage battery of the car but an extra battery was necessary.

It is the object of my invention to supply the necessary bias for the grid in a high frequency or impulse spark system from the circuit and original source and eliminate the need for an extra battery.

It is a further object of my invention to accomplish the above without complicating the whole system to too great an extent.

For a better understanding of the nature and objects of this invention, reference is made to the following specification wherein there are described the embodiments of my invention which are illustrated in the accompanying drawing, in which,

The figure of the drawing is a schematic electric circuit which includes my invention.

Referring specifically to the drawing, the battery 2 has one of its terminals connected to a circuit breaker 4, by wire 6, and the other of its terminals connected to one end of an inductance coil 8, by wire 10, which wire is also connected to one terminal of a condenser 12, and one end of a primary transformer winding 14. The opposite terminal of the circuit breaker connected to the battery is connected by wire 16 to the other end of the inductance coil 8 and is then continued to connect with the grid 18 of a three element vacuum tube 20.

Connected in shunt across the terminals of the circuit breaker is a condenser 11 by circuit 9. The circuit breaker 4 may be operated at the correct instant by conventional connection to any desired part of the motor. A short distance from the connection between the wire 16 and the inductance coil 8 is a tap 22 on the inductance coil which separates the coil into two portions A and B. This tap is connected to the opposite end of the condenser 12 and also to one side of the heated element 24 of the vacuum tube by wire 26. The relative number of turns in the coil depends upon the inductance and on the characteristics of the tube used in the system, but it was found that a total coil of 350 turns, 310 of which were used to charge the condenser, and 40 for grid potential, was satisfactory.

A small "A" battery 28 is connected across the heating element 24 and serves to cause the same to heat up and glow to emit electrons. The plate 30 of the vacuum tube is connected by wire 32 with the opposite end of the primary transformer winding 14. In the secondary current, the secondary 34 of the transformer has one end connected to a common terminal which is connected to one side, that is the grounded side of the spark plug, by any metallic contact and is illustrated by the wire 36. The opposite end of the secondary winding is connected by a wire 38 through the central or revolving post 40 of the conventional distributer, having a leg 42 which rotates in proximity with the contact points 44 each of which is connected to one of the spark plugs 48 by a wire 46.

The operation of the circuit is as follows:

The battery 2 is connected in series with the

contact points of the circuit breaker 4 and the inductance coil 8, and when the contact points are closed, current flows from the battery to the inductance coil and the latter builds up a magnetic field therearound. When the contacts at 4 are opened the magnetic field around the inductance coil collapses and induces a flow of current in the circuit including the condenser 12, wire 10, the portion A of the inductance coil up to the tap 22, and the wire 26. This tends to charge the condenser and since the collapse of the field is comparatively slow, the charge on the condenser will gradually build up. During this time, also, the portion B of the inductance coil, between the connection of the wire 16 and the tap 22, is forcing current to the grid 18 which negatively biases the potential thereof to prevent electron flow between the filament and plate. As the condenser becomes charged, and flow of current from the induction coil to both the condenser and the grid lessens, the stop valve action of the tube will tend to break down due to the increase potential between the filament and the plate due to increased charge on the condenser and also the fact that the bias action of the grid has become less. When this occurs, the condenser discharges rapidly in the series circuit containing condenser 12, wire 26, filament 24, plate 30, wire 32, primary winding 14 of the transformer and wire 10 back of the condenser. This rapid discharge or flow in this circuit induces in the secondary work circuit a current of the same characteristics and since at this time the leg 42 of the rotating distributer is adjacent one of the points 44, this high frequency current will be applied across the spark plug points and will result in a spark to ignite the fuel.

The action of the condenser 11, in shunt across the contact points of the circuit breaker 4, is merely to cause less arc and preserve the life of the points.

It will thus be evident that I have provided a high frequency or impulse spark plug system whereby the biasing voltage for the grid is obtained by the tap on the inductance instead of requiring a necessity of a further source of voltage which will result in a similar system.

I claim:

1. In an ignition system, a condenser, a discharge circuit including the condenser, a three element vacuum tube and a primary transformer coil, and means to apply a charge to the condenser said means including an induction coil, a portion of which charges the condenser and the remainder supplies energy for the grid to bias the same and control the breakdown of the tube to allow electron flow and the condenser to discharge.

2. In a spark generating system, a condenser, an electric valve to prevent flow until a certain potential is reached by the condenser said valve comprising a three electrode vacuum tube, and an induction coil, the major portion of which is utilized to charge the condenser and the remainder to supply energy to bias the grid of the tube to prevent current flow until the condenser is sufficiently charged.

3. In a spark generating system, a source of current, a timed circuit breaker and an induction coil in series, a condenser connected across a major portion of the induction coil, a three element tube connected in series with the condenser which acts to prevent a flow of current therefrom until a given potential is reached and the grid of the tube connected across the remainder of the induction coil to receive its potential therefrom.

4. In a high frequency generating system, a condenser, an electric valve in a discharge circuit to prevent discharge until a specific potential is acquired, biasing means within the valve and a single source of current supply for charging the condenser and supplying the biasing means.

5. In a high frequency generating system, a condenser, a discharge circuit for the condenser, a pair of spaced members that will not conduct current thereacross until a specific potential has been reached in the discharge circuit, means between the members to adjust the resistance to flow by biasing the potential and a common source of current for charging the condenser and supplying the biasing means.

6. In a high frequency generating system, a condenser, a discharge circuit for the condenser, spaced members in the discharge circuit acting as a gap to prevent flow until break-down, means between the two members to charge the characteristics of the gap, a single member supplying charging current to the condenser and biasing current to the means and a source of current for the member.

7. In a high frequency generating system, a condenser, a discharge circuit for the condenser, spaced members in the discharge circuit acting as a gap to prevent flow until break-down, electrical means between the two members to change the characteristics of the gap, an induction coil having taps whereby a portion of the coil charges the condenser and another portion supplies current for the biasing means and a single source of current for the coil.

8. In a high frequency generating system, a condenser, a charging circuit therefor including an induction coil, a discharge circuit including an enclosed gap and a transformer primary, a biasing means in the gap, means for connecting the biasing means to a portion of the inductance for its energy supply and a secondary work circuit to utilize the current through the transformer.

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