Jan. 10, 1956 P. S. JERNIGAN 2,730,582

IGNITION SYSTEMS

Filed Sept. 10, 1951 3 Sheets-Sheet 1

Fig. 1

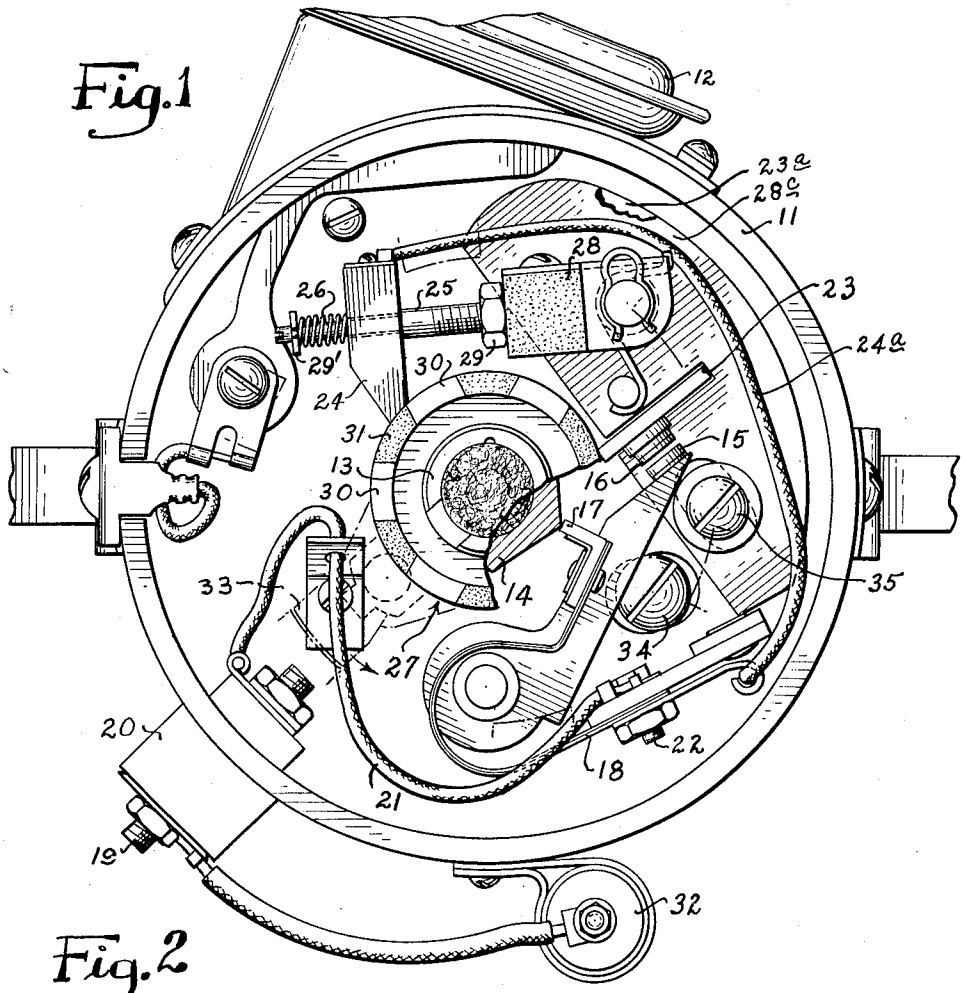


Fig. 2

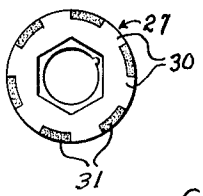


Fig. 3

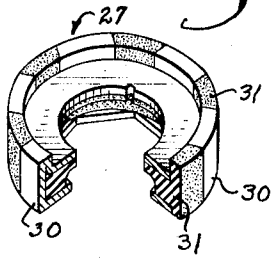
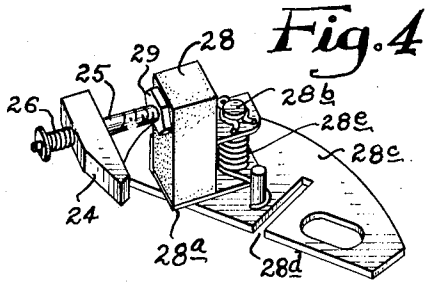


Fig. 4



INVENTOR.
Paul S. Jernigan
BY
Wayland D. Keith
Agent

Jan. 10, 1956 P. S. JERNIGAN 2,730,582

IGNITION SYSTEMS

Filed Sept. 10, 1951 3 Sheets-Sheet 2

Fig. 5

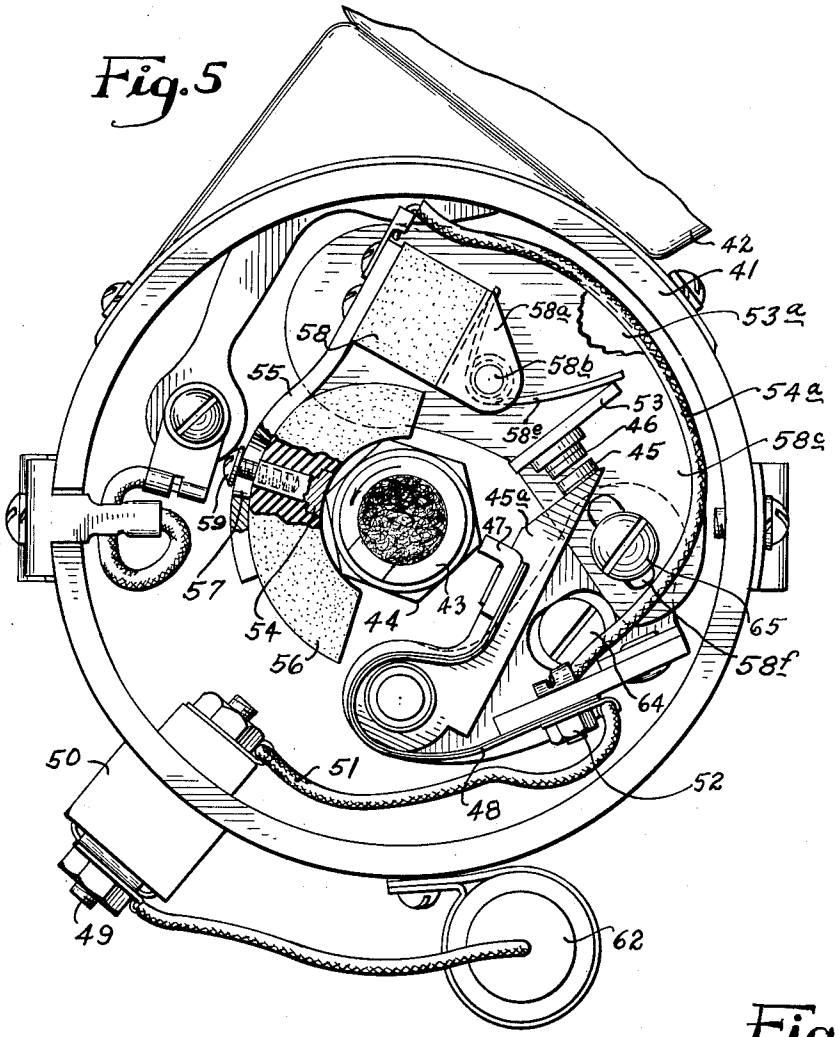


Fig. 6

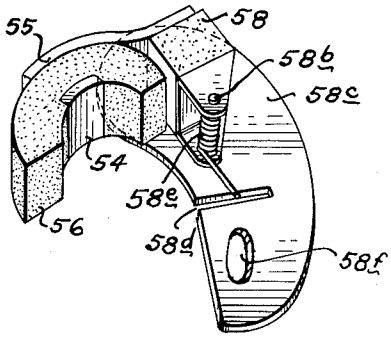
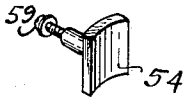


Fig. 7



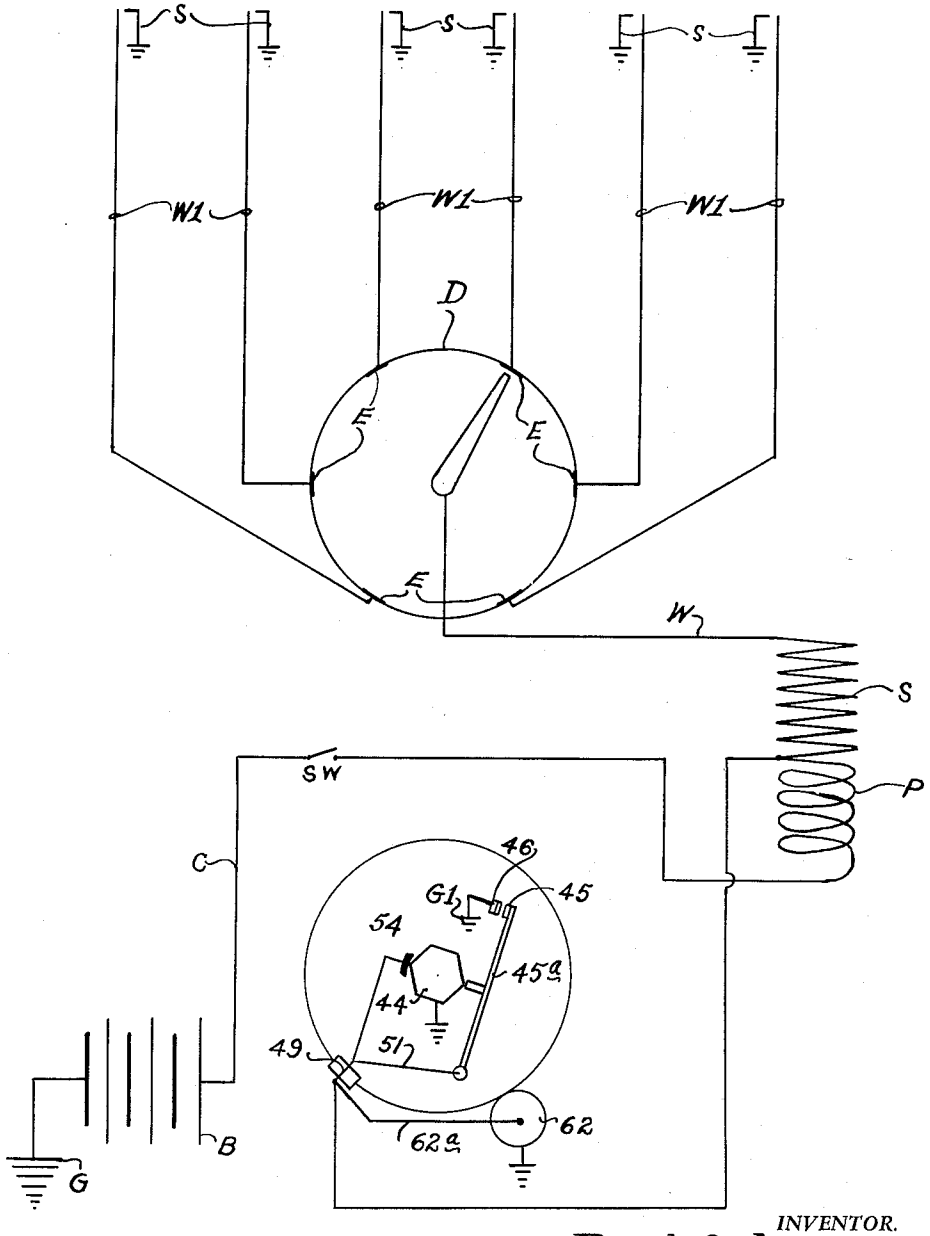
INVENTOR.
Paul S. Jernigan
BY
Wayland D. Keith
Agent

Jan. 10, 1956 P. S. JERNIGAN 2,730,582

IGNITION SYSTEMS

Filed Sept. 10, 1951 3 Sheets-Sheet 3

Fig. 8



INVENTOR.
Paul S. Jernigan
BY
Wayland D. Keith
HIS AGENT.

United States Patent Office 2,730,582 Patented Jan. 10, 1956

2,730,582

IGNITION SYSTEMS

Paul S. Jernigan, Wichita Falls, Tex.

Application September 10, 1951, Serial No. 245,843

3 Claims. (Cl. 200—22)

This invention relates to improvements in the electrical system of the distributor of internal combustion engines and more particularly to lengthening the dwell or ground period of the primary circuit of the high tension coil, so as to more thoroughly saturate the core of the coil with magnetism to cause the secondary winding of the coil to be more thoroughly magnetized and the condenser to be more thoroughly saturated with electrical energy which will be discharged at the proper time to more highly intensify the spark across the spark gap within the cylinder of an internal combustion engine, which is desirable in engines of the so-called high compression type.

The invention is to be used in conjunction with the electrical system of an internal combustion engine having a high tension ignition coil which has primary and secondary electrical circuits, a condenser, and a distributor with breaker points.

Heretofore, internal combustion engines had the points of the electrical system closed approximately the same length of time they were open, therefore, when an engine was running at high speed the coil and condenser did not have time to store up sufficient electrical energy to give a spark of the desired intensity as to ignite the fuel quickly enough to get the full efficiency of the fuel.

An object of this invention is to provide a distributor for an internal combustion engine whereby the primary circuit of the electrical system is grounded a major portion of the cycle so as to store up a greater amount of electrical energy to provide for a higher voltage spark when the circuit is opened.

Another object of the invention is to provide a supplementary ground for the primary circuit of the ignition system of an internal combustion engine that may be adjusted at the same time the points are adjusted, or it may be adjusted independently of the points.

Yet another object of this invention is to provide a ground brush for the high tension electrical ignition system of an internal combustion engine which grounds the circuit before the points of the ignition system close and which ground brush is not grounded at the time the points open.

Another object of this invention is to provide, for the ignition system of a high compression internal combustion engine, more voltage to jump the spark plug gaps, thereby increasing the efficiency of the ignition and to prevent failure thereof.

Still another object of this invention is to provide, in the ignition system of an internal combustion engine, means for increasing the amount of dwell of the points, thus increasing the amount of electrical energy that may be stored for the spark plug gaps.

An embodiment of this invention, together with a modification thereof are illustrated in the accompanying drawings, in which:

Fig. 1 is a top plan view of the ignition distributor having the cover removed, and showing the invention

installed thereon, with parts broken away and shown in section to bring out the details of construction;

Fig. 2 is a bottom plan view of a rotor element that is fitted on the distributor shaft of the form of the invention as shown in Fig. 1;

Fig. 3 is a perspective view taken from the top and a side of the rotor element, with parts broken away and shown in section, of the form of the invention as shown in Fig. 1;

Fig. 4 is a perspective view of the ground brush and mounting assembly of the form of the invention as shown in Fig. 1;

Fig. 5 is a top plan view of an ignition distributor with the cover removed, and showing the modified form of the invention installed thereon, with parts broken away and shown in section to illustrate the details of the construction;

Fig. 6 is a perspective view of the ground brush and mounting assembly removed from the distributor;

Fig. 7 is a perspective view of the contact point of the ground brush removed from the insulation member, and

Fig. 8 is a diagrammatic view of an ignition system of an internal combustion engine in which the invention is applied.

In the following detailed description, like reference characters refer to like parts in all views of the drawing.

With more detailed reference to the drawing, the numeral **11** designates an ignition distributor housing of the conventional type which has automatic spark advance mechanism **12** secured to a side thereof. The distributor has an axial shaft **13** rising upwardly therethrough, the upper portion of which shaft is rounded and has a polygonal shaped cam element **14** formed on said shaft which is usually integral therewith, and which has the same number of points or lobes as there are cylinders of the internal combustion engine on which it is used, which in the present instance, is hexagonal. Ignition points **15** and **16** are provided in the distributor. The point **15** has an insulated cam follower **17** for riding on cam **14** to open the points **15—16**. A spring **18** is provided to urge the points **15—16** together when the cam follower **17** is not on a lobe of the cam.

A terminal post **19** is provided to which a source of primary, low voltage electricity is connected. The terminal post is insulated from housing **11** by insulation member **20** and has an electrical conduit **21** leading from the inner end of the terminal post **19** to terminal post **22** for connection therewith so as to form an electrical circuit to point **15**, but which is insulated from the distributor housing **11**. The point **16** is mounted on upstanding member **23** that is grounded to the distributor housing **11**. These points **15—16** are usually adjusted to open approximately .020 of an inch for the best performance under ordinary operating conditions, however, this does not give sufficient grounding of the primary circuit to fully saturate the iron core of the coil with electrical energy so it will be fully energized when the contact between points **15—16** is broken.

However, with the present arrangement, an additional contact member in the form of a brush **24** is mounted on a stem **25**, which brush **24** is spring pressed by a spring **26** toward a rotor element **27**. The stem **25** is screw threaded at the inner end into an insulation member **28**. The stem **25** is held in adjusted position by a lock nut **29** and is shouldered intermediate the brush **24** and the insulation member **28** so the inward movement of the brush will be limited.

The outer end of the stem **25** preferably has a screwdriver slot to enable the turning of the stem for the adjustment thereof. Adjacent the outer end of the stem

and secured thereto is a washer 29' to retain the spring 26 under compression to urge brush 24 against rotor 27. The brush 24 is insulated from the distributor housing 11 by insulation member 28 and is connected in parallel with an electrical conductor 24*a* to point member 15 so that the electricity from the primary circuit will flow to both the point 15 and to the brush 24 simultaneously. The rotor generally designated at 27, is composed of an equal number of electrical contact segments 30 and insulating segments 31 of equal length, and the contact segments 30 are spaced in timed relation with respect to the polygonal opening formed in the bottom of the rotor element 27, which opening interengages with the cam elements to open and close the contact points 15—16, so when the brush 24 is just making contact with one of the electrical contact segments 30, the points 15—16 have opened the maximum opening, which is usually .010 of an inch, therefore, the primary circuit will be grounded by the brush 24 and segment 30, through approximately 45 degrees during which time the primary winding of the coil is electrically energized, which gives sufficient time to thoroughly saturate the magnet within the coil temporarily. The rotor 27 has now rotated until the brush 24 is on fibre insulation member 31, whereupon the points 15—16 are opened thereby breaking the primary circuit which will cause electrical energy stored within condenser 32 to discharge through the high tension secondary winding of the coil through the distributor rotor 33 through the high tension circuit to the spark gap of one cylinder of the internal combustion engine.

The form of the invention as shown in Figs. 1 through 4, has the brush member 24 mounted on a fibre or insulated member 28, which insulation member 28 is secured to a base plate 28*a* which is pivotally mounted on post 28*b* secured to plate 28*c*. A torsion spring 28*e* is positioned around post 28*b* and is connected with the base plate 28*a* so as to urge the brush 24 inward. The plate 28*c* has a slot 28*d* therein which interfits in tight fitting relation with upstanding portion 23 on which point 16 is mounted, and since the upstanding portion 23 is mounted on an underlying plate 23*a* which may be adjusted to adjust the points 15—16, brush 24 may be simultaneously adjusted with the points 15—16 by a cam screw 34. After the cam has been adjusted a screw 35 may be tightened to hold the plates 28*c* and 23*a* in adjusted position.

The brush 24 may be adjusted independently by turning the screw threaded stem 25, which has a screwdriver slot in one end, until the brush is properly positioned, whereupon, nut 29 is utilized to lock stem 25 in adjusted position.

A diagrammatic view of the electrical ignition system is shown in Fig. 8, wherein the letter G designates the battery ground, B the battery, C the cable leading to and through switch SW. P and S designate the primary and secondary coil windings, respectively, with G1 designating the ground therefor. A secondary wire W leads to distributor rotor 63 in distributor cap D. Electrodes E in the distributor cap have wires W1 leading to spark plugs S. A wire 62*a* leads to the condenser.

Operation

In the operation of internal combustion engines of the high compression type, the compression ratio is often so high that the voltage required to jump the spark gap in the cylinder is in excess of 20,000 volts. The conventional coil is capable of producing such voltage across the spark gap, but only if the primary circuit is grounded a sufficient length of time to permit complete saturation of the magnetic core of the coil, temporarily, prior to the opening of the points.

With the distributor shaft 13 rotating in the direction indicated by the arrow, in Fig. 1, a lobe of the cam 14 will cause cam follower 17 to open point 15 with respect to point 16. After the points 15—16 have opened, the rotor 27 will move until brush 24 is grounded on one of the metal segments 30 of the rotor 27 and will continue to be grounded throughout the length of the segment of the rotor or approximately 30 degrees plus the width of the face of the brush 54, which may be of any desired width, but is usually 10 to 15 degrees. However, as the distributor shaft 13, rotor 27 and cam 14 rotate, the follower 17 moves off a lobe of the cam 14, which closes the points 15—16. While these points 15—16 are closed, the rotor 27 rotates until insulation element 31 is beneath brush 24, whereupon, a lobe of the cam 14 rotates beneath cam follower 17 to cause points 15—16 to open so as to cause an interruption in the primary circuit to cause the condenser 32 and secondary winding of the coil to discharge a high voltage spark across the spark gap of the particular cylinder, which is determined by the distributor rotor 33 mounted on distributor shaft 13.

It is to be pointed out that in modern engine design, the increase in the number of cylinders and the rapidity with which the contact points make contact and break contact, the full efficiency of the coil is impaired unless the points are grounded a sufficient length of time to permit the building up of an electrical charge in the condenser which discharges into the secondary winding. Since the present arrangement makes it possible to ground the points through an arc of travel of 50 to 55 degrees of the distributor rotor, in a six cylinder engine, and up to 40 degrees travel of the rotor of an eight cylinder engine, a greater percentage of the time permitted for the electrical charge to build up than in the arrangements now in general use, whereby the points make contact and break contact by the lobe of the cam 14 acting on the cam follower 17.

Modification of the invention

The modified form of the invention, as shown in Figs. 5 through 7, gives the same results as the form of the invention as described above, but in a somewhat different manner. The distributor housing 41 has an automatic governor control 42 mounted thereon and has an axially positioned distributor shaft 43 within housing 41, which has a cam 44 secured thereto or made integral therewith.

The distributor has conventional points 45 and 46 mounted thereon, and the point 45 is mounted on a rocker arm 45*a*, which rocker arm has a cam follower 47 mounted thereon for engaging the lobes of the cam 44 for opening and closing point 45 with respect to point 46. The rocker arm 45*a* has a spring 48 attached thereto and to an insulation member or portion of the housing 41 so as to urge the cam follower 47 against the lobe of cam 44, as will best be seen in Fig. 5. A terminal post 49 is provided which post is insulated from the distributor housing 41 by an insulation block 50 so as to conduct primary electrical energy therethrough and through electrical conductor 51 which connects with spring 48 by means of a screw bolt 52 and since the spring 48 is in contact relation with rocker arm 45*a* and point 45, but is insulated from the housing 41 and from the distributor shaft 43 and cam 44 respectively, the electrical energy will be forced to flow through points 45 and 46 to the ground plate 53*a* or through the electrical conductor 54*a* to brush 54 through brush holder 55. The brush holder 55 is mounted on an insulation member 58, which insulation member is pivotally mounted on hinge member 58*a* for hinging about an upright post 58*b* that is mounted on a base plate 58*c*. The plate 58*c* has a notch 58*d* therein and is superposed on plate 53*a* so that projection 53 on plate 53*a* will protrude up through notch 58*d* and be movable with plate 53*a* upon movement of the adjacent cam screw member 64. The plate 53*a* and the plate 58*c* are mounted on a plate within the distributor and are held in binding relation thereto by means of a screw 65 that passes through slot 58*f* so as to permit adjustment of point 46 with respect to point 45. Simultaneously with the adjustment of plate 53*a*, plate 58*c* will be moved to give coordinated adjustment of the brush 54 with respect to

point 46. A torsion spring 58e is provided to urge contact brush 54 against a lobe of the cam 44. The contact brush 54 is mounted within an arcuate fibre insulation member 56 that has a semi-circular concave opening on the inner side so as to circumscribe three lobes of the cam 44 when one of the lobes of the cam is in contact with contact brush 54. The outer portion of fibre insulation member 56 is arcuate to conform to an arcuate portion of brush holder. The brush holder 55 has an elongated slot 57 therein through which a screw 59 passes so as to bindingly engage the fibre insulation member 56 with the brush holder 55, which enables screw 59 to be adjusted within slot 57 to give independent adjustment of the contact brush 54 with respect to the position of the lobe of the cam 44. As shown in Fig. 7, the contact brush 54 may be made removable for replacement when necessary. Contact brush 54 may be made any desired arcuate length, depending on how long a time it is desired to have the circuit thru the contact closed.

A distributor rotor (not shown) similar to the rotor 33 in Fig. 1, will be positioned on the upper end of the distributor shaft 43 for directing the electrical current to the particular electrodes in the distributor cap (not shown) as desired. In the present instance a six lobe cam is shown, which would indicate use with a six cylinder internal combustion engine.

The advantage of maintaining the primary circuit closed longer has been pointed out above, and need not be again recited here, as this form of the invention is applicable in so far as operation is concerned, to the form of the invention described above.

Having thus described the invention what is claimed is:

1. In an auxiliary grounding brush for an ignition distributor having breaker points and a mounting for mounting the auxiliary grounding brush, a brush holder arm pivotally mounted on said mounting and insulated therefrom, said arm extending outward therefrom and carrying an insulation block thereon, which block has a concave cylindrical surface thereon which surface is adapted to cooperate with the cam of said distributor so at least two lobes of said cam will be in contact with said concave cylindrical surface of said insulating block at all times, a ground brush mounted on said insulation block and having a cylindrical surface thereof in common with the inner cylindrical surface of said insulating block, means connecting said brush with a source of electricity supplying electricity to said breaker points, said brush being adjustable circumferentially so as to contact with a lobe of said cam for a predetermined time before the closing of the points of said distributor, and resilient means for urging said insulation block and said auxiliary brush into contact relation with the lobes of said cam.

2. In an auxiliary grounding brush for an ignition distributor having breaker points and a mounting for mounting the auxiliary grounding brush, a brush holder arm having a concave face, which arm is pivotally mounted on said mounting and insulated therefrom, an elongated slot formed in said arm, said brush holder arm extending from said mounting and having an insulation block mounted thereon by means of an adjustment screw passing through said slot, said block having a convex outer surface complementary with said concave face of said arm, a concave cylindrical surface formed in said block, which surface is adapted to cooperate with the cam of said distributor so at least two lobes of said cam will be in contact with said concave cylindrical surface of said insulating block at all times, a ground brush mounted on said insulation block and having a concave, cylindrical surface thereof in common with the inner cylindrical surface of said insulating block, means connecting said brush with a source of electricity supplying electricity to said breaker points, said brush being adjustable circumferentially so as to contact with a lobe of said cam for a predetermined time before the closing of the points of said distributor, and resilient means for urging said insulation block and said auxiliary brush into contact relation with the lobes of said cam.

3. An auxiliary grounding brush assembly for an ignition distributor having a cam, breaker points, and a mounting for mounting said auxiliary grounding brush assembly, said auxiliary grounding brush assembly having a base plate, a brush holder arm pivotally mounted on said base plate being insulated therefrom, said arm extending outward therefrom and carrying an insulation block thereon, which block has a concave cylindrical surface thereon which surface is adjustable with respect to said cam of said distributor, said concave cylindrical surface of said block being in contact with at least two lobes of said cam at all times, a ground brush mounted on said insulation block and having a concave cylindrical surface thereof in common with the inner cylindrical surface of said insulating block, means connecting said brush with a source of electricity supplying electricity to said breaker points, said brush being adjustable circumferentially so as to contact with a lobe of said cam for a predetermined time before the closing of the points of said distributor, and resilient means for urging said insulation block and said auxiliary brush into contact relation with the lobes of said cam.

References Cited in the file of this patent

UNITED STATES PATENTS

1,183,196	Heany	May 16, 1916
1,257,784	Beirns	Feb. 26, 1918
2,124,528	Kongsted	July 26, 1938