Oct. 16, 1962 S. BARKER 3,059,148

IGNITION SYSTEMS FOR INTERNAL COMBUSTION ENGINES

Filed July 19, 1960

Fig. 2.

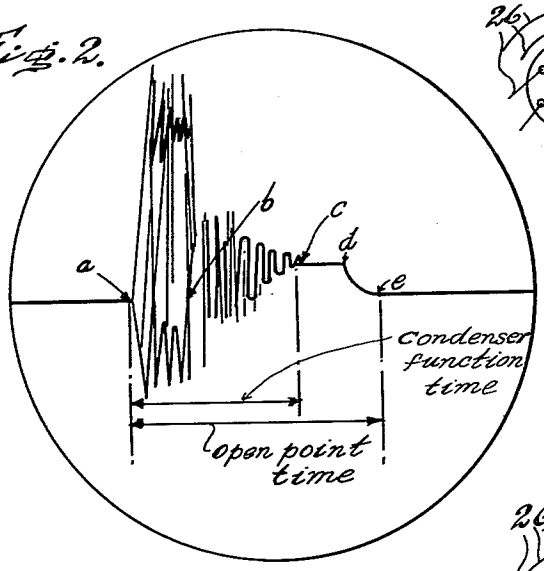


Fig. 1.

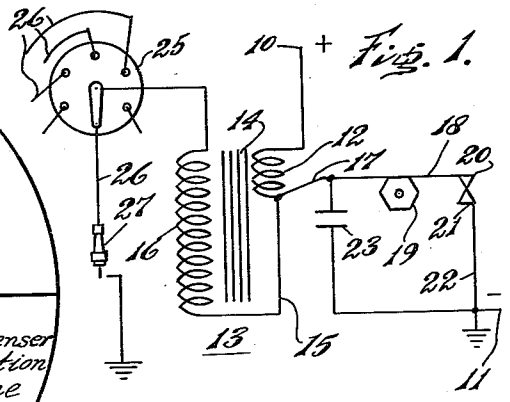


Fig. 3.

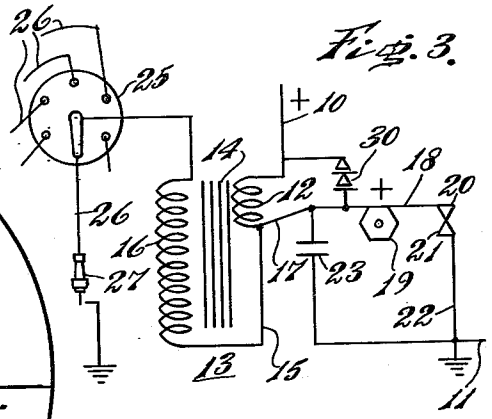


Fig. 5.

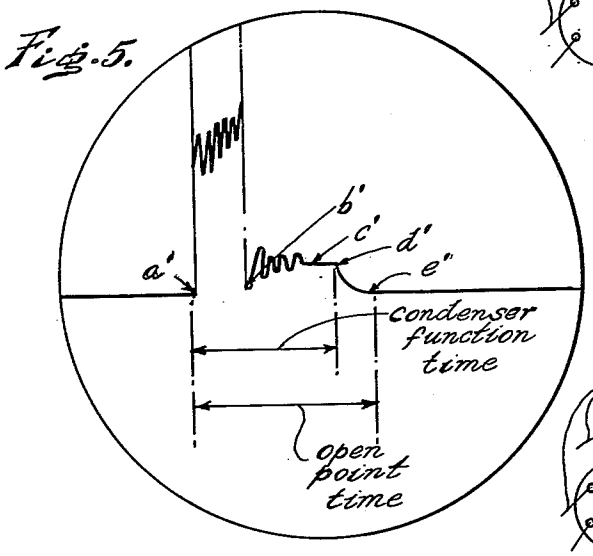
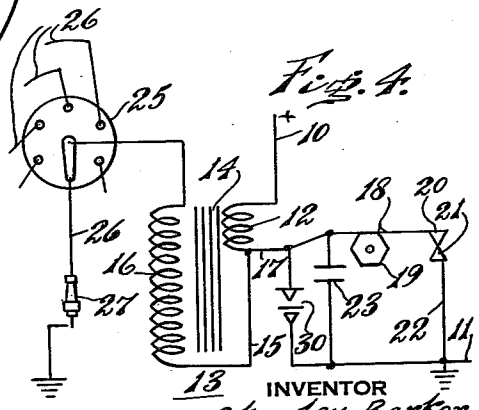


Fig. 4.



INVENTOR
Stanley Barker
BY
ATTORNEY

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IGNITION SYSTEMS FOR INTERNAL COMBUSTION ENGINES

Stanley Barker, 644 W. Indiana Ave., Philadelphia 33, Pa.

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1 Claim. (Cl. 315—206)

This invention relates to ignition systems for internal combustion engines for automotive service, and more particularly to such a system with which longer life of the ignition points and spark plugs will be available, together with improved and smoother operation of the engine.

In the operation of conventional ignition systems the heavy current flowing through the primary winding builds up the magnetic flux of the iron core to a saturation point, then when the ignition points are opened by the action of the timing cam, the flow of current through the primary winding is interrupted so that a rapid breakdown of the magnetic field of the iron core produces a current in the primary winding of the coil which flows to the condenser across the open points, charging the condenser to a voltage equal to its capacitance. This produces a high E.M.F. in the coil primary and secondary windings thereby making a very high voltage available for the spark plug.

While this high voltage is produced, radio frequency oscillations are also produced and while it is not entirely certain it is believed that the current flow attendant on these oscillations is at least in part responsible for the pitting of the points by an electro-deposition action.

It is the principal object of the present invention to suppress the flow in automotive ignition systems of radio frequency oscillations.

It is a further object of the present invention to provide an ignition system for automotive vehicles with which greatly prolonged life of the ignition points is obtained.

It is a further object of the present invention to provide an ignition system for automotive vehicles with which the normal life of the spark plug electrodes is greatly extended.

It is a further object of the present invention to provide an ignition system for automotive vehicles with which a suppressor effect of high frequency oscillations is obtained in a manner which does not introduce any tendency to difficult starting of the engine.

It is a further object of the present invention to provide an ignition system in which the open point time can be reduced thereby permitting more rapid operation of the ignition system.

It is a further object of the present invention to provide an ignition system for automotive vehicles with which smoother operation of the engine will be obtained.

Other objects and advantageous features of the invention will be apparent from the specification and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which:

FIGURE 1 is a diagrammatic view of a conventional form of ignition system in common use;

FIG. 2 is an oscilloscope trace pattern as obtained from the ignition system illustrated in FIG. 1;

FIG. 3 is a diagrammatic view of a preferred form of ignition system in accordance with the present invention;

FIG. 4 is a view similar to FIG. 3, showing another preferred form of ignition system in accordance with the present invention; and

FIG. 5 is an oscilloscope trace pattern as obtained with the ignition systems illustrated in FIGS. 3 and 4.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that

various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Referring now more particularly to FIG. 1 of the drawings, the ignition system there shown preferably includes conductors **10** and **11**, connected to any suitable source of energy (not shown), such as a conventional generator or storage battery. One of the conductors, such as the condutor **10**, is preferably connected to one terminal of the primary winding **12** of an ignition coil **13** having an iron core **14**. The other terminal of the primary winding **12** is connected by a conductor **15** to one terminal of the secondary winding **16** of the ignition coil **13**.

The terminal of the primary coil **12** to which the conductor **15** is connected is also connected by a conductor **17** to a breaker arm **18** operated by a cam **19** for controlling the make and break of the ignition points **20** and **21**. The fixed point **21** is connected by a conductor **22** to ground and to the conductor **11** and a condenser **23** is shunted across the points **20** and **21**.

The other terminal of the secondary winding **16** is connected to a distributor **25** having a plurality of conductors **26** each leading therefrom to one of the spark plugs **27** which in turn are grounded to the engine.

Referring now more particularly to FIG. 2 of the drawings, an oscilloscope trace pattern is there illustrated of a character obtained with the ignition system of FIG. 1.

Upon reference to that pattern in which the events occurring in the system are shown the opening of the points is illustrated at *a*, with the spark at one of the plugs from *a* to *b*, the condenser function time of the condenser **23** from *a* to *c*, the open point time of the breaker points **20** and **21**, from *a* to *e*, with the breaker points closing from *d* to *e*. The cam angle at which the points are closed is represented by the interval from *e* to *a*. The residual voltage effect after spark discharge is in the interval from *b* to *c*.

It will be noted that during the interval *a* to *b* of the spark discharge a number of tracings present indicate radio frequency oscillations occurring with the spark.

Referring now more particularly to FIG. 3 of the drawings, the ignition system there illustrated is essentially the same as that illustrated in FIG. 1, but with a blocker or suppressor **30** shunted across the primary winding **12** of the ignition coil **13**. This blocker or suppresor **30** preferably consists of a multiple plate rectifier of the metallic type. Such rectifier is not a pure rectifier, but has internal resistance which prevents leakback. Rectifiers of this type are currently available.

Referring now to FIG. 4 of the drawings, in which another preferred form of ignition system is illustrated, the blocker or suppressor **30** there shown is the same as that referred to in connection with FIG. 3, but is shown as shunted across the breaker points **20** and **21**.

When the suppressor or blocker **30** is employed as shown in FIGS. 3 and 4, the oscilloscope trace pattern as illustrated in FIG. 5 is obtained. It will be noted upon comparison with FIG. 2 that the plug spark between *a'* and *b'* seems to be a different shape with a tendency to rise, and with an absence of the multiple tracings which appear between *a* and *b* on FIG. 2. The spark discharge from *a'* to *b'* is followed by a more rapid reduction from *b'* to *c'* of the residual voltage.

It will be noted that because of the short suppression time of the residual voltage, the open point time of the ignition points can be reduced thus permitting more frequent firing than has heretofore been possible.

The clean spark obtained as shown between *a'* and *b'* is believed to contribute to the extension of the effective life of the ignition points **20** and **21** and extension of the effective life of the spark plugs **27**.

Smoother operation of the engine has also been noted in use.

I claim:

In an ignition system for internal combustion engines, an induction coil having a primary circuit including a primary winding and a secondary circuit, a distributor connected to the secondary circuit of the coil, a spark plug to which said distributor is connected, a source of direct current electrical energy, connections from the terminals of the primary circuit to said source, one of said connections having an interrupter interposed therein, a condenser connected across said interrupter, and means

connected across said primary winding for suppressing voltages of radio frequency generated in said primary winding, said means comprising a multiple plate rectifier having internal resistance and having its negative terminal connected to the positive terminal of the source.

References Cited in the file of this patent

UNITED STATES PATENTS

1,904,149	Leonard	Apr. 18, 1933
2,382,808	Ochsenbein	Aug. 14, 1945
3,007,082	Kappele	Oct. 31, 1961