Nov. 10, 1959 R. E. LEIBOLD 2,912,529

IGNITION DISTRIBUTORS

Filed Nov. 25, 1957

FIG.1.

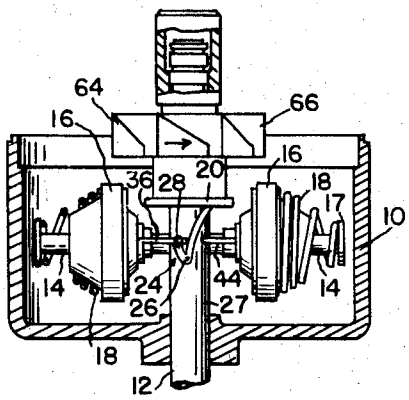


FIG.2.

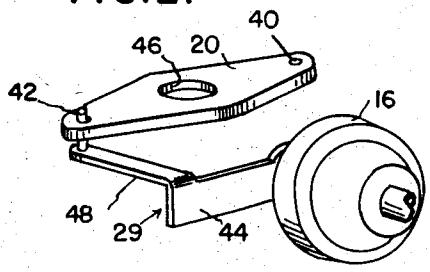


FIG.3.

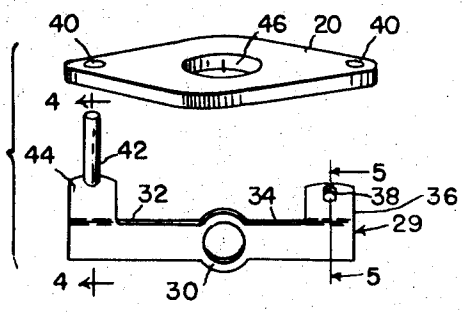


FIG.4.

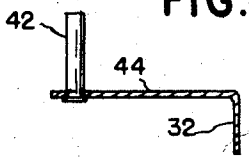


FIG.6.

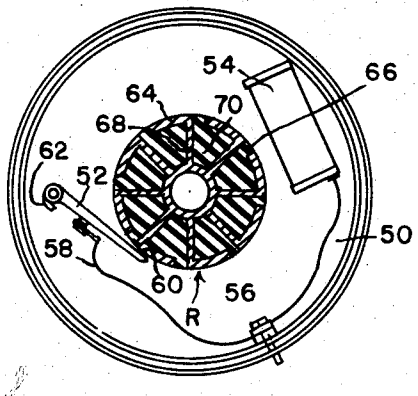


FIG.5.

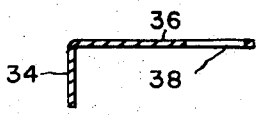
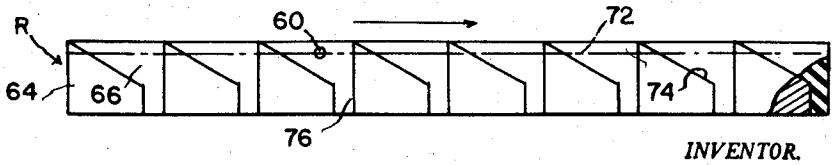


FIG.7.



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IGNITION DISTRIBUTORS

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4 Claims. (Cl. 200—25)

The present invention relates to ignition distributors.

At very high engine speeds the time available for current to flow into the ignition coil is very short and as a result the current does not reach its maximum value and the output voltage is accordingly reduced. In present ignition distributors which must operate at speeds where this reduced output is serious it has been common practice to provide two sets of contacts wired in parallel and arranged so that their periods of closure overlap. This method increases the closed or dwell time throughout the entire speed range but has the disadvantage that at low speeds where the coil naturally saturates anyway, additional energy is provided which must be dissipated in the form of heat.

It is an object of the present invention to provide means for increasing the dwell time with an increase in engine speed.

More specifically, it is an object of the present invention to provide means which will attain a constant high voltage at the spark plugs regardless of engine speed.

It is a further object of the present invention to provide a means of increasing the dwell time with no loss of energy at lower speeds.

It is a feature of the present invention to provide means for increasing the dwell time comprising a cylindrical rotor having electrically conducting circumferentially spaced electrically connected segments adapted to be sequentially engaged by a brush type electrical contact member, means for relatively shifting the contact member and rotor in a direction parallel to the axis of the rotor in response to changes in rotor speed, said electrically connected segments being shaped to maintain the interval of closure with the contact member substantially constant at all speeds.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

Figure 1 is a fragmentary vertical section of an ignition distributor constructed in accordance with the present invention.

Figure 2 is a fragmentary perspective view illustrating a detail of connection to the rotor.

Figure 3 is an exploded perspective view showing the relationship between the cam plate and its actuator.

Figure 4 is a fragmentary section on the line 4—4, Figure 3.

Figure 5 is a fragmentary section on the line 5—5, Figure 3.

Figure 6 is a diagrammatic plan view of the ignition distributor with the cover removed.

Figure 7 is a developed view of the peripheral surface of the rotor.

Referring first to Figure 1, the distributor comprises a housing 10 into which extends a driving shaft 12 adapted to be connected to the engine whose ignition is controlled by the distributor. The shaft 12 accordingly

rotates at a speed which is dependent on engine speed. Within the housing 10 the shaft 12 is provided with a cross shaft 14 on which are slidably mounted centrifugal weights 16. The ends of the cross shaft 14 are provided with spring seating heads 17 and intermediate these heads and the centrifugal weights are compression springs 18 acting to urge the weights 16 radially inwardly against the centrifugal force developed by the rotation of the shaft 12. Accordingly, for each particular shaft speed, balance will be attained when the force developed by the spring exactly equals the centrifugal force developed by the weights 16.

Carried by the shaft 12 for rotation therewith but capable of both circumferential and axial adjustment relative thereto, is a cam plate 20 rigidly connected to the distributor rotor R.

A pair of lever cams 24 are pivoted as indicated at 26 to opposite sides of the shaft 12. The lever cams each comprise a camming arm 27 engageable with the underside of the cam plate 20 and an actuating arm 28. Fixed to the weights 16 are brackets 29, details of which are best seen in Figures 2–5, comprising an intermediate eye portion 30 having a relatively long arm 32 and a relatively short arm 34 extending laterally therefrom. It will be understood that the eye 30 is dimensioned to receive the cross shaft 14 so that the bracket 29 is slidable together with the weight 16 longitudinally of the cross shaft. At the outer end of the relatively short arm 34 there is provided a lateral extension 36 having an elongated slot 38 therein. The slot 38 receives the actuating arm 28 of the lever cam 24 so that outward movement of the weight 16 operates to raise a cam plate 20 through the camming arm 27 and hence effects vertical movement of the rotor on the shaft 12.

The cam plate 20 is provided with radially elongated openings 40 adapted to receive pins 42 carried at the ends of extensions 44 provided at the ends of the relatively longer bracket arms 32. The cam plate 20 is provided with the central opening 46 which receives the shaft 12 and which provides for rotation of the cam plate about the axis of the shaft 12. It will be observed that the pins 42 are thus operable to effect angular or circumferential adjustment of the cam plate 20 about the axis of the drive shaft 12. In addition to effecting the angular or circumferential adjustment in accordance with shaft speed, the pins are also effective to drive the cam plate in rotation at shaft speed.

From the foregoing it will be observed that the rotor R is driven at shaft speed but is adjustable relative to the shaft both axially and circumferentially in accordance with changes in shaft speed.

Referring now to Figure 6 there is illustrated a plate 50 on which is mounted a contacting follower arm 52 and a condenser 54 which is connected to a terminal 56. An electrical conductor 58 leads from the condenser to a brush type contact 60 located on the follower arm 52. The follower arm is provided with a spring 62 which urges the contact 60 into continuous engagement with the smooth cylindrical surface of the rotor R.

The rotor R has a smooth continuous cylindrical surface in which are exposed electrically connected circumferentially spaced electrically conducting segments 64 which are separated by electrical insulating material as indicated at 66. The direction of rotation of the rotor is indicated by the arrow in Figure 1.

As best seen in Figure 6 the segments 64 are electrically connected by radially extending portions 68 leading to a central ring portion 70 which may be grounded. It will thus be seen that so long as the contact 60 is in engagement with an electrically conducting segment 64, a circuit is completed through the primary contained in the usual ignition coil (not shown) and this circuit is inter-

rupted when the contact **60** passes off the surface of a segment and engages a cylindrical insulating surface **66** provided between adjacent connecting segments.

In Figure 7 the cylindrical surface of the rotor R is shown in a planar development and the electrically conducting segments **64** and the intermediate insulating surfaces **66** being shown. It will be recalled that in use the rotor is adjusted relative to the shaft **12** both axially and circumferentially. Also, the brush type contact **60** is relatively fixed and at any instance may occupy a position such as indicated in Figure 7, dependent upon the speed of the shaft **12**. Obviously, if the parts are in the relationship illustrated in Figure 7 the contact **60** relatively traverses the rotor along a path indicated by the dot and dash lines at **72** and the relative intervals of circuit closure and interruption of the circuit are as indicated by the portion of this line overlying the conducting segments **64** and the insulating material **66** respectively. The circuit is closed as the contact **60** meets the inclined leading edge **74** of the contact segments and is interrupted as the contact **60** passes off the straight trailing edges **76** thereof. Accordingly, as the rotor R is moved upwardly relative to the fixed contact **60** the interval of circuit closure is increased.

It will be recalled that in addition to the axial adjustment imparted to the rotor as a result of change in shaft speed, there was also a circumferential adjustment. The circumferential adjustment is a timing adjustment which advances and retards the spark in accordance with well understood principles.

It will of course be understood that if desired the means for effecting circumferential adjustment of the cam could be omitted and timing accomplished by suitably inclining the trailing edge **76** of the conducting segments **64**. In this case a suitable drive connection such for example as a straight spline connection between the rotor and shaft would be provided. However, the illustrated arrangement is preferred since the means for effecting the axial and circumferential rotor adjustment include independent devices which can accordingly be changed without affecting the operation of the other. Thus for example, a change in shape in the cam arm **27** will produce a change in axial adjustment of the rotor which is independent of the circumferential adjustment affected by the pin and slot connection **42**, **40** between the bracket **29** and the cam plate **20**.

The drawings and the foregoing specification constitute a description of the improved ignition distributors in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. An ignition distributor comprising a drive shaft, a rotor carried by said shaft for movement relative thereto, means carried by said shaft for adjusting said rotor axially relative to said shaft in accordance with shaft speed, a contact arm adjacent said rotor having a contact element thereon engageable with said rotor, said rotor having a cylindrical surface of insulating material, a plurality of electrically connected conducting segments set into the cylindrical surface of said rotor in circumferentially spaced relation, said segments having cylindrical contact surfaces forming a smooth continuation of the insulating cylindrical surface, said contact surfaces being tapered in a direction axially of said rotor to provide an increase in the circumferential extent of each segment and a corresponding decrease in the circumferential spacing between adjacent segments in axially spaced zones thereon.

2. An ignition distributor comprising a drive shaft, a rotor carried by said shaft for movement relative thereto, means carried by said shaft for adjusting said rotor axially relative to said shaft in accordance with shaft speed, a contact arm adjacent said rotor having a contact element thereon engageable with said rotor, said rotor having a cylindrical surface of insulating material, a plurality of electrically connected conducting segments set into the cylindrical surface of said rotor in circumferentially spaced relation, said segments having cylindrical contact surfaces forming a smooth continuation of the insulating cylindrical surface, said contact surfaces being tapered in a direction axially of said rotor to provide an increase in the circumferential extent of each segment and a corresponding decrease in the circumferential spacing between adjacent segments in axially spaced zones thereon, the leading edge of each of said segments being inclined to the axis of said rotor.

3. An ignition distributor comprising a drive shaft, a rotor carried by said shaft for rotation therewith and for axial movement relative thereto, a contact arm adjacent said rotor having a contact element thereon engageable with said rotor, means carried by said rotor to effect relative adjustment between said element and rotor axially of said shaft in accordance with shaft speed, said rotor having a cylindrical surface of insulating material, a plurality of electrically connected conducting segments set into the cylindrical surface of the rotor in circumferentially spaced relation, said segments having cylindrical contact surfaces forming a smooth continuation of the insulating cylindrical surface, said contact surfaces being tapered in a direction axially of said rotor to provide an increase in the circumferential extent of each segment and a corresponding decrease in the circumferential spacing between adjacent segments in axially spaced zones thereon.

4. An ignition distributor comprising a drive shaft, a rotor carried by said shaft for rotation therewith and for axial movement relative thereto, a contact arm adjacent said rotor having a contact element thereon engageable with said rotor, means carried by said rotor to effect relative adjustment between said element and rotor axially of said shaft in accordance with shaft speed, said rotor having a cylindrical surface of insulating material, a plurality of electrically connected conducting segments set into the cylindrical surface of the rotor in circumferentially spaced relation, said segments having cylindrical contact surfaces forming a smooth continuation of the insulating cylindrical surface, said contact surfaces being tapered in a direction axially of said rotor to provide an increase in the circumferential extent of each segment and a corresponding decrease in the circumferential spacing between adjacent segments in axially spaced zones thereon, the leading edge of each of said segments being inclined to the axis of said rotor.

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