Dec. 30, 1947. K. A. HARMON 2,433,757

DISTRIBUTOR

Filed May 22, 1946

Fig. 1.

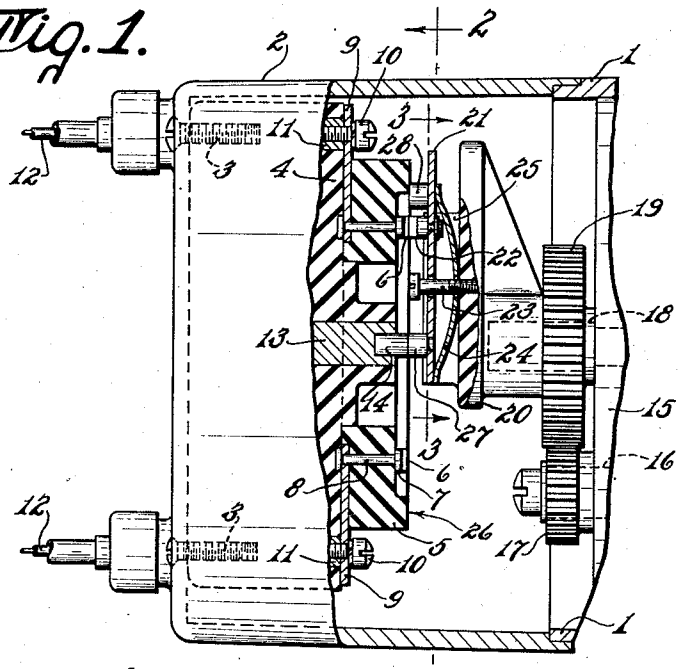


Fig. 2.

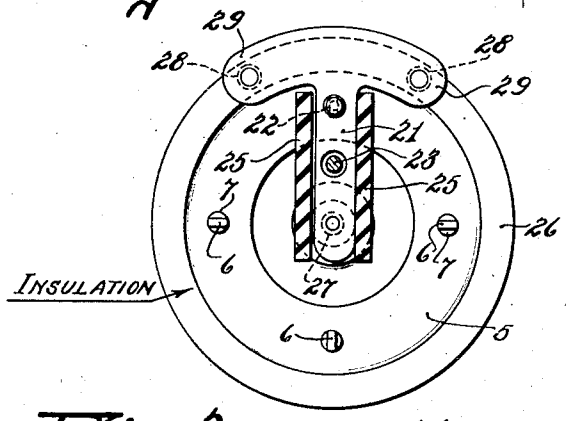


Fig. 3.

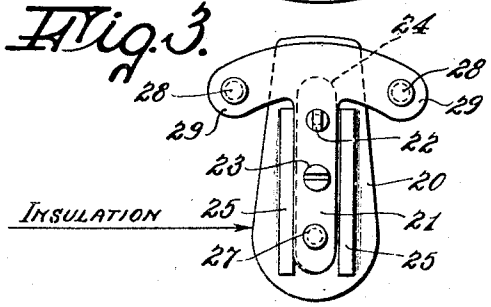
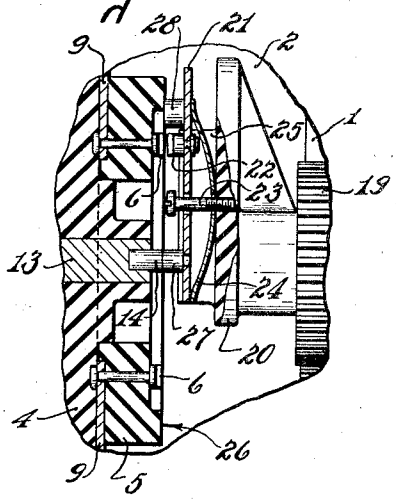


Fig. 4.



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2,433,757

DISTRIBUTOR

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Application May 22, 1946, Serial No. 671,429

5 Claims. (Cl. 200—24)

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This invention relates to improvements in distributors.

The invention is also an improvement in that disclosed in my copending application filed May 3, 1946, under Serial No. 667,069.

In common with the invention of said application, the present invention provides a distributor in which the rotatable electrode is mounted for universal movement, within ample limits, on the member which supports and drives it, and guiding means are provided to compel the active face of the movable electrode to be positioned in parallelism with the active faces of the fixed electrodes, as it successively confronts the latter during its rotation.

The invention is capable of use in ignition systems where the movable electrode successively moves into close proximity to, but does not actually engage, the fixed electrodes. It provides for the maintenance of uniform gaps between the movable electrode and the fixed electrodes. It also provides compensation for wear of the electrodes, and hence provides for gaps that will not burn away due to sparking and become greater than the desired predetermined length.

The invention is also adapted for use where contact between the movable electrode and each fixed electrode is desired, as for example, in an ignition system of the type disclosed in the application of Kenneth A. Harmon and Allen L. Brownlee, filed December 7, 1944, under Serial No. 567,092, and assigned to the assignee of the present application. In this system, a capacitor is discharged through the primary of a spark plug, transformer to induce in the secondary a high tension, high frequency current to produce the ignition spark. The capacitor discharge is at relatively low tension and the timing of the discharges from the capacitor is effected by the distributor. The invention provides for accuracy of engagement between the movable and fixed electrodes and also provides for accuracy in the timing of the discharges from the capacitor, as will hereinafter appear.

This invention has for an object to provide a different structure for accomplishing the desired results, above set forth, and a structure, which is somewhat simpler and less expensive to manufacture and is perhaps better adapted for use in distributors of relatively small size than the structure of the first-named prior application.

More particularly, the invention has for an object an arrangement of the guiding means for the movable electrode in inner and outer parts,

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which are located on opposite sides of such electrode, with at least two of the supporting brushes for the movable electrode riding on one part and at least one riding on the other part—the whole affording a three point support for the movable electrode.

A further object of the invention is to utilize as the inner part of the aforesaid guiding means, the central electrode, which makes electrical contact with the inner end of the distributor finger carrying the rotatable electrode and which is fixed in position for the guiding function.

The invention will be disclosed with reference to the accompanying drawings, in which—

Fig. 1 is an elevational view, with parts in section, of a distributor embodying the invention;

Figs. 2 and 3 are cross sectional views taken on the lines 2—2 and 3—3, respectively, of Fig. 1; and

Fig. 4 is a fragmentary view, taken similarly to Fig. 1 and showing a modification.

Referring to these drawings; there is shown in Fig. 1 a portion of the housing of an ignition apparatus, which may for example be constructed as disclosed in the copending application of Sidney K. Smart and Allen L. Brownlee, filed April 18, 1946, under Serial No. 663,098, and assigned to the assignee of the present application. The portion of the housing shown includes a main casing 1 and a cover 2. These have been broken open to reveal the distributor, which forms the subject matter of this invention.

The cover 2 has fixed thereto, as by screws 3, a support 4 for an annular ring 5 of insulating material. This ring carries a plurality of fixed electrodes 6, which are arranged around the axis of the ring (Fig. 2) and, in this case, equally spaced in a circular series coaxial with the ring. These electrodes may be fastened to the ring in any suitable way. As shown in Fig. 2, each electrode 6 consists of a rectangular strip of suitable hard metal, such as tungsten, for example, set into the head 7 of a rivet 8 (see also Fig. 1). Each rivet 8 passes through ring 5 and a conducting strip 9 and is headed over against such strip, whereby the electrodes are held to the ring. Each strip 9 is connected by a screw 10 to a metal insert 11 in the support 4, whereby the ring 5 is held to support 4. These several inserts are connected to the distribution wires 12 in the usual or any suitable manner (not shown). The support 4 also has fixed therein a metal insert 13, which is located coaxially of ring 5 and which has fixed in its outer end an electrode 14, such

for example as a brush of carbon graphite or other suitable material.

In this particular case, the center electrode 14 is part of the discharge circuit of a capacitor, contained in support 4, and the other fixed electrodes 6 are adapted to be connected one to each to the primaries of spark plug transformers, all as shown in said application. The capacitor discharges successively through said primaries. The distributor serves to time as well as distribute the discharges. The capacitor is charged to a voltage of about 1500 and the current flow through each discharge circuit is relatively heavy, say around 200 amperes.

The casing 1 has fixed therein a frame 15, in which is mounted a shaft 16, carrying a drive pinion 17. The frame also has fixed therein a stud 18 for supporting the rotatable elements of the distributor. Mounted on stud 18 is a gear 19, which is driven by pinion 17 and to which is fixed a distributor arm 20, made of suitable insulating material. Carried by arm 20 is a conducting strip, or distributor finger 21, which at its inner end electrically connects with the described fixed center electrode 14 and which carries an electrode 22 arranged to successively move into confronting relation with the fixed electrodes 6. The movable electrode 22 may be constructed in the same way as the fixed electrodes 6 and it may be secured to its finger 21 in the same way that the electrodes 6 are fixed to ring 5.

According to this invention, the distributor member 21 is mounted on the arm 20 with full freedom to be moved in any direction that may be necessary to enable the active and outer end face of the movable electrode 22 to be brought into parallelism with the active and end face of each fixed electrode 6, as it successively confronts the same. This member 21 must be free to rock, within limits, in any direction, as if on a ball and socket joint. And it must also be free to move toward and away from the fixed electrodes 6 in a general direction parallel to its axis of rotation. One way of accomplishing the results desired, is to mount the finger 21 loosely on the shank of a stud 23, which is fixed to and projects from the arm 20, and to provide a flat spring 24, which is also mounted on stud 23, for pressing the finger outwardly and away from the arm. The finger 21 will also fit between two parallel outstanding ribs 25 on arm 20, one of which will engage and drive the finger. There is enough clearance between the finger 21 and ribs 25 so that the finger can freely move in any of the directions necessary. It will be clear that the member 21 can yield axially inward relatively to stud 23 and that it can rock relatively thereto so that the plane in which the member 21 is located may lie at various angles other than right angles to the axis of the stud 23. The member 21 can wobble on the stud 23 and it is fully free within ample limits to assume positions in planes at variance with the plane in which the outer face of its supporting member 20 is located.

The positioning of the member 21 is controlled by a plurality of brushes on the member riding on suitable guiding means. As shown, these means comprise an outer part—and annular track 26 on ring 5—and an inner part—the outer end face of the fixed central electrode 14. A brush 27 fixed on the inner end of finger 21 lies coaxially, and engages the outer end face, of electrode 14. Two brushes 28, fixed one to each of two ears 29 extending from opposite sides of member 21 near its outer end, ride on the track 26. As will be clear from Fig. 2, this arrangement provides a three point support for the member 21. The spring 24 presses the several brushes against the described guides 26 and 14 and the member 21 is made to lie in a predetermined plane, which need not and may not be normal to the axis of rotation. In the form shown in Fig. 1, the brushes 27 and 28 and the movable electrode 22 are finished so that their outer faces lie in one common plane. Also, the outer faces of the fixed electrodes 6 and 14 are made to lie in the same plane as track 26. Thus, when the parts are assembled, the outer end face of the movable electrode 22 will lie in the same plane as that in which the outer end faces of the fixed electrodes 6 lie and the movable electrode will successively engage each fixed electrode accurately and squarely.

Actual contact of the movable electrode 22 with each fixed electrode 6 is not essential in all cases. It is desirable in an ignition system of the type disclosed in the second-named application because distribution is at relatively low voltage, and because the distributor serves also to time the electrical discharges. However, even in such case, it is possible to have a small gap of a few thousandths of an inch between the plane in which the outer end face of the movable electrode is located and that in which the outer end faces of the fixed electrodes are located. The invention can also be used in a system, where distribution is at high voltage and a substantial gap exists between the movable and each fixed electrode, as they move into confronting relation. Fig. 4 shows such an arrangement. This figure is exactly like Fig. 1 except for the presence of the gap described. Corresponding parts in Figs. 1 and 4 have been given the same reference numerals. In the arrangement of Fig. 4, the outer end faces of the brushes 27 and 28 will be finished at one time to lie in one common plane and the outer end of the movable electrode will be finished at the same time to lie in a parallel and adjacent plane separated from the first plane by the length of gap desired. The outer end face of the center electrode and track 26 will lie in the same plane as before.

The invention provides a mounting of the movable electrode on its supporting driving member 20, such as to enable, within ample limits, universal movement of such electrode relatively to such member. Hence, the electrode is free to move into whatever plane is ncessary for the purpose. Such plane is determined by the stationary guiding means—the track 26 and center electrode 14—and the brushes 27 and 28, which are resiliently pressed against the guiding means, furnish a three point support from the predetermined plane of the guiding means to locate the active outer end face of the movable electrode in such plane or in a plane parallel therewith.

I claim:

1. In a distributor, a rotatable driving member, a plurality of fixed electrodes disposed around the axis of revolution of said member and each having an active face, an element rotatably driven by said member, an electrode fixed to said element and having an active face adapted to successively move into confronting relation with the active faces of the fixed electrodes during rotation of said member, said element being mounted

to float on its driving member with freedom to be adjustably moved as may be necessary to enable the active face of the rotatable electrode to freely move into parallelism with the active faces of the fixed electrodes as it successively confronts the same, a plurality of brushes fixed to said element, fixed guiding means on which said brushes ride including inner and outer parts with at least one of the brushes riding on one part and at least two of the brushes riding on the other part, and resilient means for moving said element to press the brushes against the parts on which they ride, whereby to cause the active face of the rotatable electrode as it moves into confronting relation with the active faces of the fixed electrodes to be positioned in parallelism therewith.

2. In a distributor, a rotatable driving member, a plurality of fixed electrodes disposed around the axis of revolution of said member and each having an active face, an element rotatably driven by said member, an electrode fixed to said element and having an active face adapted to successively move into confronting relation with the active faces of the fixed electrodes during rotation of said member, said element being mounted to float on its driving member with freedom to be adjustably moved as may be necessary to enable the active face of the rotatable electrode to freely move into parallelism with the active faces of the fixed electrodes as it confronts the same, a plurality of brushes fixed to said element, fixed guiding means on which said brushes ride, said means including a fixed electrode located at said axis and on which one brush rides and by which electrical connection is made to the movable electrode, said means also including a circular track on which two other brushes ride, and resilient means for moving said element to press said brushes against their respective guiding means, whereby to cause the active face of the rotatable electrode as it successively moves into confronting relation with the active faces of the fixed electrodes to be positioned in parallelism therewith.

3. In a distributor, a rotatable driving member, a plurality of fixed electrodes disposed around the axis of revolution of said member and each having an exposed active face, an element rotatably driven by said member, an electrode fixed to said element and having an active face adapted to successively move into confronting relation with the active faces of the fixed electrodes during rotation of said member, said element being mounted to float on its driving member with freedom to be adjustably moved as may be necessary to enable the active face of the rotatable electrode to freely move into parallelism with the active faces of the fixed electrodes as it successively confronts the same, a plurality of brushes fixed to said element one at the axis of revolution of the movable electrode and two located radially beyond the movable

electrode and on opposite sides of a radius passing through the movable electrode, a central fixed guide engaged by the first-named brush, a fixed track surrounding the central guide and on which the two last-named brushes ride, resilient means for moving said element to press the first brush against the central guide and the other brushes against the track, whereby to cause the active face of the rotatable electrode as it successively moves into confronting relation with the active faces of the fixed electrodes to be positioned in parallelism therewith.

4. In a distributor, a rotatable driving member, a plurality of fixed electrodes disposed around the axis of revolution of said member and each having an active face, a stationary guide consisting of a circular track located coaxially of said member, another guide located at said axis, an element driven by said member and mounted thereon for universal movement within a limited range with respect thereto, said element engaged at one point with the central guide and at two points with the other guide, and resilient means for holding said element engaged with said guide at said points, whereby to cause the active face of the movable electrode as it successively moves into confronting relation with the active faces of the fixed electrodes to be positioned in parallelism therewith.

5. A distributor, comprising, a rotatable arm having on one face two outstanding ribs paralleling a radius of the arm and a stud located between the ribs and radially spaced from the axis of revolution of the arm, a plate-like element loosely mounted on said stud and between said ribs, a plurality of fixed electrodes arranged around said axis and each having an exposed active face, an electrode fixed to said element and having an active face adapted to be successively moved into confronting relation with the active faces of the fixed electrodes, resilient means between said arm and element for pressing the latter toward said faces of said fixed electrodes, a fixed stationary electrode located at said axis and electrically connecting with said element and the movable electrode thereon, a stationary circular track located coaxially of the arm, a central brush fixed to the inner end of said element and bearing on the fixed central electrode, and two brushes carried by said element and located radially beyond the movable electrode and angularly spaced therefrom and riding on said track.

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The following references are of record in the file of this patent:

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