United States Patent [19]

Bednarz

[11] **3,751,610**

[45] **Aug. 7, 1973**

[54] **IGNITION DISTRIBUTOR**

[76] Inventor: **Othniel A. Bednarz,** 1340 Northwood Dr., Inkster, Mich. 48141

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[21] Appl. No.: **253,976**

[52] **U.S. Cl.** .... **200/19 R,** 123/146.5 A, 123/148 E, 200/80 R

[51] **Int. Cl.** **H01h 19/12**

[58] **Field of Search** ..... 123/146.5 A, 148 E; 200/27 A, 19 R, 19 AM, 80 R

[56] **References Cited**

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2,740,006	3/1956	Drugan	200/80 R
2,997,552	8/1961	Silverschotz	200/80 R
3,148,250	8/1964	McAllister	200/80 R

Primary Examiner—Laurence M. Goodridge
Assistant Examiner—Cort Flint
Attorney—Allan J. Murray

[57] **ABSTRACT**

An ignition system for internal combustion engines, incorporating an improved rotor. The rotor is annular in form, and non-conductive. It is formed with slideways extending diametrically from its axis of rotation, and opening downwardly throughout their length. Non-conductive slide elements are received in the slideways, and on their bottom faces carry transmitter plates. The transmitter plates are substantially triangular in form with the wide end of the triangle extending inwardly toward the axis of rotation. On its outer end face, each slide carries a spring. A grounding ring depends from the rotor and encircles the slideways so that the springs bear on the inner peripheral surface of the ring, normally urging the slide elements in toward the axis of rotation. A set screw extends through the ring and the rotor to contact the distributor shaft, and establish electrical contact between ring and shaft.

A brush housing is disposed beneath the rotor, and a brush, socketed in the housing is urged upwardly by a spring to have sliding contact with the bottom faces of the rotor, sliding elements, and transmitter plates, which are co-planar. The brush has electrical communication with the primary winding of a coil, and the necessary, usual electrical circuitry, and a source of electrical current, are present to render the ignition system operable.

Contact of the brush with the transmitter plates closes a circuit to the primary winding of the coil, and the duration of such contact, of course, determines the strength of the spark reaching a spark plug. Obviously, as speed of rotation increases, the duration of contact decreases and the strength of spark is diminished. To compensate for increased speed of rotation, the present invention provides triangularly shaped transmission plates, which, are mounted on, and beneath the slide elements, to slide outwardly as centrifugal force intensifies with speed of rotation. Outward sliding travel disposes a longer path of travel over the transmission plates, due to the diverging lateral edges thereof to compensate in part for the decreased time of such travel to afford a longer build-up of magnetic field in the primary coil and hence a stronger spark.

6 Claims, 13 Drawing Figures

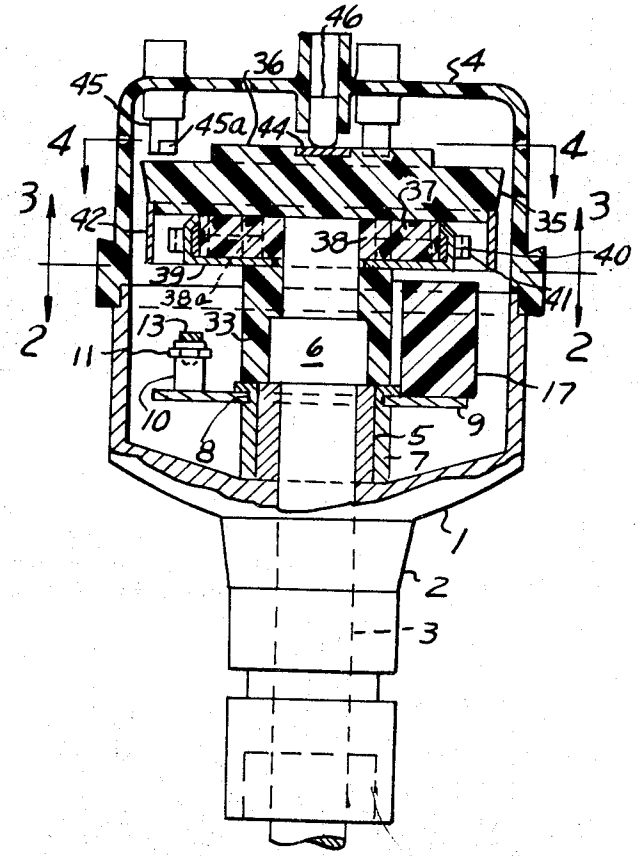


FIG. 2

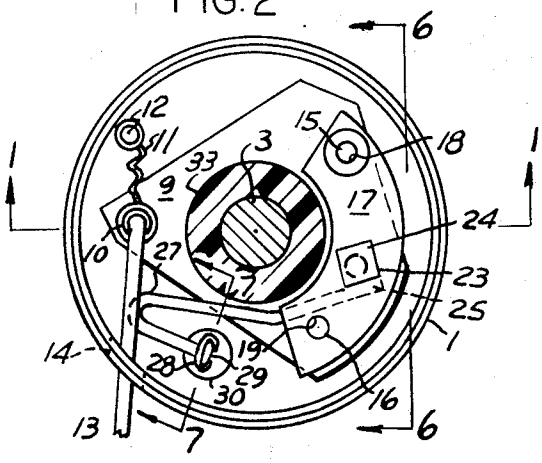
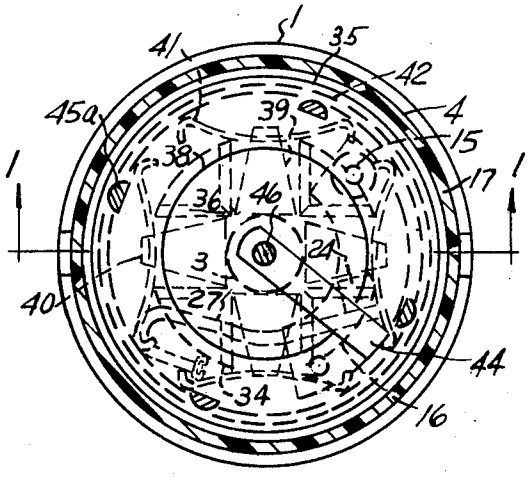


FIG. 4



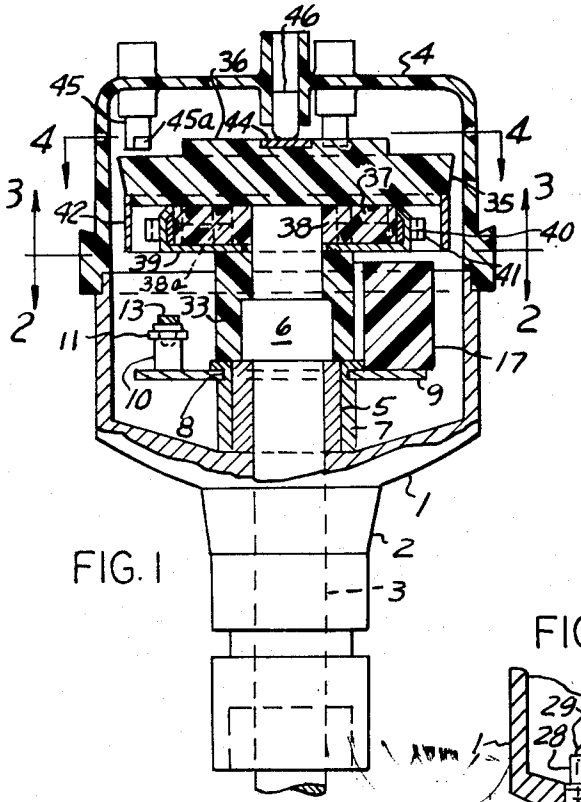


FIG. 1

FIG. 5

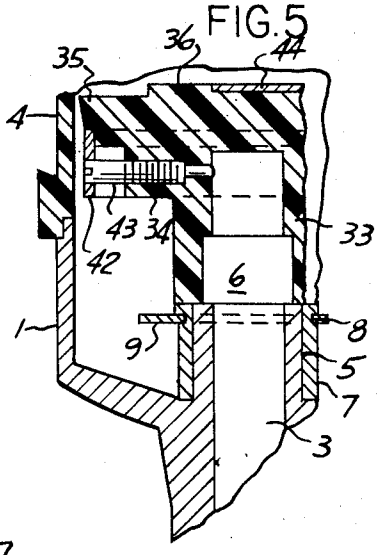


FIG. 7

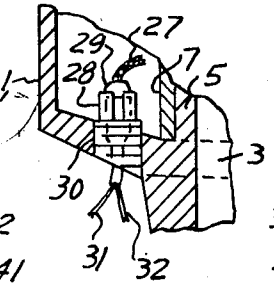


FIG. 3

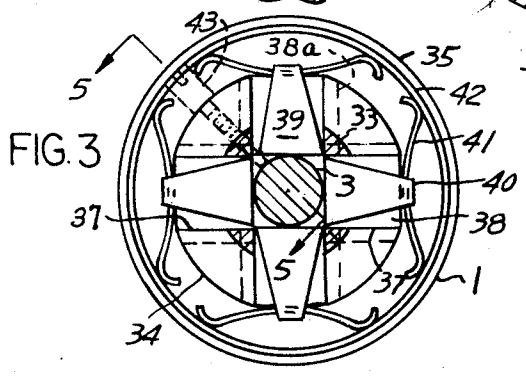


FIG. 6

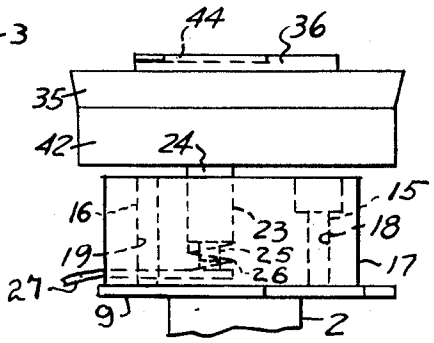


FIG. 8

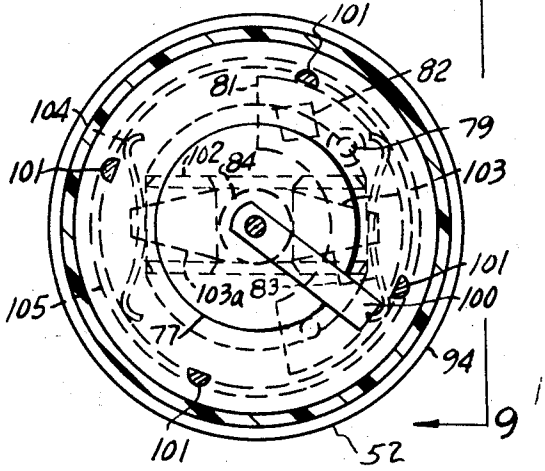


FIG. 9

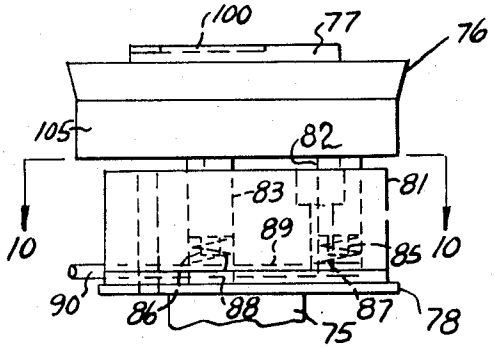


FIG. 11

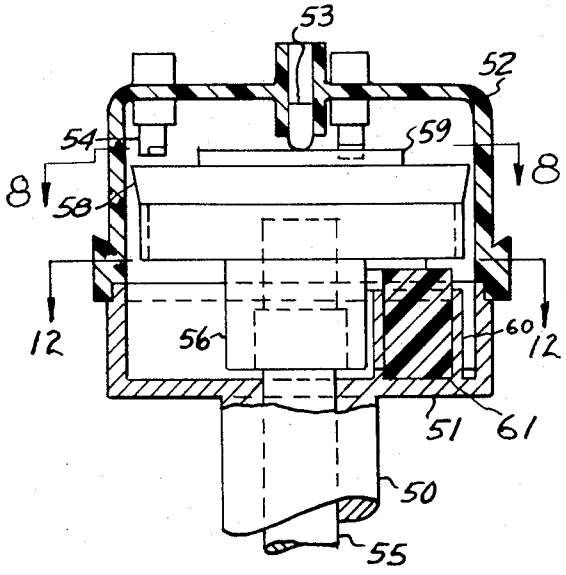


FIG. 10

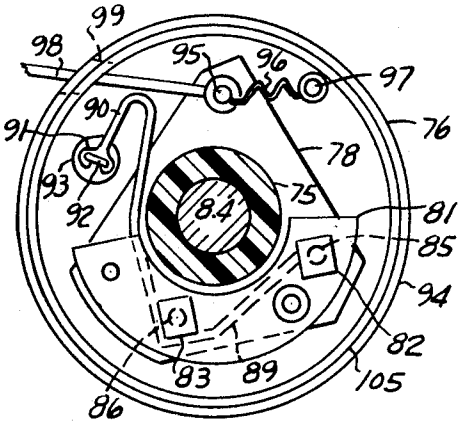


FIG. 13

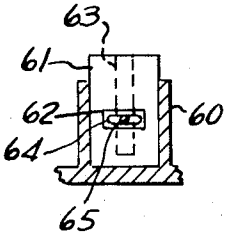
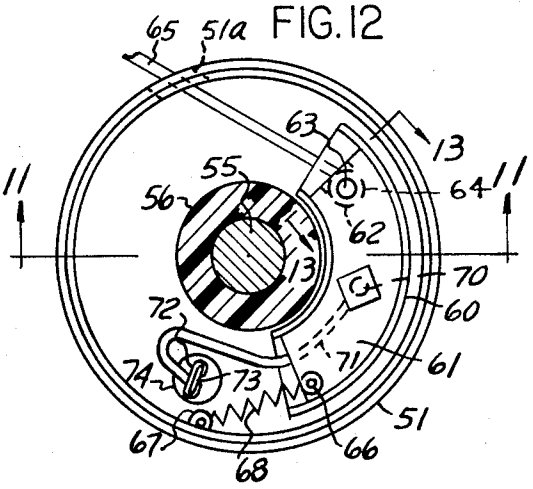


FIG. 12



IGNITION DISTRIBUTOR

FIELD OF INVENTION

The invention lies in the field of improved ignition distributor systems, and particularly such systems as are intended to eliminate the opening and closing "points" which arc, pit, and burn, thus decreasing efficiency and requiring replacement.

DESCRIPTION OF PRIOR ART

There has been some activity in the prior art, as is evidenced by the below identified patents, some of which are intended to eliminate distributor points, but none of which disclose a structure which would appear to preclude issuance of a patent on the present invention.

The said patents are:

Tuggle	3,379,181
Wolrab	3,022,389
Smith	3,342,955
De Rugeris	3,004,115
Robertson	2,830,140

SUMMARY OF INVENTION

Invention resides in the provision of a rotor having slideways, elongated diametrically thereof, with slide elements therein, said rotor and said slide elements being non-conductive, and in provision of transmitter plates beneath said slide elements to engage an upwardly projecting brush, during which engagement current flows through said brush to the primary winding of a coil. The transmitter plates, which are triangular in form, and spring members yieldably resist the tendency of the slide elements to move radially, outwardly responsive to centrifugal force. When the sliding elements and their associated transmitter plates do move outwardly under centrifugal force, the extend of the transmitter plate exposed to contact with the brush is greater, thus presenting a longer path through which the brush sends current to the primary coil as the speed of rotation of the distributor shaft increases. The spring elements on the outer end faces of said sliding elements tend to resist the sliding travel effected by centrifugal force, and when such force lessens, said spring elements urge the sliding elements inwardly to their normal position.

An object of the invention is to provide a means of compensating for decreasing spark strength as the speed of distributor rotation increases.

Another object is to provide an electrically conductive brush and plate so disposed as to increase their length of contact as speed of rotation increases.

A further object is to halve the number of sliding elements, and double the number of brushes engageable by said transmitter plates and thus reduce the number of movable parts required to effectively distribute electrical current in an internal combustion engine.

Still a further object is to form in a circular, nonconductive rotor, a plurality of slideways elongated diametrically of said rotor, and to provide sliding, nonconductive elements in said slideways, and to apply to a surface of said sliding elements a conductive material, and to provide grounding means upon said rotor, and grounding means upon said sliding elements, which latter grounding means serve the dual purpose of both electrical grounding, and of yieldable resisting radially outward displacement of said sliding elements responsive to said centrifugal force.

These and various other objects are attained by the invention hereinafter described and illustrated in the accompanying drawings, wherein:

FIG. 1 is a partial, elevational view in partial section of a distributor casing and cap, with the rotor and sliding elements and brush disclosed in section.

FIG. 2 is a horizontal, sectional view looking downwardly upon the brush housing and brush, taken on line 2—2 of FIG. 1, and omitting the distributor cap.

FIG. 3 is a horizontal, sectional view looking upwardly at the bottom face of the rotor, the sliding elements, the triangularly shaped transmitter plates, and the spring members engaged with the grounding ring, taken on line 3—3 of FIG. 1, and omitting the distributor cap.

FIG. 4 is a horizontal, sectional view taken on line 4—4 of FIG. 1 to show a conductor arm surmounting said rotor, and the disposition of the various electrodes in said distributor cap.

FIG. 5 is a partial, sectional, elevational view on line 5—5 of FIG. 3 illustrating the grounding screw extending from said grounding ring to the distributor shaft.

FIG. 6 is a partial elevational view on line 6—6 of FIG. 2, but omitting the distributor casing for purposes of clarity, to illustrate a brush housing and a spring-loaded conductive brush received therein.

FIG. 7 is a partial, vertical, sectional view on line 7—7 of FIG. 2 to illustrate a double wire leading from said brush, through an insulated screw plug in the wall of the distributor housing, with one wire leading to a coil (not shown) and the other wire leading to a condenser (not shown).

FIG. 8 is a view similar to FIG. 4, illustrating a modification of the device wherein one-half the number (two, in this instance) of slide elements and transmitter plates are employed, and twice the number of brushes are employed, with each transmitter plate contacting both brushes, successively, in each rotation of the rotor.

FIG. 9 is a view similar to FIG. 6, taken on line 9—9 of FIG. 8, and omitting, for clarity, the distributor casing to illustrate a brush carrier with two spring loaded brushes therein.

FIG. 10 is a horizontal, sectional view taken on line 10—10 of FIG. 9, and is similar to FIG. 2, except that it discloses two brushes electrically connected in the brush housing.

FIG. 11 is a partial, elevational view in partial section of a modification of the device, and is similar to FIG. 1, except that the rotor and slide elements are not shown in section.

FIG. 12 is a horizontal, sectional view looking downwardly upon the brush housing and brush, being taken on line 12—12 of FIG. 11, and otherwise being similar to FIG. 2.

FIG. 13 is a partial, vertical, sectional view on line 13—13 of FIG. 12, to illustrate the interconnection of a link arm for the purpose of advancing a spark in the distributor system.

In these views the reference character 1 designates a distributor casing having a downward extension 2 journalling a distributor shaft 3. Surmounting the casing, is a distributor cap 4 which is removably secured by any convenient means (not shown) to the upper end portion of the distributor casing. It should be understood that the ignition includes a coil and condenser (not shown), the coil having the usual primary and second-

ary windings, and further includes (not shown) a source of electrical current, such as a battery, and an alternator or generator.

The distributor illustrated has a concentric, internal, upwardly extending collar **5** upon which rotatably rides a shoulder formed by the increased diameter of a section **6** of the distributor shaft. A tubular sleeve **7** closely encircles said collar and has its upper end portion reduced slightly in diameter as at **8**, to receive a conventional "breaker plate" **9**. Said breaker plate normally carries points, which open and close in the conventional manner, and is provided with a post **10** from which a spring **11** extends to a pin **12**, or the like, secured to the interior of the distributor casing. A lever **13** engages said post **10** and extends outwardly through a slot **14** in the wall of the distributor casing to a vacuum advance device, or the like, whereby the breaker plate **9** may be rotated slightly about the axis of rotation of the distributor shaft to "advance the spark" in a conventional manner. The breaker plate further has posts **15** and **16** and it is proposed in this version of the invention to utilize said posts. An arcuately formed brush housing **17** is formed with a hole **18** which receives a pin **15**, and a second hole **19** to receive the pin **16**.

The brush housing, as shown in FIGS. **2**, **4**, and **6**, is formed with a square socket **23** to receive a brush **24**. The lower end portion of said brush may be formed with a circular protruding stud **25** to be encircled by a coil spring **26**. The coil spring bottoms in the socket **23** and urges the brush upwardly into contact with transmitter plates as hereinafter described. A "pigtail" **27** terminates in a female clip **28**, which engages a male clip **29**. The latter clip is set in a non-conductive, threaded plug **30**, which, as shown in FIG. **7**, is received in the bottom wall of the distributor casing. Two conductors **31** and **32** emerge from said plug, one such conductor going to a condenser (not shown) and the other to the primary side of said coil.

A rotor has a lower portion **33** fitted upon the upper portion of the distributor shaft, and has an enlarged circular boss **34** surmounted by a circular head **35** and upwardly terminates in a circular platform **36**. The rotor is keyed, or otherwise releasably secured to the distributor shaft for rotation therewith, and is formed of non-conductive material.

The circular boss **34** is formed with two or more radially extending slideways **37**. Each slideway is downwardly opening and receives a slide member **38** of non-conductive material. The slides are formed with shoulders **38a**, to resist downward escape from the slideways. Each slide member carries a transmitter plate **39**, of conductive material having its lateral edges diverging uniformaly inwardly, in the direction of the distributor shaft, as is clearly seen in FIGS. **3** and **4**. A flange **40** extends upwardly over the outer end face of each slide member **38**, and retains a spring member **41** as by means of a screw or the like (not shown) passing through the flange and the spring member and into the slide member.

Each respective transmitter plate is recessed into the bottom surface of a respective slide element so the exposed lower surfaces are co-planar, and said co-planar surfaces are in turn co-planar with the lower face of the circular boss **34**. The aforesaid brush **24** bears upwardly against said co-planar faces, which pass over said brush as the rotor is rotated by the distributor shaft, the co-planar relationship of said lower faces minimize abrasion of the brush.

An annular grounding ring **42** is rigidly secured to, and depends from the circular head **35** of the rotor, so that said grounding ring encircles and retains the slide members **38** and their associated springs **41**. As is seen in FIGS. **3** and **5**, a grounding screw **43** passes through said grounding ring, so that its inner end is in slidable contact with the surface of the rotating distributor shaft, while its outer end is in contact with the grounding ring **42**.

A conductor arm **44** is recessed into the platform **36**, and extends radially of said rotor at a predetermined angle with respect to the direction of the slideways **37** with their slide members **38**. As may be seen in FIGS. **1** and **4**, the distributor cap **4** is provided with the usual electrodes **45**, disposed an equal distance from the axis of rotation of the distributor shaft, and angularly equally spaced about said axis. A central electrode **46** is also provided, and is in constant contact with the conductor arm **44**. As may be seen in FIG. **4**, the electrodes **46** terminate in half circular contact tips **45*a***. The usual electric wires (not shown) extend from each electrode **45** to a spark plug (not shown), and the usual electric wire (not shown) extends from the central electrode **46** to the secondary side of the coil.

It may now be clear, that as the rotor rotates, the transmitter plates **39** pass over and in contact with the brush **24**. While the transmitter plates are in contact with the brush, a circuit is closed from the grounded side of a battery through the distributor shaft, and the grounding screw **43** to the grounding ring **42**, and thence through the springs **41** to the brush. Thence the circuit leads through the pigtail **27** to the female clip **28**, the male clip **29**, and through the two conductors **31** and **32**, which respectively lead to a condenser and to the primary side of a coil.

Contact between the transmitter plates and the brush, terminates just as the conductor arm **44** makes contact with the electrode tips **45*a*** of the aforesaid electrodes **45**, and as the magnetic field generated in the primary winding collapses and creates a surge of current in the secondary winding thereof. Said current is conducted by the aforesaid wire from the secondary side of the coil to the central electrode in the distributor cap, thence through the conductor arm **44** to one of the aforesaid electrode tips **45*a***, and thence to a spark plug.

It will be apparent, that the duration of contact between a transmitter plate **39** and the brush **24** will control the magnetic field built up in the primary winding of the coil, and consequently the strength of the spark ultimately reaching the spark plug. Obviously, as speed of rotation of the distributor shaft and the rotor increases, the length of time for such contact between a transmitter plate and the brush will diminish. To at least partially compensate for the diminished time of contact, the slide members **38** will slide outwardly in the grooves **37**, carrying the triangular transmitter plates. Due to the angle of the lateral edges of said transmitter plate a wider area thereof, and thus, a longer path of travel, is presented to the brush so that a stronger magnetic field may be built up in the primary winding of the coil, with a consequent stronger spark discharged at the spark plug. The angle at which the awuare brushes are disposed allows the transmitter plates to terminate contact with the brushes at a mini-

mal point provided by one of the four corners, thus further reducing arcing. The tendency of the slide members to slide outwardly, responsive to centrifugal force, is resisted by the springs **41**, thus causing said springs to serve a unique dual purpose in restoring the slide member to its normal position when rotation of the distributor shaft and rotor ceases, and also to function as a conductor in the electrical circuitry.

The device, as disclosed in FIG. **1**, is intended to utilize an existing distributor casing and breaker plate assembly. However, it is considered desirable to further provide for an original design of distributor which would not require the use of a breaker plate. Accordingly, FIG. **11** discloses a distributor casing **50** having an annular upper, cup-like portion **51**. Said cup-like portion is surmounted by a distributor cap **52** with the usual central electrode **53** having electrical communication with a coil (not shown) and the usual peripheral electrodes **54** each having electrical communication with a respective spark plug. A distributor shaft **55** has its upper end portion surmounted by a rotor, comprising a lower portion **56**, beneath a circular boss **57**, surmounted by a ciruclar head **58**, and upwardly terminating in a circular platform **59**. All of said elements of said rotor are integral, and the entire rotor is of non-conductive material. The basic difference between the disclosures of FIGS. **11**, **12** and **13**, and the disclosure hereinbefore described, resides in the formation of the upper portion **51** of the distributor casing, and the provision of a radially, arcuate track **60** concentric with the axis of rotation of the distributor shaft **55**. Received slidably in said track **60** is a radially arcuate brush housing **61**, having a recess **61** at one end to receive a pin **63** which passes through the looped end **64** of a rod **65** which attaches to a spark advance mechanism (not shown). The opposite end of said brush housing may carry a pin **66** which cooperates with a pin or loop **67** on the wall of the distributor casing to secure a coil spring **68** between the aforesaid pin **66** and the loop **67**. As is usual, it is intended that the spark will be advanced by means of the rod **65**, and when the necessity for having the spark advanced is terminated, the spring **68** will return the brush housing **60** to a normal position.

The brush housing, as may be seen from FIG. **12**, carries a brush **69**. It is contemplated that the brush will downwardly terminate in a circular lug **70** to receive a coil spring (not shown) similar, to the one earlier shown and described, to urge the brush upwardly into contact with the bottom surfaces of the rotor and of slide elements and transmitter plates. It is further proposed that the brush should have the usual pigtail **71** terminating in a female clip **72**, engaging a male clip **73**, imbedded in a non-conductive plug **74** received in the bottom wall of the cup **51** of distributor **50**.

A modification of the invention is disclosed in FIGS. **8**, **9** and **10** and said modification employs the basic construction illustrated in FIGS. **1**, **2** and **4**. In this modification is shown, as in FIG. **8**, the lower portion **75** of the rotor, with the upper circular head **76**, surmounted by and upwardly terminating in circular platform **77**. A breaker plate **78** has a pin **79** at one end thereof and a pin **80** at the other end thereof. A brush housing **81** carries two brushes **82** and **83** predeterminedly, radially spaced relative to the axis of rotation of the distributor shaft **84**. Said brushes downwardly terminate in circular lugs **85** and **86**, and are provided with coil springs **87** and **88** which bottom in the holes provided for said brushes, and urge the brushes upwardly into contact with the lower face of the rotor, the transmitter plates, and the slide members. Because it is necessary to electrically interconnect the two brushes, a length of pigtail **89** extends from the brush **82** to the brush **83** and a second length of pigtail **90** extends from the brush **83** to terminate in a female clip **91** which receives a male clip **92**, imbedded in a plug **93** extending through the wall of the distributor housing **94**.

A pin **95** surmounts the breaker plate, to receive an end of a coil spring **96**, the opposite end of which spring engages a pin **97** secured in any desired manner to the interior surface of the distributor housing **94**. A rod **98** engages said pin **95** and extends through an opening **99** in the wall of the distributor hosuing to provide a means of advancing the spark. The spring **96**, of course, returns the breaker plate to its predetermined position when the need for an advanced spark is over. With reference to FIG. **8**, it will be noted that the rotor is surmounted by a conductor arm **100** to make contact with electrode points **101**, it being understood there is a central electrode in electrical communication with the secondary winding of a coil (not shown). In this modification, due to the presence of two brushes, **82**, **83**, only two slide members **102**, with their associated transmitter plates respectively **103** and **103*a***, and spring **104** are required. From FIG. **8** is may be seen that as transmitter plate **103** passes over the brush **82**, and breaks its contact with said brush, the conductor arm will be in electrical communication with the electrode **101** to convey the surge of current from the coil to a predetermined spark plug. As rotation continues, the transmitter plate **103** passes over the brush **83**, and as it breaks contact with the brush, the conductor arm is in electrical communication with the next consecutive electrode **101**. Subsequently, in one rotation, transmitter plate **103a** passes over and in contact with the brush **82** breaking such contact as the conductor arm **100** makes with a third consecutive electrode **100**. Transmitter plate **103a**, as will now be evident, then passes over and in contact with brush **83** and as such contact terminates the conductor arm is in contact with the fourth electrode **101**.

This latter modification can be applied to both existing distributor housings employing breaker plates, and to the modified form of distributor casing as disclosed in FIGS. **11**, **12** and **13**, and obviously would save in the number of parts that must be manufactured. Due to the presence of the pigtail section **89** interconnecting brushes **82** and **83**, it is desirable to form the brush housing **81** in two parts, namely **81** and **81*a*** to expose a channel or groove into which the pigtails may fit upon assembly of the two parts of the brush housing, which may be sealed together as by screws, or glue or the like.

What I claim is:

1. An electrical distributor system for internal combustion engines, having,

a coil,

a source of direct current,

a rotatable shaft,

a distributor casing journalling a portion of said shaft, and

a distributor cap surmounting said casing,

wherein the improvement comprises:

a rotor surmounting the shaft for rotation therewith,

slide members carried by said rotor, said slide members having sliding travel inwardly toward said shaft, and outwardly from said shaft,

elongated transmitter plates carried by said slide members and elongated outwardly from said shaft, said plates being so formed that their width increases inwardly, and decreases outwardly of their length,

an electrically conductive brush disposed to contact each transmitter plate during each rotation of the rotor, and close a circuit to the coil,

means establishing said circuit,

whereby said slide members slide outwardly responsive to centrifugal force when said assembly rotates to expose a progressively wider path of travel of said transmitter plates over said brush to prolong the time of said closed circuit

2. In a distributor as set forth in claim **1,**

spring means carried by said slides, and yieldably resisting said outward sliding travel,

restraint means carried by said rotor, and engaged by said spring means, to establish a positive limit to said outward travel.

3. In a distributor as set forth in claim **2,**

said restraint means being an annular grounding ring encircling said rotor, and comprising part of said circuit,

and said circuit including means connecting the distributor shaft and said grounding ring.

4. In a distributor as set forth in claim **3,**

said rotor being formed with slideways elongated radially thereof to receive said slide members.

5. In an electrical distributor system as set forth in claim **4,**

a brush carrier disposed in said housing,

a socket formed in said carrier to receive said brush,

said slideways having a slot opening upon said brush carrier,

said rotor having a surface opposing said brush housing,

a surface of said slide members being co-planar with said surface of said rotor, and an exposed surface of said transmitter plates being co-planar with both said faces, and

spring means urging said brush into contact with said co-planar faces.

6. In a distributor as set forth in claim **5,**

said brush housing being disposed for travel in a radially arcuate path about said shaft to advance the brush for contact with transmitter plates, and to thus advance the spark.

* * * * *