March 17, 1970 J. E. SAULMON 3,501,600

IGNITION DISTRIBUTOR

Filed Feb. 19, 1968

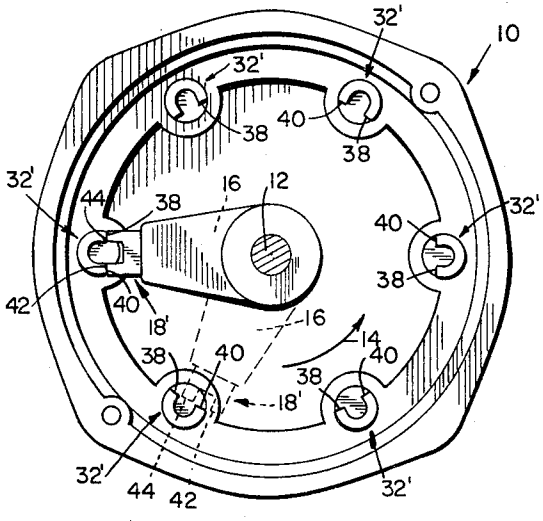



Fig. 1

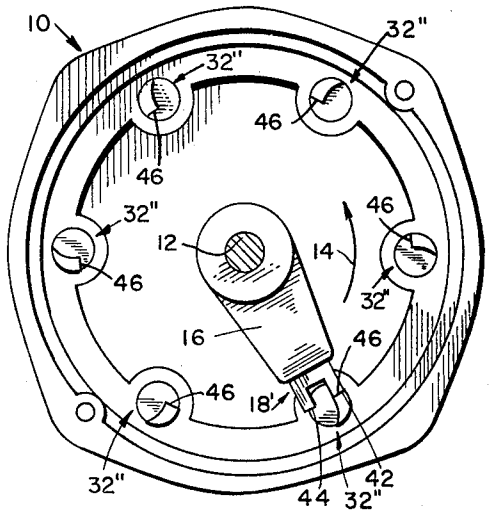
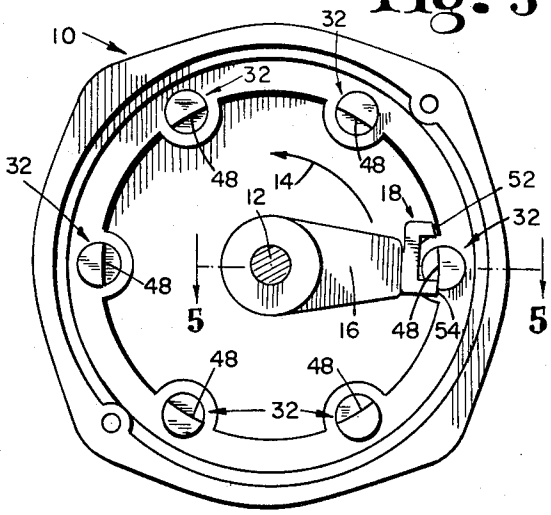



Fig. 2

Fig. 3



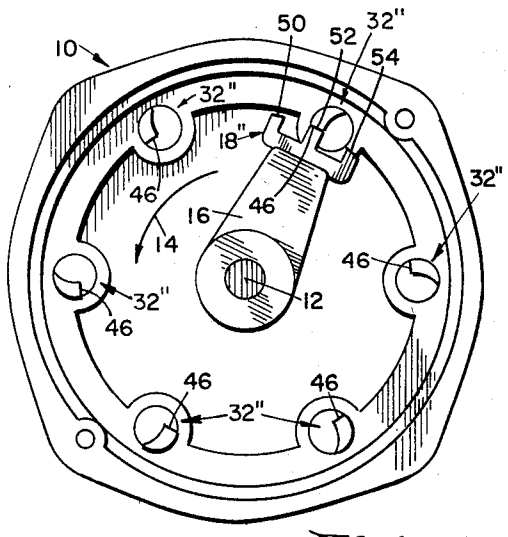




Fig. 4

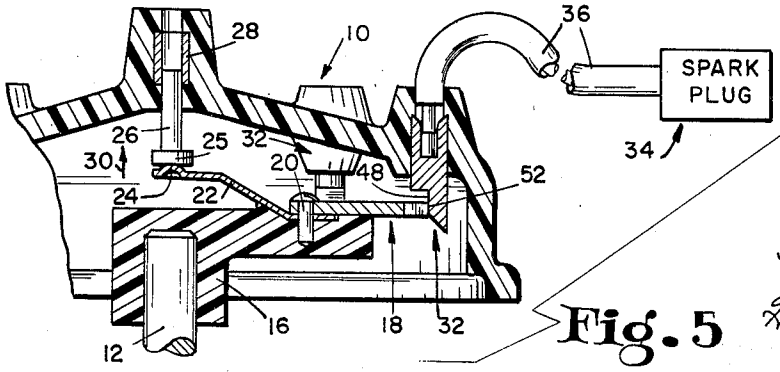



Fig. 5

INVENTOR
JAMES E. SAULMON
BY
Wood, Gust & Irish
ATTORNEYS

United States Patent Office 3,501,600 Patented Mar. 17, 1970



3,501,600

# IGNITION DISTRIBUTOR

James E. Saulmon, 305 E. Main St.,
Wabash, Ind. 46992

Filed Feb. 19, 1968, Ser. No. 706,537
Int. Cl. H01h 19/12
U.S. Cl. 200—19 8 Claims

## ABSTRACT OF THE DISCLOSURE

An improved distributor comprising a drive shaft, a plurality of contact elements peripherally spaced about the shaft, each contact element being adapted to be connected to a conventional spark plug, a rotor mounted on the shaft for rotation therewith and current carrying means mounted on the radially outer portion of the rotor and arranged to move past and transmit current to each contact element. In one embodiment of the invention, each contact element is formed to define at least two peripherally spaced contact areas past which the current carrying means moves so that two separate surges of current are transmitted to each spark plug for each revolution of the rotor. In another embodiment, the current carrying means comprises at least two peripherally spaced contact points arranged to move past each contact element so that at least two separate surges of current are transmitted to each spark plug during each revolution of the rotor. And, in still another embodiment, each contact element is formed to define a plurality of peripherally spaced contact areas and the current carrying means is formed to define a plurality of peripherally spaced contact points, each contact point being arranged to move past each contact area so that a plurality of separate current surges is transmitted to each spark plug during each revolution of the rotor.

## BACKGROUND OF THE INVENTION

### Field of the invention

The present invetnion relates generally to current distributors, and more particularly to the provision of an improved distributor for use with the ignition system of an internal combustion engine.

### Description of the prior art

A distributor is a rotary electrical switch used to distribute electrical current from one source to a number of separate circuits. A common example is the distributor generally associated with an automobile engine ignition system. In such systems, high-tension ignition current suitable for use by spark plugs is delivered to a current carrying means at the distal end of a revolving switch arm. Peripherally spaced about the path of this current carrying means is a plurality of contact elements, each of which is connected to a spark plug. Rotation of the arm brings the current carrying means successively opposite the contact elements. There may be actual contact between the current carrying means and the contact elements, or the current may be required to jump a small gap therebetween, in which case, the potential of the current must be quite high.

Conventionally, the contact elements and the current carrying means are proportioned and designed so that there is a single surge of current transmitted to each spark plug during each revolution of the arm. Specifically, each current carrying means conventionally comprises a single contact point arranged to move past each contact element and to transmit a single surge of current to each element.

The prior art known to the present inventor does not show current carrying means or contact elements proportioned and designed so that more than one surge of current is transmitted from the current carrying means to a contact element during each revolution of the current carrying means.



## SUMMARY OF THE INVENTION

It is a primary object of the present invention, therefore, to provide an improved distributor comprising a plurality of peripherally spaced contact elements, each of which is adapted to be connected to a conventional spark plug, and a revolving current carrying means, the contact elements and current carrying means being arranged so that a plurality of separate current surges is transmitted to each such spark plug during each revolution of the current carrying means.

It has been found that an automobile engine having an ignition system comprising the distributor of the present invention will give significantly better performance than it will with an ignition system comprising a conventional distributor. Specifically, it is an object of this invention to provide a distributor that will cause a spark plug in a cylinder to fire at least two times during each ignition cycle in the cylinder, thereby to burn a greater percentage of the fuel mixture that is compressed in the cylinder during the compression cycle.

The improved distributor of the present invention comprises a drive shaft, a plurality of contact elements peripherally spaced about the shaft, a rotor mounted on the shaft for rotation therewith, and current carrying means carried by the rotor. In one embodiment of the invention, the current carrying means comprises at least two peripherally spaced contact points, each contact point being arranged to move past and transmit current to each contact element. In another embodiment of the invention, each contact element is formed to define at least two contact areas past which the current carrying means must move and the current carrying means is arranged to transmit current to each of the contact areas. In still another embodiment of this invention, each contact element is formed to define a plurality of contact areas past which the current carrying means must move and the current carrying means comprises means defining a plurality of contact points, each of which is arranged to move past and transmit current to each contact area.

Since, in some instances, it is desirable that there be actual contact between the current carrying means and each contact element while, in other instances, it is desirable that there be a gap therebetween, nothing in this description or in the claims appended hereto is to be interpreted as requiring an actual contact or a gap between the current carrying means and the contact elements. Thus, it will suffice to say that each current carrying means moves past and transmits current to each contact element. Other features and objects of this invention will become apparent as this description progresses.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings wherein:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view taken so as to show the interior of a distributor cap having one type of contact element peripherally spaced thereabout and a distributor arm mounted for rotation relative to the distributor cap, the distributor arm carrying one type of contact member at its distal end;

FIG. 2 is a view similar to FIG. 1, but showing contact elements of a different type;

FIG. 3 is a view similar to FIG. 1, but showing contact elements of still another type and a different type of contact member carried by the distribtuor arm;

FIG. 4 is a view similar to FIG. 1, but showing contact element of the type shown in FIG. 2 and still another type of contact member carried by the distributor arm; and

FIG. 5 is a fragmentary, sectional view, slightly enlarged, taken from FIG. 3 generally along the line 5—5 and showing the manner in which a conventional spark plug is connected to each contact element.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, it will be seen that there is illustrated a conventional distributor cap **10** of the type which is used in ignition systems of six cylinder engines, and a rotor drive shaft **12** which is journalled for rotation relative to the distributor cap **10**, the axis of the shaft being generally coincident with the axis of the cap. Conventionally, the shaft **12** is drivingly connected to the crank shaft of the engine so that, when the engine is running, the shaft is rotated in the direction of the arrow **14**. Mounted on the shaft **12** for rotation therewith is a rotor member **16** which is conventionally fabricated from an insulative material. Although the illustrative rotor member **16** is a radially extending arm, it will be understood that rotors may take various forms and, in some cases, the rotor may be a circular disc concentrically mounted on the shaft **12** for rotation therewith.

As seen in FIG. 5, current carrying means, indicated generally by the reference numeral **18** and hereinafter referred to as the contact member **18**, is mounted on the radially outer portion of the rotor member **16** by means such as the illustrated fastener **20**. A current-carrying leaf spring is connected to the contact member **18** by the fastener **20** and is arranged to extend radially inwardly therefrom. This spring **22** is provided with a contact portion **24** arranged to engage the contact portion **25** of a current carrying member **26**. The current carrying member **26** is carried in the lower portion of a conventional ferrule **28** mounted in the center opening of the distributor cap **10**. The ferrule **28** receives the high-tension plug which is conventionally connected to an automobile distributor. The spring **22** is proportioned and designed to urge its contact portion **24** in the direction of the arrow **30** against the contact portion **25**. It will be appreciated that the spring **22** rotates relative to the member **26** and that the contact portions **24** and **25** provide a continuous connection between the member **26** and the contact member **18**.

Conventionally, the distributor cap **10** carries a plurality of contact elements **32** peripherally spaced about the path of movement of the contact member **18**, each contact element being adapted to be connected to a conventional spark plug **34** (FIG. 5) by means of a spark plug wire **36**. When a surge of current is transmitted from the contact **18** to a contact element **32**, the spark plug **34** connected to the contact element fires. The object of the present invention is to cause each spark plug **34** to fire more than one time during each revolution of the contact member **18** or, in other words, to arrange the contact member **18** and each contact element **32** so that there will be more than one surge of current transmitted to each contact element during each revolution of the contact member. The various illusrative embodiments provided to meet this object will be discussed in conjunction with FIGS. 1–4. In this discussion, like reference numerals indicate like parts.

In the embodiment of FIG. 1, each contact element **32'** is formed in a U-shape to define a pair of spaced-apart contact areas **38, 40** and the contact member **18'** is formed to define a pair of spaced-apart contact points **42, 44**. Preferably, the peripheral spacing between each pair of contact areas **38, 40** is equal to the peripheral spacing between the contact points **42, 44**. Thus, as the contact member **18'** moves in the direction of the arrow **14** past one of the contact elements **32'**, there will be transmitted to the contact element three separate surges of current. Specifically, the first surge of current will be transmitted when the contact point **42** moves past the contact area **38** of the one contact element **32'**, the second surge of current will be transmitted when the contact points **42** and **44** move past, respectively, the contact areas **40** and **38** of the one contact element **32'** and the third surge of current will be transmitted when the contact point **44** moves past the contact area **40** of the one contact element **32'**. It will be apparent that, if one of the contact points **42, 44** is removed, there will be two surges of current transmitted to each contact element **32'** during each revolution of the contact member **18'**. Further, it will be appreciated that the time duration between current surges transmitted to a contact element **32'** will be dependent on the spacing between the contact points **42, 44** and the contact areas **38, 40**. Since the spacing between each pair of contact areas **38, 40** is equal to the spacing between the contact points **42, 44**, the time duration between successive current surges transmitted to each contact element **32'** will be equal if the speed of the shaft **12** remains constant.

In the embodiment of FIG. 2, each contact element **32''** is formed to define a single contact area **46**. In this embodiment, the contact member **18'**, with its spaced apart contact points **42, 44**, is utilized to transmit two separate surges of current to each contact element **32''** during each revolution of the contact member **18'**. Specifically, as the contact member **18'** moves past one of the contact elements **32''**, the first surge of current will be transmitted when the contact point **42** moves past the contact area **46** of the one contact element and the second surge of current will be transmitted when the contact point **44** moves past the contact area **46** of the one contact element.

It has been found that the embodiment of FIG. 2 is more suitable for the use with ignition systems of smaller automobile engines for the so-called compact cars than it is with ignition systems of larger engines. Such smaller engines have relatively short combustion strokes and, therefore, the two sparks generated by the two separate surges of current are sufficient completely to ignite the fuel in the cylinders.

In the embodiment of FIG. 3, the contact elements **32**, one of which is shown in section in FIG. 5, are conventionally-shaped contact elements. Specifically, each contact element **32** is formed to define a generally peripherally extending contact area **48** and the contact member **18**, which is also shown in section in FIG. 5, is formed to define a pair of peripherally spaced apart contact points **52, 54**. The spacing between the contact points **52, 54** is such that the contact point **52** can move completely past a contact area **48** before its trailing contact point **54** begins to move past the contact area. The illustrated position of the contact member **18** in FIG. 3 clearly illustrates this feature.

It will be appreciated that the contact areas **48** of the contact elements **32** extend peripherally a greater distance than the contact areas **38, 40** and **46** illustrated in FIGS. 1, 2 and 4.

In the embodiment of FIG. 4, the contact elements **32''** are used with a contact member **18''** formed to define three peripherally spaced contact points **50, 52, 54**. Each contact point **50, 52** and **54** is arranged to move past each contact area **46**, thereby to transmit three separate surges of current to each contact element **32''** during each revolution of the contact member **18''**.

The various embodiments of the present invention are effective to increase the performance of many automobile engines. Specifically, it has been found that the improved distributor of the present invention will produce increased gas mileage, better starting characteristics, longer spark plug life and a cleaner, less noxious exhaust. These results have been obtained by modifying the distributors of

several automobile engines to incorporate one of the above-described embodiments.

It has been found that in many cases, it is desirable to retime the ignition system when a distributor embodying the present invention is substituted for a conventional distributor in an existing engine.

In a working embodiment of this invention, typical dimensions for the rotor contact **18** of FIG. 1 are listed in the following, it being understood that these are given by way of example only and are not to be considered as limitative of the invention:

| | Inch |
|---|---|
| Width of rotor contact **18** | 5/16 |
| Spacing between contact points **42, 44** | 3/16 |
| Width of each contact point **42, 44** | 1/16 |
| Length of each contact point **42, 44** | 1/16 |
| Thickness of each contact point **42, 44** | 1/16 |

While there have been discussed above the principles of this invention in conjunction with specific apparatus, it is to be clearly understood that this description is made by way of example and not as a limitation to the scope of the invention.

What is claimed is:

**1.** An improved distributor comprising a drive shaft, a plurality of contact elements peripherally spaced about said shaft, each contact element being adapted to be connected to a conventional spark plug, and a rotor mounted on said shaft for rotation therewith relative to said contact elements, wherein the improvement comprises current carrying means carried by the rotor, means for continually connecting said current carrying means to a current source, said current carrying means comprising at least two peripherally spaced apart contact points, each contact point being arranged to move past and transmit a current surge to each contact element, whereby, at each such spark plug, at least two sparks are generated during each revolution of said rotor.

**2.** A distributor as in claim **1** wherein each of said contact elements is formed to provide a plurality of peripherally spaced contact areas past which each contact point must move, whereby each contact point transmits current to each contact area during each revolution of said rotor.

**3.** A distributor as in claim **2** wherein each contact element is formed to provide a pair of said contact areas and there is a pair of said contact points, the peripheral spacing between each pair of contact areas being equal to the peripheral spacing between said contact points.

**4.** A distributor as in claim **1** wherein there are three of said contact points arranged to move past and transmit current to each contact element, whereby, at each such spark plug, three sparks are generated during each revolution of said rotor.



**5.** An improved distributor comprising a drive shaft, a rotor mounted on said shaft for rotation therewith, current carrying means carried by said rotor, means for continually connecting said current carrying means to a current source, a plurality of contact means peripherally spaced about said shaft and disposed stationary relative thereto, each contact means being adapted to be connected to a conventional spark plug, each contact means comprising means defining a plurality of peripherally spaced contact areas, each contact area being adjacent the path of movement of said current carrying means so that, during each revolution of said rotor, a surge of current is transmited from said current carrying means to each contact area, whereby each such spark plug receives a plurality of current surges during each such revolution of said rotor.

**6.** A distributor as in claim **5** wherein said current carrying means comprises means defining a plurality of current-carrying, peripherally spaced contact points, each of which is arranged to move past and transmit current to each of said contact areas.

**7.** The distributor of claim **1** in which the peripheral spacing between said contact elements and said contact points is such that a surge of current is transmitted to each contact element by each contact point before a surge of current is transmitted to its peripherally adjacent contact element.

**8.** The distributor of claim **5** in which the peripheral spacing between said contact means and the contact areas of each contact means and the dimensions of said current carrying means are such that a surge of current is transmitted to each contact area of each contact means by said current carrying means before a surge of current is transmitted to a contact area of a peripherally adjacent contact means.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,520,709 | 8/1950 | Biller | 200—29 |
| 2,681,393 | 6/1954 | Hopkins | 200—8 |
| 3,053,956 | 9/1962 | Clavel | 200—8 XR |
| 3,056,003 | 9/1962 | Rabinow | 200—19 XR |
| 3,206,562 | 9/1965 | Griggs et al. | 200—8 XR |
| 3,226,496 | 12/1965 | Seabury | 200—8 XR |
| 3,275,761 | 9/1966 | Yakim | 200—8 XR |
| 3,372,249 | 3/1968 | Withem | 200—19 |



ROBERT K. SCHAEFER, Primary Examiner

J. R. SCOTT, Assistant Examiner

U.S. Cl. X.R.

200—23