Oct. 30, 1956 M. A. CROSBY 2,769,021

IGNITION SYSTEM

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FIG-1

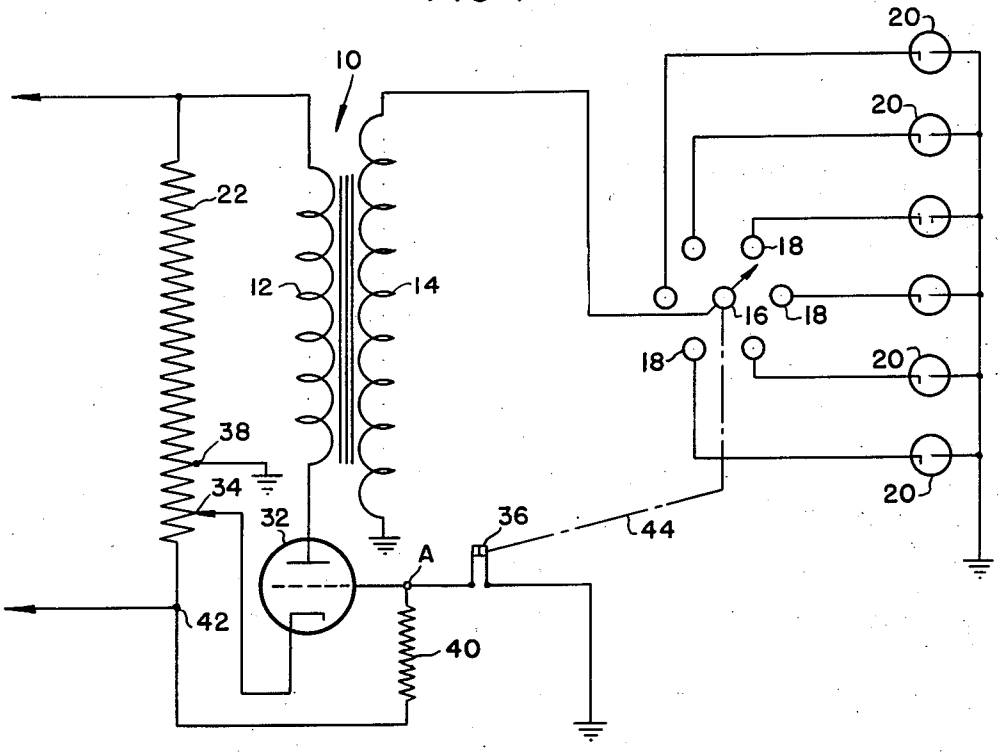
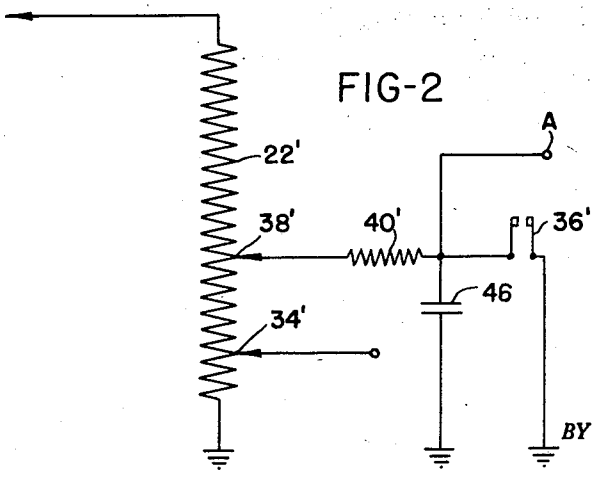


FIG-2



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FIG-3

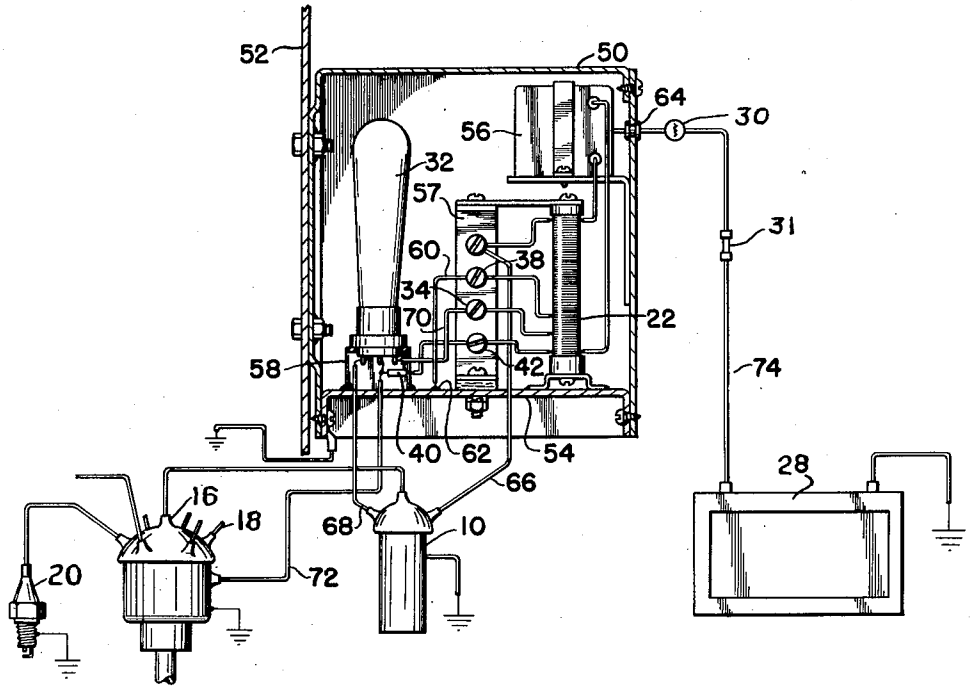
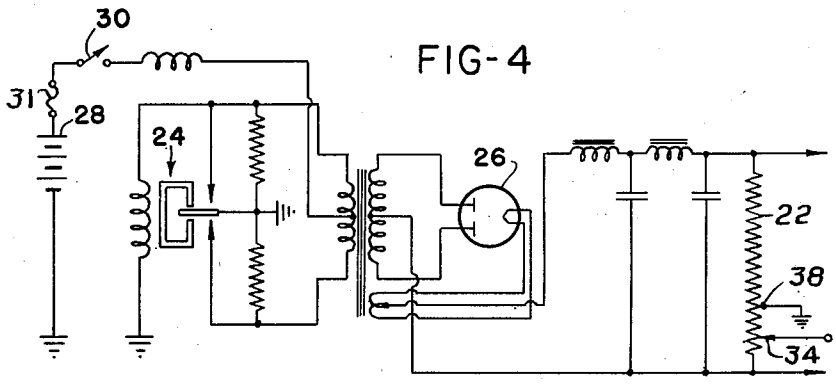


FIG-4



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IGNITION SYSTEM

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Application May 21, 1953, Serial No. 356,360

5 Claims. (Cl. 123—148)

The invention relates to an electronic ignition system for automobiles and in particular, pertains to such a system wherein the destructive current across the breaker points is eliminated. This invention is an improvement over the invention disclosed in application, Serial No. 356,264, filed May 20, 1953.

Present day automobile ignition systems consist essentially of a distributor, spark coil or an induction transformer, breaker points which are operated by the rotation of a cam, the latter being connected to rotate with the distributor. The breaker points are located in the primary circuit of the transformer in series with a source of voltage, namely a battery. Normally these points are closed, thus permitting a high current to flow through the primary winding. When the distributor rotor passes closely adjacent to each stationary segment corresponding to a particular spark plug, the breaker points open, thus causing a high inductive surge in the secondary of the spark coil transformer and resulting in firing of the proper cylinder.

It is believed well known that the effective life of this circuit is seriously limited by the breaker points. This is caused by the location of the breaker points in a high current circuit thus necessitating these points to interrupt the high current flow and in so doing, drawing a heavy arc. Over a period of time this causes disintegration of the points in form of pitting and burning, thus requiring frequent cleaning and many times complete replacement of the breaker points.

The present invention contemplates the use of vacuum tube control of the current in the primary of the spark coil or induction transformer rather than the use of breaker points as discussed above. Various electronic systems have been developed in the past to overcome the above noted weaknesses in an automotive engine ignition system, but these systems have not been generally accepted since, in most cases, the additional parts required have made it physically or economically impracticable in an automobile. Furthermore, these prior art devices have been unduly complex and as a consequence, many changes in an existing automobile ignition system have been necessary in order to incorporate the electronic ignition system therein.

It is therefore a primary object of my invention, not only to privide an ignition system which will eliminate the deterioration and arcing of the breaker points but also such an ignition system which may be incorporated in a conventional vehicle with a minimum of change.

More specifically, it is an object of this invention to provide an electronic ignition system which can be incorporated as a unit behind the dash panel and which will require the connection of a minimum number of parts for its operation.

A particular object of this invention is the provision of a unit of the nature referred to which can be incorporated in the ignition system of a conventional internal combustion engine with absolutely no change whatsoever in the standard components of the system merely by effecting a small number of electrical connections while fixing the unit to the engine in grounded relation thereto.

These and other objects will become more apparent upon reference to the following description and drawings, in which:

Figure 1 is a schematic electrical circuit showing my invention in a complete ignition system;

Figure 2 is a schematic circuit diagram showing a modification of the invention;

Figure 3 is a diagrammatic representation of my invention as it would be inserted in an automobile;

Figure 4 is a schematic electrical circuit showing the power supply intended to be used with the present invention.

Referring more particularly to the drawings, it will be noted that Figure 1 shows the conventional elements used in an automotive ignition system. Thus, the spark coil or transformer is designated by the numeral **10** and consists of primary and secondary windings **12** and **14**.

In the secondary circuit is the usual distributor rotor **16** operable on rotation to pass closely by one of the peripheral stationary segments **18** which are in turn connected to a particular spark plug **20** for firing of the proper cylinder. This is the conventional ignition system thus far and therefore no further explanation is believed necessary.

The primary winding **12** is connected at one end to the upper terminal of voltage divider **22** of a conventional power supply seen in Figure 4. A maximum voltage of approximately 250 volts is developed across voltage divider **22** through the normal action of vibrator **24** and rectifier **26**. The source of voltage is the automobile battery **28** and the system is turned on by closing the ignition switch **30** in the normal manner.

The opposite end of winding **12** is connected to the plate of a high vacuum tube **32** such as a triode, the cathode of the latter being connected to a tap **34** near the lower or negative end of the voltage divider **22**.

Since it is desirable that tube **32** be normally conductive, a voltage positive with respect to the cathode of tube **32** is applied through normally closed conventional breaker points **36** to the grid of tube **32**. This is accomplished by grounding a point as **38**, on the voltage divider **22**, which point is positive with relation to the tap **34** which is connected to the cathode of tube **32**. Since the normal arrangement of the breaker points in present day ignition systems is to have one of the contacts of the breaker points connected to ground, it will be evident that by so constructing the voltage divider, a positive voltage will be applied to the grid of the tube when the breaker points are closed and, accordingly, the tube will conduct. This voltage is sufficient to cause tube **32** to draw a maximum of current in its plate circuit.

Also connected to the grid of tube **32** is one end of a resistor **40** having its opposite end connected to the low point or negative end of voltage divider **22**. Because of the size of the resistor **40**, the negative voltage of point **42** relative to point **34** will have no effect in determining the grid voltage when the breaker points **36** are closed.

The breaker points **36**, well known in ignition systems, are normally closed and are on the same shaft or otherwise mechanically interconnected with the distributor rotor **16** as shown at **44**. As stated above, one of the breaker points is connected to the grid of tube **32**, the other point thereof being connected to ground as is conventional.

The operation of this circuit is as follows:

With distributor rotor **16** somewhat between any two of the segments **18**, there will be a high current flowing in the primary **12** of the spark coil due to the positive voltage being applied through the closed breaker points

to the grid of tube 32. Upon the rotor 16 coming close to a segment 18, the breaker points 36 will open, thus removing the positive voltage derived from point 38 of voltage divider 32 from the grid. Since current no longer flows in resistor 40, there is no voltage drop thereacross, and the negative voltage applied from point 42 relative to point 34 is, in effect, directly applied to the grid. This voltage is sufficient to render tube 24 non-conductive. The resulting instantaneous collapse of the large current in primary coil 12 will cause a high voltage to be induced in secondary winding 14, which voltage is applied to the spark plugs in the usual way.

A modification of the grid circuit is shown in Figure 2 and is intended to be substituted at A for the grid circuit of Figure 1. In this embodiment the breaker points 36' are normally open and tube 32 is rendered normally conductive by application of a positive voltage obtained from the voltage divider 22' at the tap point 38'. It will be noted that the voltage divider 22' of the power supply in the modified arrangement of the invention has the ground connected to the negative terminal or lower point thereof. The tap-offs from the voltage divider 22' are identical in number to those of voltage divider 22 but the various connections are changed somewhat. Thus since cathode of tube 32 is now connected to point 34' and the grid is connected to point 38' through the resistance-capacity combination 40', 46, the tube 32 will normally be conductive. Upon closure of the breaker points 36' the grid of tube 32 will be connected to ground and will be negative relative to the cathode thus cutting the tube off. Once again it should be noted that, because of voltage drop through resistor 40', the previously effected negative voltage obtained from point 38' will no longer be effective in determining the condition of tube 32.

Therefore, when the breaker points 36' are closed in synchronism with the passing of distributor rotor 16 past a particular segment 18, the tube 32 is rendered non-conductive, thereby cutting the primary current off and causing the high inductive surge in the secondary as in the previous embodiment. Capacitor 46 is placed in this circuit to limit the speed at which the tube current builds up when the breaker points are opened for preparation for the next firing.

From the above description, therefore, it will be evident that an ignition system has been provided which enables the conventional breaker point to be connected in the usual manner, namely, that is having one of the points grounded. This is necessary since in every ignition system one of the breaker points is grounded and no simple means is available for isolating this breaker point from ground, or for bringing an extra lead into the distributor housing, or for connecting the extra lead to this breaker point. Thus, it will appear that the present system avoids such difficulties and enables the present invention to be used in an automobile ignition system with absolutely no change in any of the existing elements thereof.

Referring now to Figure 3, it will be noted that the entire conversion units can be mounted in a housing 50, which, in turn, can be secured to the vehicle in which the device is to be installed, and that only a few simple connections need be made presently to be described. The housing 50 is secured to one side of the dash-panel 52 by any suitable connecting means, such as the bolts shown, and is also electrically in contact with a grounding plate 54 likewise secured to the dash-panel.

The interior of the housing is arranged to suitably retain the power unit 56, the tube 32 and the voltage divider 22 together with the various leads for connection. The tube 32 is mounted in any convenient position on a support such as the flange member 58 shown as secured to the housing 50.

A plate 57 in the housing has four terminal connections thereon, and it will be quite evident that these are the connections leading to the voltage divider 22. Since tap 38 is grounded, a lead 60 connects this point with the ground plate 54 at 62. It will be understood that, in practice, the terminals referred to could be located on the exterior of the housing, for convenience, and the unit could then be installed very simply.

The walls of the housing 50 are provided with grommeted openings as 64 for receiving the various leads running between the normal ignition system and the converter unit. Thus, the upper positive tap of voltage divider 22 connects to the induction coil 10 by means of lead 66, and lead 68 connects the other end of the induction coil 10 with the plate of tube 32. Tap 34 is connected to the cathode of tube 32 through the connecting lead 70, and the grid of tube 32 is connected to the low negative tap 42 of the voltage divider and also, through lead 72, connects to one of the breaker points located in the distributor.

Also shown connected to the power unit 56 are the conventional ignition switch 30, fuse 31, automobile battery 28, and lead wire generally indicated at 74.

Thus it will be apparent from the above description that only four connections need be made between the conventional components of an automobile ignition system and converter unit of the present invention these being numbered 66, 68, 72 and 74 in Figure 3.

Furthermore, it is believed to be readily apparent that, in order to adapt the converter unit of Figure 3 to the embodiment of this invention wherein the breaker points are normally opened, all that is required is to interchange the connections on the plate 57. Thus, leads from the voltage divider to contact points 38 and 42 need only be interchanged to achieve this result.

From the above it will be seen that the conventional breaker points are still effective in making and breaking the current in the primary coil of the ignition system but are removed from the actual high current circuit. In the low current grid circuit, where the make and break current is sharp and non-inductive, the contact points should last indefinitely. Also, by providing the special type of power unit of this invention, installation and conversion of a conventional ignition system to one of the nature of this invention can be accomplished with a minimum of change and with a maximum of economy.

It will be understood that we do not wish to be limited to the exact embodiment shown and described herein, but desire to comprehend such changes thereof as may be further desirable to adapt this invention to different conditions and uses.

I claim:

1. In an automotive vehicle having an ignition system including breaker points having one outside point connected to ground, a supporting panel, an electronic ignition converter unit including a vacuum tube having a grid connected to the other of said breaker points, means for securing said unit to said panel, and means for connecting said unit to said ignition system without disconnecting the ground on said breaker point.

2. In an automotive vehicle having an ignition system including an induction coil, an ignition switch, and a set of breaker points having one of said points connected to ground, a supporting panel, an electronic ignition converter unit including a vacuum tube having a grid connected to the other of said breaker points, means for securing said unit to said panel, and means for connecting said unit to said ignition system without disconnecting the ground on said breaker point comprising leads extended between said unit and said ignition switch, said induction coil and said breaker points, such leads comprising the only connections to said converter unit.

3. An automotive vehicle having an ignition system including grounded breaker points, a supporting panel, an electronic ignition converter unit comprising a power supply and a vacuum tube means, means connecting one of said breaker points to the grid at said vacuum tube,

means for housing said converter unit, means for securing said housing means to said panel, and means for connecting said unit to said ignition system without disconnecting the ground on said breaker points.

4. In an automotive vehicle having an ignition system wherein one of the breaker points therein is connected to ground, a supporting panel, an electronic ignition converter unit comprising a power supply and vacuum tube means having a grid connected to the other of said breaker points, means for housing said converter unit, means for securing said housing means to said panel, said power unit including a voltage divider having tapped connections extending to contact points on said power unit, and means for connecting said unit to said ignition system without disconnecting the ground on said breaker points comprising leads between said contact points and said vacuum tube means and said ignition system.

5. In an automotive vehicle having an ignition system, an insulated supporting panel, an electronic ignition converter unit having a vacuum tube, said unit including

a power supply unit having external contact points associated therewith, means for housing said converter unit and means for securing said housing means to said supporting panel, a grounding plate secured to said supporting panel and means for connecting one of said contact points to said grounding plate, a set of breaker points in said ignition system having one of the points thereof connected to ground and the other of the points connected to the grid of the vacuum tube, and means for connecting said converter unit to said ignition system without disconnecting the ground on said breaker points.

References Cited in the file of this patent

UNITED STATES PATENTS

2,044,155	Dibley	June 16, 1936
2,328,444	Francis	Aug. 31, 1943
2,353,527	Touceda et al.	July 11, 1944
2,456,743	Short	Dec. 21, 1948
2,643,284	Putnam	June 23, 1953