Sept. 14, 1965 M. V. LINGENFELTER 3,206,565

IGNITION BREAKER AND DISTRIBUTOR FOR MULTI-CYLINDER ENGINES

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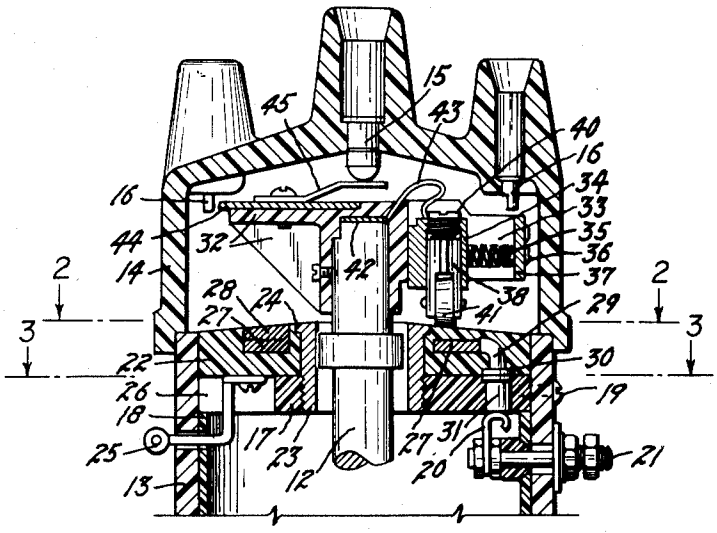

Fig_1

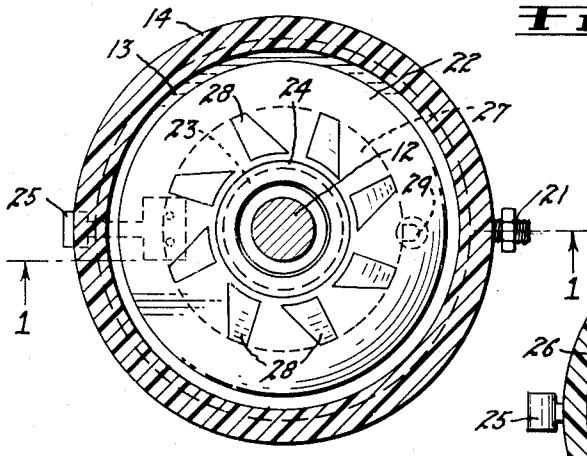

Fig_2

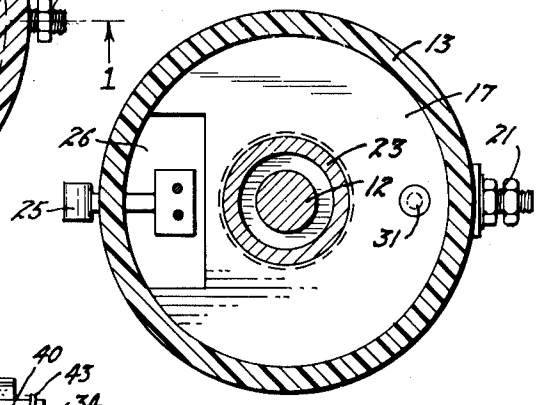

Fig_3

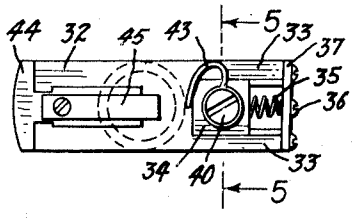

Fig_4

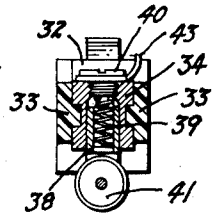

Fig_5

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IGNITION BREAKER AND DISTRIBUTOR FOR MULTI-CYLINDER ENGINES

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This invention relates to an ignition distributor for inter combustion engines. Present distributors for this use employ a breaker arm vibrated by a cam to open and close breaker points for controlling the primary current to the ignition coil. The breaker points must make and break the primary circuit for each spark occurring in the engine cylinders and due to the extreme load placed thereon by modern high speed multi-cylinder engines the breaker points rapidly burn away and become a continuous source of engine trouble. At extreme high speeds they cannot operate sufficiently fast to insure continuous uniform sparking in all cylinders and at extreme low speeds, as when starting the engine, they do not maintain the coil energized sufficiently long to provide efficient ignition.

The principal object of this invention is to provide a combined breaker and distributor for this use in which a single, simple, non-reciprocating, rotating element will serve as both the primary circuit breaker and the secondary circuit distributor so as to completely eliminate the conventional, troublesome, and inefficient cams, breaker arms and breaker points of present engines.

A further object is to provide a distributor in which the primary current impulses will be automatically controlled to provide a relatively long energization or "dwell" at low speeds and a proportionately shorter dwell as the speed increases to provide better starting characteristics and to provide accurately timed sparks in all cylinders at any desired maximum speeds.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is made to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

FIG. 1 is a vertical, axial, section through the upper portion of a combined breaker and distributor, taken on the line 1—1, FIG. 2, with the invention in place therein;

FIG. 2 is a horizontal cross section looking downwardly on the line 2—2, FIG. 1;

FIG. 3 is a similar cross section taken on the line 3—3, FIG. 1;

FIG. 4 is a detail view of a rotor element employed in the improved distributor, to be later described; and

FIG. 5 is a cross section through the rotor element, taken on the line 5—5, FIG. 4.

A distributor shaft is shown at 12 extending axialy upward in an insulated housing 13 closed at its top by means of an insulated cap 14 provided with a central common secondary electrode 15 and with spark plug electrodes 16. The shaft 12, the housing 13 and the cap 14 are similar to those used on present conventional distributors. This invention is mounted on the conventional shaft 12 within the conventional housing 13 and cap 14.

The invention is applied to the housing 13 by inserting a circular, fixed, insulating disc 17 in the upper extremity of the housing against an internal supporting shoulder 18 with which said housings are provided. The disc 17 is fixed against rotation in any desired manner such as by means of suitable attachment screws or set of screws 19. The fixed disc 17 corresponds in diameter to

the inner diameter of the housing and is provided with a contact plug 31 extending vertically therethrough which makes electrical contact with a flexible contact blade 20 on a primary terminal post 21 extending through the housing 13.

A similar, circular, insulated contact disc 22 is positioned on the fixed disc 17 within the upper extremity of the housing and is rotatably clamped to the fixed disc by means of a tubular bushing 23 provided with an upper retaining flange 24, which is clamped against the disc 22 by threading the bushing into the fixed disc 17. The contact disc is provided with a shift arm 25 secured thereto and extending downwardly therefrom through a cutaway 26 in the disc 17 thence outwardly through a suitable horizontally elongated opening in the wall of the housing 13 for connection to a conventional automatic spark advance mechanism.

An annular conductor ring 27 is imbedded in the insulating material of the contact disc 22. A plurality of primary contacts 28, corresponding to the number of engine cylinders, are formed on and extend upwardly from the ring 27 so as to be exposed on the upper surface of the contact disc 22. A conductor 29 is imbedded in the disc 22 electrically connecting the ring 27 to a contact 30 on the bottom of the disc 22 which, when the discs are in place, contacts the contact plug 31 to establish a circuit from the terminal post 21 to all of the contacts 28.

A diametrically elongated rotor element 32, of molded plastic or similar electrical insulating material, is mounted on and affixed to the upper extremity of the distributor shaft 12. The rotor element is formed with a radially-extending, dove-tailed slide box 33 in which a metallic, dovetailed, slide block 34 is radially slidable.

The slide block 34 is constantly and resiliently urged toward the axial extremity of the slide box by a horizontal compression spring 35 which is compressed between the slide block 34 and a pressure adjusting screw 36 threaded through a head piece 37 removably mounted on the outer extremity of the slide box.

A splined, non-rotatable, metallic, roller plunger 38 is mounted for vertical sliding movement in the slide block 34 and is constantly urged downwardly therein by a vertical compression spring 39 which reacts against a threaded spring plug 40. The plunger 38 carriers a rotatable, metallic, contact roller 41 at its lower extremity which makes successive electrical contacts with the primary contacts 28 as the shaft 12 rotates.

It can be seen that the slide block 34 will be centrifugally urged outwardly against the bias of the spring 35 as the shaft 12 rotates. The degree of radial movement of the block will be proportional to the speed of the shaft. Therefore, the circular path of contact of the roller will increase in diameter as the speed increases and will reduce in diameter as the speed lessens.

A grounding contact element 42 is positioned in the rotor element against which the shaft 12 electrically contacts. A flexible ground conductor 43 extends from the grounding contact element to the slide block 34 to electrically ground the contact roller 41.

It can now be seen that if the shaft 12 and the terminal 21 be connected in a battery-energized primary circuit to a conventional spark coil and condenser, the said primary circuit will be energized whenever the contact roller 41 rolls into contact with one of the primary contacts 28. The primary circuit will remain closed for the length of time required for the roller to roll completely across each contact 28.

The contacts 28 are shaped to provide contact durations of maximum efficiency. It will be noted that the trailing edge of each contact is accurately radial to the

axis of the shaft 12 so that the time of circuit opening is uniform regardless of the radial position of the contact roller. The leading edge of each contact is inclined, however, to provide an earlier contact and a contact surface of greater width at its axial extremity than at its circumferential extremity. Thus, at slow speeds, as when starting, the dwell or spark duration will be relatively long due to both the slower travel of the roller and the greater width of contact so as to full charge the condenser and produce a long continuous spark to facilitate starting. At high speeds the dwell will be relatively short but positive so that all cylinders will be accurately fired regardless of speed.

The elements of the invention as thus far described relate to the primary coil circuit. The secondary current is distributed similarly to the present distributors, that is, an electrode 44 is mounted on top of the rotor element in opposed relation to the slide box 33. The electrode 44 rotates in closely spaced relation to the spark plug electrodes 16 so as to allow the secondary current to jump to the electrodes 16 as the electrode 44 passes. The secondary current is supplied to the rotating electrode 44 through a contact spring 45 which axially contacts the common secondary electrode 15 similarly to present distributors. In this case however the single rotor element 32 serves as both a secondary distributor and as a primary breaker.

The upper surface of the contact disc 22 and the corresponding surfaces of the primary contacts 28 could lie in a flat horizontal plane and the contact surface of the contact roller 41 could be cylindrical. Such an arrangement, however, causes friction between the roller surface and the contacts due to the fact that the outer edge of the roller is travelling a longer path than the inner edge yet both edges are integral.

The friction is avoided in the present invention by conically including the upper surface of the contact disc 22 and the upper surfaces of the contacts 28 and correspondingly conically inclining the rolling surface of the roller 41 so the outer edge of he roller will have a greater diameter than the inner edge so that it will cover the longer outer path without slippage or friction.

While the use of a roller as a sweeping contact element reduces friction it is to be understood that the roller could be replaced by any type of brush element which would sweep across and make successive contact with the contacts 28.

While a specific form of the invention has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention what is claimed and desired to be secured by Letters Patent is:

1. An ignition breaker and distributor for a multi-cylinder engine comprising: a distributor shaft; a stationary electrically insulated contact disc surrounding said shaft in a plane at right angles thereto; a concentric, annular series of electrically connected contacts exposed on one side of said disc corresponding in number to the number of cylinders in said engine; a rotor element mounted on said shaft adjacent said one side; a contact roller carried by said rotor element in rolling contact with said contacts to successively close an electric circuit through said contacts; means for connecting said contacts and said roller in series in a primary electrical circuit; resilient means urging said roller into engagement with said contacts; a radially extending slide element in said rotor element; a slide block slidably mounted in said slide element, said roller and said resilient means being mounted in said slide block; spring means urging said slide block toward the axis of said rotor element so that centrifugal action will move said slide block radially outward against the bias of said spring means to increase the radius of travel of said roller on said contact disc, said contacts being radially elongated to accomodate the increased radius of travel and being of greater circumferential width adjacent the axis than adjacent the periphery of said disc; an annular series of stationary secondary electrodes surrounding said rotor element corresponding in number to the number of said contacts; a rotating electrode eccentrically mounted on said rotor element so as to rotate in close proximity to said secondary electrodes; and means for placing said rotating electrode and said secondary electrodes in a secondary electrical circuit.

2. An ignition breaker and distributor in claim 1 having a second stationary insulating disc positioned below and rotatably supporting said contact disc.

3. A multi-cylinder, ignition breaker and distributor for mounting in a vertical distributor housing surrounding a distributor shaft and provided with a horizontal shoulder adjacent its top comprising: a fixed insulating disc resting on and supported by said shoulder; a contact disc of insulating material resting on said fixed disc; a tubular bushing surrounding said shaft and acting to clamp said discs together; means for rotating said disc relative to said fixed disc; an annular metallic conducting ring concentrically imbedded in said contact disc; a plurality of circumferentially spaced apart contacts formed on and projecting upwardly from said ring to the plane of the upper surface of said contact disc; a rotor mounted on and insulated from said shaft above said contacts; an electrical conducting element mounted on said rotor in contact with the upper surface of said contact disc so as to make successive contact with said contacts as said shaft rotates; an electrical conductor between said distributor shaft and said conducting element; and means for conducting an electrical current to said ring.

4. A multi-cylinder, ignition breaker and distributor as described in claim 3 having a radially movable element in said rotor, said electrical conducting element being carried by said radially movable element so as to move radially therewith.

5. A multi-cylinder, ignition breaker and distributor as described in claim 4 having spring means resisting the radial movements of said radially movable element.

6. A multi-cylinder, ignition breaker and distributor as described in claim 5 in which the electrical conducting element comprises a freely rotatable electrical conducting roller positioned in a plane tangent to the axis of said shaft.

7. A multi-cylinder, ignition breaker and distributor as described in claim 6 in which the roller has a conical rolling surface with the larger diameter positioned distant from the axis and in which the contact disc and the contacts thereon be in a conical plane corresponding to the conical plane of the roller.

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(1st addition to Patent No. 546,082)

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