Feb. 14, 1961 S. D. BEHRBAUM 2,972,024

DISTRIBUTOR

Filed Aug. 8, 1958

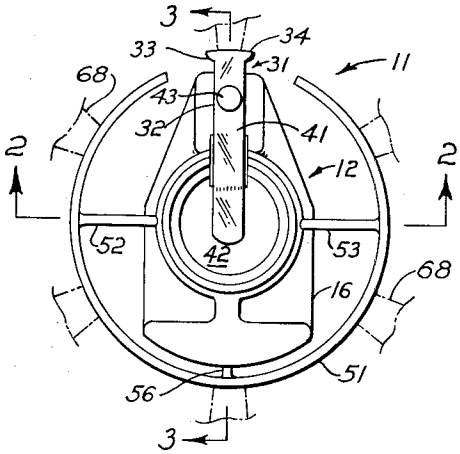



Fig. 1.

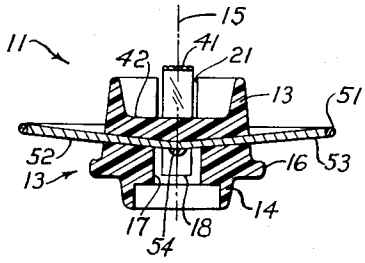



Fig. 2.

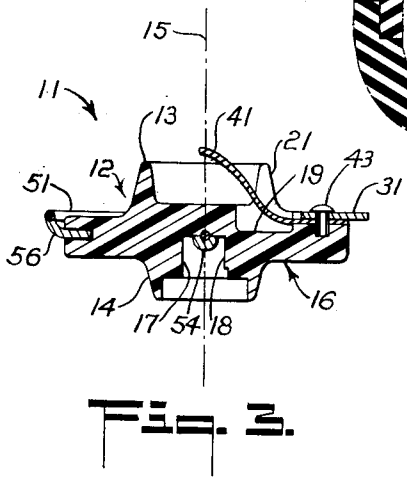



Fig. 3.

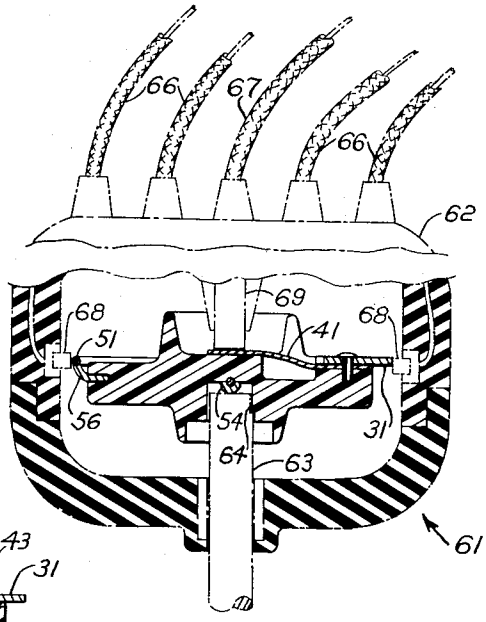



Fig. 4.

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2,972,024

# DISTRIBUTOR

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4 Claims. (Cl. 200—24)

The present invention relates to an improved electrical distributor for the ignition systems of automotive engines.

In the controlled application of a high voltage pulse to successive spark plugs of an internal combustion engine it is necessary to employ some type of sequencing and timing control and such is conventionally accomplished by an ignition distributor wherein a rotor carrying a high voltage contact is driven by the engine to supply high voltage pulses in succession to individual stationary spark plug contacts or ignition points. In the wiring of engine ignition systems it is convenient to group the ignition wires from the distributor to spark plugs into a bundle, however, this provides a high degree of inductive coupling between the spark plug wires. Inasmuch as only a single spark plug should be energized at a time this inductive coupling is highly undesirable for such coupling may induce sufficient energy to fire other spark plugs than the one being directly energized whereby ignition occurs at the wrong point in the cycle of various engine cylinders. With strong ignition systems adapted to supply very hot sparks at the plugs thereof this problem becomes of major importance, as induced voltages fire various spark plugs during parts of the engine cycle wherein no spark is desired, as for example, during charging of the cylinder with the result that combustion of gases does not provide useful power and actually produces an engine drag with consequent low engine efficiency and loss of power.

Although it is possible to maintain relatively large spark plug wire separation over much of the lengths thereof it is yet necessary for these wires to closely approach each other at the distributor unit so that with the high voltage and hot spark ignition systems, as is provided in automobile systems employing substantial voltages, the problem of inductive coupling between ignition wires remains acute.

The present invention provides an improved distributor unit which entirely overcomes prior difficulties arising from inductive coupling between ignition wires. By this invention the distributor accomplishes a continuous grounding of each ignition wire and attached spark plug except for the period during which a high voltage ignition pulse is supplied thereto. Rather than attempt to decrease the mutual inductance between ignition wires to the point where insufficient voltage is coupled between such wires to produce plug sparking, the present invention accepts the unavoidable fact of mutual inductance between wires of necessarily close proximity and prevents untimely spark plug arcing by grounding the circuits not intentionally energized.

The foregoing is herein accomplished with a minimum departure from conventional physical structure so that the present invention is readily adapted to the modification of existing automobile components as well as to inexpensive new manufacture. It is only necessary in carrying out the present invention to provide an inexpensive modification to the rotor of a conventional distributor



whereby the problem of inductive coupling between ignition wires is completely overcome.

It is an object of the present invention to provide an improved automotive ignition distributor eliminating spuriously induced ignition voltages.

It is another object of the present invention to provide an automotive ignition distributor grounding all ignition points except one intentionally energized.

It is a further object of the present invention to provide an improved distributor rotor having grounding connections as well as energizing connections for shunting voltages induced in spark plug circuits during periods between intentional energization.

The invention possesses other objects and features of advantage, some of which, with the foregoing will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

The invention is illustrated in the accompanying drawings wherein:

Figure 1 is a plan view of an improved distributor constructed in accordance with the present invention.

Figure 2 is a transverse sectional view of the rotor taken in the plane 2—2 of Figure 1.

Figure 3 is a transverse sectional view of the rotor taken in the plane 3—3 of Figure 1 rotated ninety degrees from the plane 2—2.

Figure 4 is a partial sectional view in elevation of a distributor including the rotor noted above.

Considering now the invention in some detail and referring first to Figures 1–3 of the drawing, there will be seen to be provided a rotor **11** including an insulating body **12**. The body includes a central cylindrical portion forming a hollow top cylinder **13** and smaller hollow bottom cylinder **14** on a common vertical axis **15** with a generally planar middle plate **16** extending laterally outwards from the intersection of said cylinders. This body **12** is formed of an insulating material such as Bakelite, hard rubber, on the like and includes an axial bore **17** extending inwardly from the top of the bottom cylinder. This bore **17** is adapted to receive a drive shaft and has a flat **18** formed along one side for reasons set forth below. A slot **19** is formed in the upper surface of the rotor plate **16** extending from an outer edge of the plate to the upper cylinder and a slot **21** is formed in the upper cylinder **13** thereat.

Attached to the body **12** and forming a part of the rotor **11** is a fixed electrical contact **31** having a flat shank **32** disposed in the slot **19** and extending from the body plate **16**. The contact **31** is terminated outwardly from the body **12** in an enlarged head **33** having a convex outer contacting surface **34**. Beneath the contact **31** in the slot **19** there is disposed a spring contact **41** extending inwardly of the body in the slot **19** and through the upper cylinder slot **21** into the cylinder. This spring contact **41** is formed with a shallow convex-concave curve so as to fit beneath the contact **31** and to extend upwards into the cylinder **13** in normal position adjacent the top of this cylinder, as best seen in Figure 3. The contacts **31** and **41** are formed of a material which is a good electrical conductor and the material of spring contact **41** is additionally resilient so that this contact may be resiliently depressed at the upper or free end thereof onto a surface **42** forming the bottom of the upper cylinder well. Suitable attachment means **43** such as a screw or rivet are provided through the contacts **31** and **41** at the joinder thereof and into the body plate **16** for fixing the

contacts in position in the slot 19 and maintaining good electrical connection therebetween.

As a further and important part of the rotor 11 there is provided a ring contact 51 in the form of an annulus with a circumferential segment missing and disposed about the body plate 16. The ring contact 51 is disposed in a plane normal to the vertical axis 15 of the body 11 and in the same plane as the contact 31 with this latter contact 31 oriented in the missing segment of the ring contact 51 so as to be out of electrical contact with same. Mounting of the ring contact 51 is accomplished by a pair of electrically conducting rods 52 and 53 joined to the ring at diametrically opposed points and extending into the body 12 through lateral bores therein to a juncture at a contact point 54 at the inner end of the axial body bore 17. An additional support member 56 is affixed to the ring contact 51 midway between the rod connections and this structural member extends into the body plate 16 in fixed attachment thereto. Preferably, the rods 52 and 53 are disposed in ninety degree displacement from the contact 31 with the structural member 56 diametrically opposed to this contact 31, however, other relative dispositions are possible, it only being required that the ring contact be firmly supported out of contact with the contact 31 and in electrical connection with the contact point 54.

In addition to the rotor above described there are provided conventional distributor components as indicated in part in Figure 4 and including a housing 61 with a removable cap 62, all formed of an electrically insulating material. The housing 61 has a drive shaft 63 extending through the bottom in bearing relation thereto and adapted for geared engagement with a rotating engine component such as a cam shaft (not shown). The drive shaft has a flat side 64 adjacent the top thereof and is adapted to mate within the bore 17 in the bottom of the rotor body with the shaft flat 64 abutting the bore flat 18. The rotor body fits firmly upon the shaft 63 and rotates therewith because of the engaging flat surfaces noted, however, the rotor may be lifted from the shaft for maintenance. The shaft engages the contact point 54 in the body bore 17 in electrical connection and as the shaft is formed of an electrically conducting material mating with other like material in the engine, this contact point is electrically grounded. Consequently, the ring contact 51 is electrically grounded by connection of the bars 52 and 53 between point 54 and ring 51.

The housing cap 62 is adapted to accommodate the passage of spark plug cables 66 as well as a high voltage line 67 from a coil or the like. Within the housing including the cap there are mounted a plurality of ignition or distributor points 68 removably mounted about the inner circumference of the housing in disposition to electrically contact the rotor contact 31. As the rotor 11 rotates, under the influence of the drive shaft 63, the rotor contact successively contacts the distributor points to supply electrical energy thereto. Within the housing, also, the spark plug cables 66 are individually connected to separate distributor points in proper sequence relative to the desired firing cycle of the engine. The high voltage lead 67 is connected to a bar contact 69 depending from the head cap 62 interiorly thereof and disposed on the common vertical rotor axis and adapted to engage the rotor spring contact to deflect same downward against the rotor surface 42 when the housing is completely assembled with the cap in full engagement with the lower portion of the housing.

As regards the electrical circuitry and operation of the above described distributor, the high voltage lead 67 connects through the bar contact 69 to the spring contact 41 and thence to the rotor contact 31. Rotation of the distributor rotor 12 by the drive shaft 63 causes the rotor contact to traverse a circle and to individually contact successive distributor points 68 whereby the high voltage energy is transmitted through the ignition or spark plug



cables 66. The spark plugs have one terminal grounded so that only a single wire system is herein required. During rotation of the distributor rotor 11 when the contact 31 thereof is successively engaging separate distributor points, the ring contact 51 contacts all of the distributor points not at the time engaging the contact 31. Substantially a complete circle of electrical contacting surface is provided by the contact 31 and ring contact 51 so that at any time all distributor points except one being energized through contact 31 are contacting the ring contactor 51 which is disposed at such a radius as to engage the distributor points. As the ring contact 51 is electrically grounded through rods 52, 53 and contact point 54 touching the grounded drive shaft 68 then all of the distributor points are electrically grounded except during the period it takes for the missing ring segment to rotate past same and it is in this period that the contact 31 engages the distributor point. As a result of this continuous electrical grounding of the distributor points except during actual energization of same it is not possible for induced currents in the spark plug cables to build up a charge at the spark plug. In effect, both sides of the spark plug are grounded at all times except when the plug is purposely energized to discharge and thus untimely plug firing is precluded.

What is claimed is:

1. An ignition distributor for spark plugs having both grounded and high voltage electrodes comprising an insulating rotor adapted to rotate and having a contact extending therefrom for traversing a circle about the rotor axis, contact means for energizing said contact with a high voltage during rotation, a ring contact extending from both sides of said contact out of electrical contact therewith in a circle having a radius equal to that of the circle or traverse of said contact, a point contact disposed substantially on the axis of said rotor, and means electrically connecting said ring contact and said point contact; and an insulating housing about said rotor with an electrically grounded drive shaft rotatably mounted therein for engaging said rotor in driving relation at the axis thereof in electrical contact with said point contact, and a plurality of ignition points spaced about the circle of traverse of said rotor contact for sequentially engaging same whereby spark plugs connected to said ignition points are at all times either electrically energized by the rotor contact or electrically grounded by said ring contact.

2. An ignition distributor having a plurality of ignition points arranged in equally spaced relation about the circumference of a circle, a rotor adapted to be rotated about an axis by an electrically grounded drive shaft and having an insulating body, a ring contact mounted on said body for rotation therewith in a plane normal to the axis of rotation of said body with a ring segment missing and engaging all but one of said ignition points at all times, said ring contact being electrically isolated from said shaft by said body, electrically conducting rods electrically connecting said ring contact and said drive shaft whereby said ring contact is connected to ground, an energizing contact carried by said body and disposed to extend through the missing segment of said ring to contact said one of the ignition points not in contact with said ring contact and electrically isolated from said ring contact and said shaft, and a spring contact secured to said energizing contact and extending to the axis of rotation of said body for contact thereat with a high voltage member, whereby said grounded ring contact continuously grounds all but said one of said ignition points during rotation of said rotor to drain off current induced in the ignition wiring.

3. An ignition distributor rotor comprising an insulating body having an axial bore, an electrically grounded drive shaft received in said bore to rotate the body, a high voltage contact extending from said body normal to the axis thereof, an electrically conductive spring contact extending from said high voltage contact to the body axis

for resilient engagement with a high voltage member, a ring electrode carried by said body for rotation therewith and extending about said body from opposite sides of said high voltage contact in a circle equidistant from the body axis as said high voltage contact and lying in a plane normal to the axis, said ring electrode being electrically isolated from said high voltage contact and from said shaft; and at least an electrically conducting rod extending from said ring contact through said body and into the axial bore thereof for electrically connecting said ring contact and said drive shaft.

4. An automotive ignition distributor comprising a housing having a plurality of spaced ignition points removably disposed therein about a circle and adapted to rotatably receive an electrically grounded drive shaft; and a rotor having a body with an axial bore therein for engaging said drive shaft to rotate therewith, a fixed contact extending from said body to rotate about the circle of said ignition points to sequentially contact same, a resilient member engaging said fixed contact and extending to the axis of said body for engaging an energizing contact on said housing, a ring contact carried by said body for rotation therewith and having the same diameter as said ignition point circle and extending about said body from opposite sides of said fixed contact in electrically insulated relation thereto for engaging all of the ignition points not engaged by said fixed contact, and a conducting rod extending from said ring contact to the axial bore in said body for electrically connecting said ring contact to said drive shaft.



**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,907,428 | Martin | May 9, 1933 |
| 2,443,046 | Mansen | June 8, 1948 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 598,330 | France | Sept. 26, 1925 |
| 650,532 | France | Sept. 24, 1928 |
| 867,597 | France | Aug. 18, 1941 |