March 20, 1962 A. A. RICHARDSON 3,026,451

IGNITION DEVICE

Filed Jan. 28, 1960

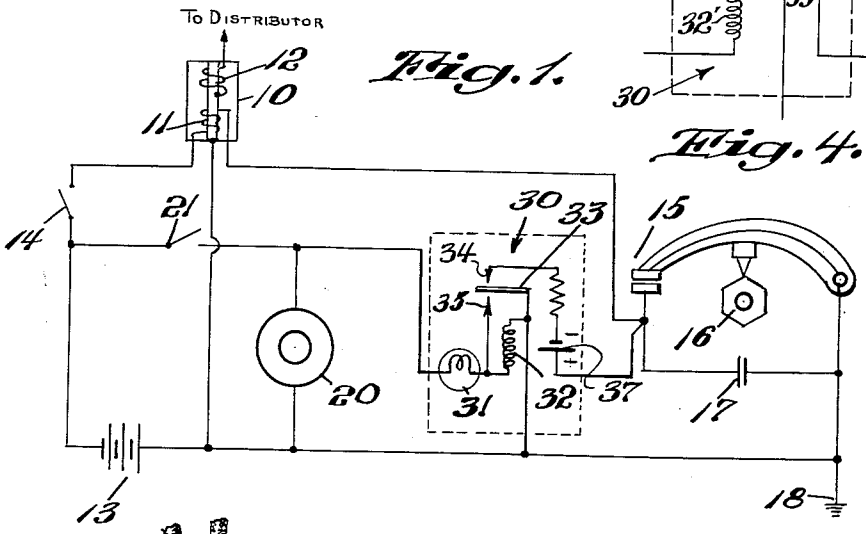


Fig. 1.

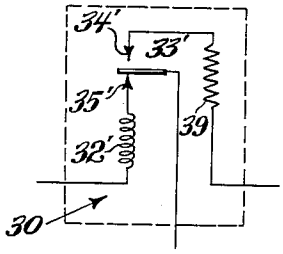


Fig. 4.

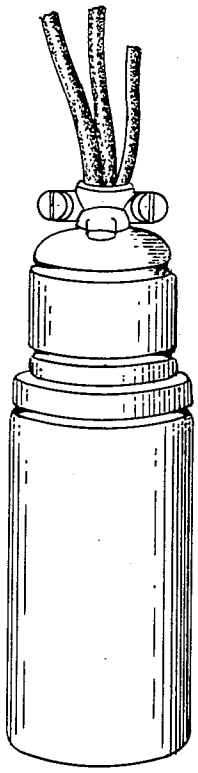


Fig. 2.

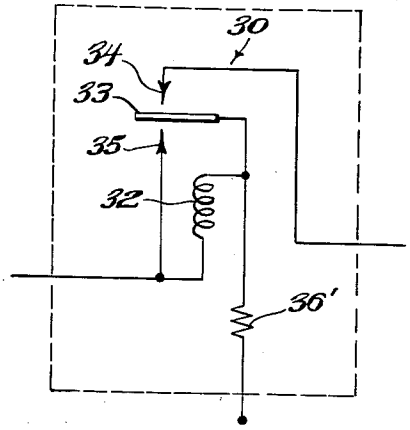


Fig. 3.

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IGNITION DEVICE

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3 Claims. (Cl. 315—172)

This invention relates to an ignition device to which may be wired into the standard automotive and the like ignition system and more particularly to a device which will increase the spark given to any one plug during the ignition cycle.

It is an object of the invention to provide a device which will increase the ability of an internal combustion engine to ignite.

Another object of the invention is to provide a plurality of electrical sparks near the top of a compression stroke of an internal combustion engine.

A still further object of the invention is to provide a relatively simple device which will operate on both six and twelve volt ignition systems without having any modifications made therein to provide the result of a multiple spark.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the drawings:

FIGURE 1 is a wiring diagram of an automotive ignition system in which the device of the invention has been inserted;

FIGURE 2 is a perspective view of the device in its case; and

FIGURE 3 is another modified circuit for the device of the invention.

FIGURE 4 is another modified circuit for the device of the invention.

The most common form of ignition system in use today is the high-tension coil and battery system. In this particular system, a high-tension coil designated **10** on the drawing is made up of a primary and a secondary winding. The primary winding **11** is supplied with current from a battery **13**, one side of the battery being connected to the coil through the usual ignition switch **14** and the other side of the battery being connected to the coil **11** through a set of breaker points **15**. With the breaker points **15** closed, it will be apparent that current is allowed to flow through the primary coil **11**. At the proper moment in the ignition cycle, the points **15** are opened by a cam **16** and the current flow will stop. When the current flow is stopped by the opening of the points **15**, the magnetic field collapses, and the resulting rapid motion of the magnetic lines of force created around the coils **11** and **12** generates a high voltage in the secondary coil **12** which is then led to a spark plug through the usual distributor or rotary switch (not shown) which in turn routes the voltage to the proper spark plug. As is well known in the art, a capacitor **17** is provided which is connected directly across the points **15** and which effectively absorbs current which would otherwise arc across the points **15**.

Also shown in the drawing is an electric starting motor **20** which is used to supply torque to the internal combustion engine to aid in the starting process. The starting motor is momentarily connected across the battery **13** through a switch device **21** which may be termed a starting switch. It will be understood, of course, that in practice the starting switch **21** is normally supplemented by a starting solenoid which is generally mounted directly on the starting motor to keep short leads between the battery and the starting motor due to the high current that is drawn. Thus, from a remote station some distance away, the switch **21** may be closed.

In the block enclosed by dotted lines, there is shown the device of the invention which consists of a vibrator generally designated **30**, a current limiting device **31**, a resistor **36** and a battery **37**. The vibrator **30** is made up of a coil **32**, a vibrating reed **33**, and a pair of contact points **34** and **35**. As will be known to those skilled in the art, the reed **33** is mounted spaced from the points **34**, **35** in a neutral position and in the magnetic field of the coil **32** so that it may be made to vibrate alternately between the contact points **34** and **35**, thus in effect alternately making and breaking said contacts. In the arrangement illustrated in FIGURE 1, I connect this coil **32** through the current limiting device **31**, which in effect is a negative resistance device herein shown as a lamp bulb, to one terminal of the starting motor **20** and I connect the other lead of the coil **32** to the reed **33**. Reed **33** is in turn connected to the other lead of the starting motor (ground) and contact **34** is connected through a low ohmic resistance **36** and battery **37** to the breaker points **15** and the primary of coil **10**. Thus the vibrator device **30** will not be energized until the starting motor is energized. Now when the starting switch **21** is closed, the vibrator will go into action and alternately make and break the contacts **34**, **35**. Thus, if the coil of the vibrator **32** is connected across a source of voltage such as the battery **13**, the reed **33** will be first pulled toward contact **35** which shorts the coil **32**, the reed being released and springing to close against contact **35** which closes circuit in parallel with points **15**. The spring mounting of the reed accomplishes this result and magnetic force pulls it back into contact with contact **35** and the cycle repeats at a frequency of something on the order of 100 cycles per second.

If the breaker points **15** are closed and the starting switch **21** is then closed thereby energizing the vibrator **30**, there will in effect be a short circuit across the battery **13**. To prevent this, resistance **36** of low ohmic value, below 5 ohms, is inserted in the series circuit through vibrator **30**. Assuming now that the vibrator is operating, there will be a plurality of magnetic field collapses once the breaker points close which will give a plurality of high voltage generations of rather rapid succession, the rapidity, of course, depending upon the frequency with which the reed **33** vibrates. Accordingly, instead of a single field collapse upon opening of breaker **15** and the spark plug receiving just one spark per breaker point break, there will be received at that spark plug a plurality of sparks in rapid succession. Thus with the reed **33** alternately connecting and disconnecting the primary of the ignition coil across the battery **13** thru contact **34**, the vibrator acts like a high frequency breaker. Accordingly, it will be apparent that should there be any fouling of the spark plugs or moisture at the points of the plug, the rapidity of the sparks being impressed thereon will rapidly break down this condition and will, of course, aid in the ignition of the compressed gas in the cylinder, thus practically insuring ignition on every compression stroke.

Battery **37** has been inserted in the circuit in a voltage aiding position with respect to primary winding **11**. In this position a higher primary voltage and consequent higher secondary voltage will result. This is particularly effective since under severe starting conditions primary battery voltage drops about 2 volts. To this end battery **37** has been found useful and may be on the order of 1.5 volts which will insure full primary voltage being applied to primary winding **11**.

It might here be pointed out that the current limiting device **31** has been inserted in the circuit more from a protective measure standpoint than from any other. As with any electrical device, the device is usually designed to operate at a certain current rating. To this end, there-

fore, the current limiting device **31** limits the current in the coil **32** of the vibrator to the proper level or at least within limits thereof. The unit enclosed in dotted lines may be connected either to 6- or 12-volt starting systems with no danger of burning out of the coil **32** of the vibrator **30** inasmuch as the current limiting device **31** is of the negative resistance variety in which with higher currents more resistance is inserted in the circuit, thus effectively lowering the output current of the device.

In FIGURE 3, there is shown a modification of the device of the invention which modification utilizes the vibrator **30** with its actuating coil **32**, contacts **34**, **35** and vibrating reed **33**. In this case, however, a low ohmic resistance **36'**, on the order of less than five ohms and preferably on the order of one or two ohms, is inserted in the vibrating reed leg and in this position will prevent any short circuits from occurring if perchance a circuit is made through the vibrator contacts when the breaker points **15** are closed. Additionally, in this position resistance **36'** serves to some degree as a current limiting device since it is also in series with the coil **32** of the vibrator **30** and permits the vibrator to operate on a number of voltages quite successfully. In this case as in the case of the embodiment of FIGURE 1, the same results are secured in the operation thereof with the exception that there is no battery boost present but in all other respects the device is identical in operation.

In FIGURE 4 there is shown a still further modification of the device of the invention, which modification utilizes a vibrator **30'** that has an actuating coil **32'**, contacts **34'**, **35'** and a vibrating reed **33'**. In this case, however, the vibrator **30'** is shown as embodying a different circuit than that shown in connection with the embodiments of FIGURES 1 and 3. To this end, the reed **33'** is normally engaged with the contact **35'** and is pulled away therefrom when coil **32'** is energized, the spring action of reed **33'** reclosing the circuit. With this type of a vibrator, assuming that the coil **32'** is defined for a mid-voltage range of say 9 volts, the device will operate on both 6 and 12 volt battery ignition systems. To prevent short circuits from occurring and also in an effort to reduce the current output of the device to

a lower level, a resistor **39** is inserted in series with contact **34'**, which resistance **39** should be of a low ohmic value on the order of less than five ohms and preferably in the range of one to two ohms. Basically, the resistance **39** functions in the same fashion as resistance **36** functions in the previous embodiment.

I claim:

1. In a high tension coil breaker point and battery system for an internal combustion engine having a starting motor and switch therefor in which the primary of the high tension coil, the breaker points, and the battery are connected in series, a vibratory contact device, the output of said device being in parallel with said breaking points, the vibratory contact device having a coil which is connected on the load side of a starting switch and to the electrical return of the battery system so that the vibratory contact device is actuated only upon the closing of the starting switch, a resistance in series with said device, said device having a frequency of oscillation rate greater than 50 cycles per second.

2. In a high tension coil breaker point and battery ignition system in which the primary of the high tension coil, the breaker points and the battery are connected in series, a vibratory contact device having an actuating coil and a set of contact points, said actuating coil connected in parallel with a starting device so that said vibratory contact device is actuated only upon the closing of a starting switch, the contact points of the vibratory device being in parallel with the breaker points, a battery connected in series with said contact points and said primary in boosting relationship, said vibratory contact device having a frequency of oscillation greater than 50 cycles per second.

3. A device as in claim 2 wherein a resistance is inserted in series with the actuating coil of said vibratory device.

References Cited in the file of this patent

UNITED STATES PATENTS

858,928	Varley	July 2, 1907
2,412,540	Sellaro	Dec. 10, 1946
2,554,720	Sebesta	May 29, 1951