May 15, 1928.

1,669,806

R. B. BRETZ

COMMUTATOR

Filed Nov. 13, 1925

Fig. 1.

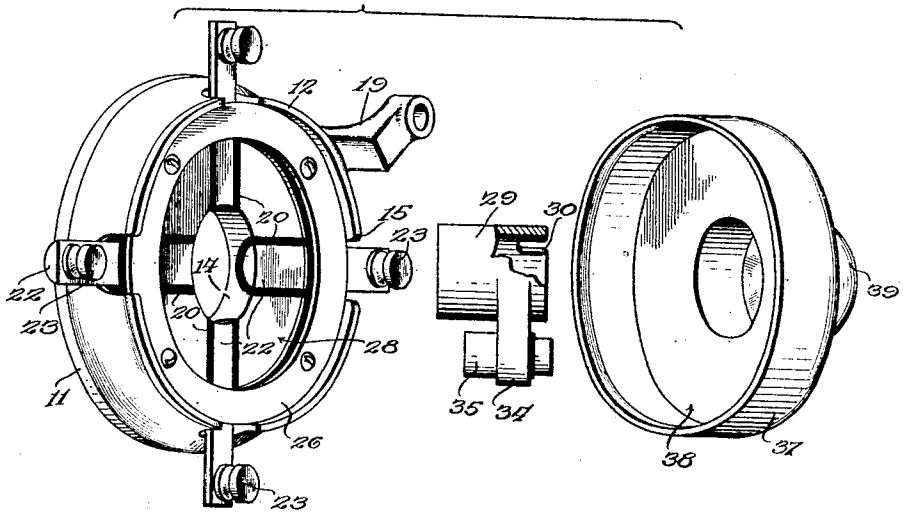


Fig. 2.

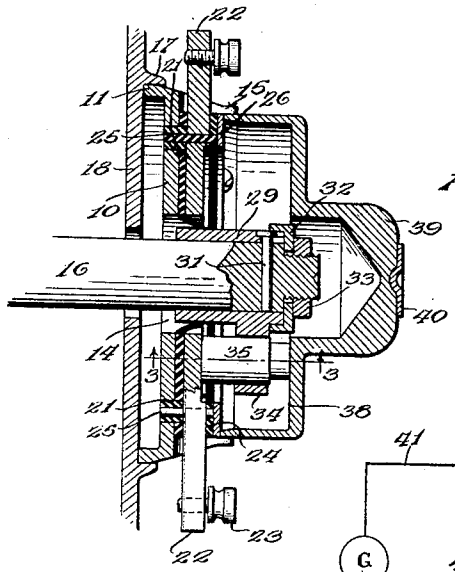


Fig. 3.

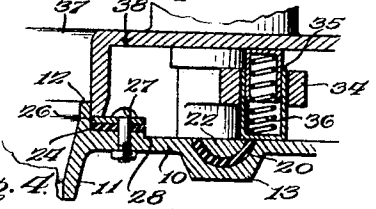
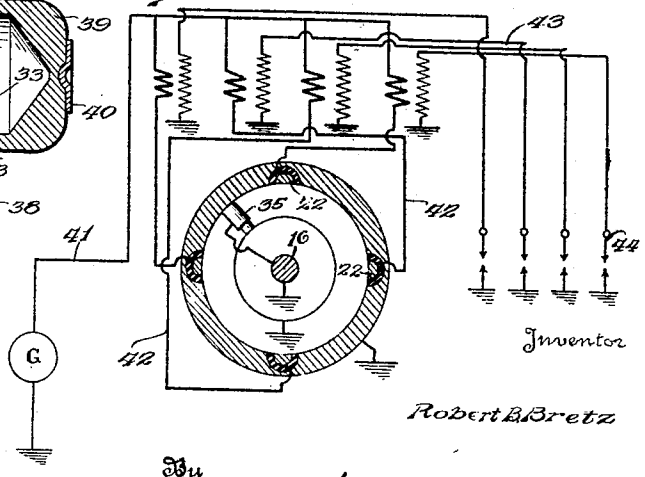


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROBERT B. BRETZ, OF EL RENO, OKLAHOMA, ASSIGNOR OF ONE-HALF TO ARTHUR C. SCHROEDER, OF SYRACUSE, NEW YORK.

COMMUTATOR.

Application filed November 13, 1925. Serial No. 68,903.

This invention relates to an improved commutator particularly designed for use in connection with Ford engines, and seeks, among other objects, to provide a device of this character wherein the usual troubles of imperfect circuit closing and consequent time lag, shorting, oil fouling, and premature failure as now commonly experienced in connection with prevalent commutators for Ford engines, will be eliminated.

The invention seeks, as a further object, to provide a commutator wherein the primary ignition circuit will not only be closed through the timer shaft, as in ordinary commutators, but will also be closed directly through the engine block.

Still another object of the invention is to provide a commutator wherein the brush employed will, at each of the energized contacts of the device, function to bridge the gap between the contact and the electrically grounded base of the device, as the brush moves onto the contact, and will likewise function to bridge the gap between each contact and the base as the brush moves off the contact, and wherein the brush will be constantly grounded to the base so that arcing of the current as well as pitting and burning of the contacts and brush will be minimized.

A further object of the invention is to provide a device wherein the brush will be confined between confronting electrically grounded raceways to coact therewith and wherein the brush will be mounted to revolve about its own axis against said raceways so that the contact surfaces of the brush will be maintained bright and clean.

And the invention seeks, as a still further object, to provide a device wherein the brush will be mounted to float upon the rotor of the commutator so that movement of the rotor, due to any end play or lateral play in the timer shaft, will not dislocate the brush.

Other objects of the invention not specifically mentioned in the foregoing will appear during the course of the following description.

In the accompanying drawings:

Figure 1 is a perspective view of my improved commutator showing the parts disassembled but in proper relative position.

Figure 2 is a vertical sectional view showing the device applied.

Figure 3 is a detail sectional view on the line 3—3 of Figure 2, looking in the direction indicated by the arrows.

Figure 4 is a diagrammatic view showing the commutator in connection with the primary and secondary ignition circuits of a Ford engine.

In carrying the invention into effect, I employ a circular base having a bottom wall 10, and extending rearwardly from said wall is a surrounding skirt 11 while a peripheral flange 12 extends forwardly from said wall. Integral with the wall 10 are quadrantly spaced radial channels 13 connected at their inner ends by an annular flange 14 defining a central opening through the base, and formed in the flange 12 at the outer ends of said channels are notches 15. As shown in Figure 2, the central opening of the base is of a diameter to freely receive the usual Ford timer shaft, as conventionally illustrated at 16, while the skirt 11 of the base is of a diameter to snugly fit within the usual centering flange 17 on the transmission gear case 18 of the engine. The base is preferably of bronze. although brass, copper, or any other suitable material may be employed, and projecting from the base at one side thereof is a preferably integral arm 19 to which the usual control rod is connected for rotating the base to advance and retard the instant of firing.

Lying in the channels 13 of the base are trough-shaped insulating bushings 20, and extending through said bushings and through the bottom walls of the channels 13, as particularly seen in Figure 2, are sleeves 21 locking the bushings in position. Lying in the bushings 20 are substantially semi-cylindrical contacts 22 which are freely accommodated through the notches 15 of the flange 12 to project radially with respect to the base, and mounted upon the outer ends of said contacts are binding screws 23 for connecting the usual circuit wires thereto. Fitting snugly within the flange 12 of the base to overlie the contacts 22 is an insulating ring 24 and extending through said ring and through the contacts are insulating locking pins 25 accommodated by the sleeves 21 for securing the contacts against endwise movement. Overlying the insulating ring 24 is a metal clamping ring 26, and extending through said rings and through the wall 10 of the base, as seen in Figure 3, are bolts

or other fastening devices 27 tightly binding the contacts in position. Thus, as will be perceived, the contacts are clamped between the bushings 20 and the ring 24 and are thus effectively insulated with respect to the base to prevent short circuiting. At the inner peripheries of the rings 24 and 26, the contacts are stepped to lie flush with the outer face of the wall 10 of the base and cooperate therewith to define an annular raceway 28.

Mounted upon the forward end of the timer shaft 16 is a rotor including a sleeve 29 which slidably fits over the shaft, and formed in said sleeve is a notch 30 to accommodate the usual locking pin 31. Encircling the sleeve to overlie the head of said pin is the usual retaining cap 32, and screwed on the forward end of the shaft is the customary nut 33 securing the rotor upon the shaft. Projecting radially from the sleeve 29 of the rotor is an arm 34, and mounted to float upon said arm is a brush 35 which, as shown in Figure 3, is composed of tubular telescopic sections closed at their outer ends and slidably fitting one within the other to house a spring 36 pressing the sections apart. As will be observed, the arm 34 is formed near its outer end with an opening to freely receive the larger section of the brush and preferably the rotor and brush are formed of the same material as the base.

Snugly fitting within the flange 12 of the base is a cap 37 which rests against the clamping ring 26 and is stepped to define an annular raceway 38 from which rises an axially disposed dome 39. The dome is of an internal diameter to freely accommodate the forward end of the shaft 16 and associated parts thereon, and bearing at one end against the dome is the usual spring arm 40 clamping the cap and base in assembled relation as well as holding the base seated within the flange 17 of the timing gear case of the engine. Thus, as will be seen, the brush is confined between the raceways 28 and 38 to seat flat at its ends thereagainst while the spring 36 is compressed for holding the ends of the brush in firm contact with said raseways.

As will now be readily understood in view of the foregoing, the brush 35 will, as the timer shaft 16 rotates, be caused to ride at its inner end over the contacts 22 for closing a circuit through said contacts successively, and in Figure 4 of the drawings, I have diagrammatically shown the commutator in connection with the usual primary and secondary circuits of a Ford ignition system. Extending from the engine magneto to connect with corresponding terminals of the primary windings of the usual coils, is a wire 41, and connecting the opposite terminals of said windings with the several contacts 22 are wires 42, while wires 43 connect the secondary windings of said coils with the several spark plugs, indicated at 44. Thus, as the brush travels over each of the contacts 22, a circuit through the primary winding of the corresponding coil is closed through the wire 41 and one of the wires 42 so that current is caused to flow through the secondary winding of said coil and through one of the wires 43 and a corresponding spark plug to effect ignition.

As will be perceived, the brush 35 is permanently grounded at its outer end through the raceway 38, cap 37, and the base of the commutator, direct to the engine block while the inner end of the brush is likewise directly grounded intermittently to the engine block through the raceway 28 of the base. Accordingly, as the inner end of the brush moves onto any one of the contacts 22, as suggested in Figure 3, a circuit will be closed through the outer end of the brush to the raceway 38 and thence through the cap and base to the engine block, while at the inner end of the brush a portion of the end face thereof will overlie the contact and another portion of said face overlie the raceway 28 for bridging the gap between said contact and the latter raceway and closing the circuit through the inner end of the brush, the later raceway, and through the base 10 to the block. Like conditions will, of course, prevail as the brush leaves each contact. The brush thus provides a grounded double-contact connection in the circuit and by bridging the circuit at the inner end of the brush, it has been found that arcing, burning, and pitting of the parts is minimized. Furthermore, attention is directed to the fact that since the brush is loosely mounted on the arm 34 of the rotor, the ends of the brush will, as said arm revolves, frictionally coact with the raceways for causing the brush to rotate about its own axis. This individual rotation of the brush will, of course, be entirely automatic so that the end surfaces of the brush will be constantly smoothed, flattened, and cleaned by the grinding action thereon set up by the rotation of the brush, while any given points on said surfaces will coincidently be caused to change their radial position in the circular tracks on the raceways of the brush ends to prevent scoring of said raceways. Thus, assuming that a crater should be formed on the inner end of the brush, the crater would be immediately ground off while, due to the local circular travel imparted to the crater by the individual rotation of the brush, the crater would be prevented from scratching a circular groove in the raceway 28. Likewise, should any foreign substance, such for instance as a particle of dust, become disposed beneath either end of the brush, such substance would be immediately thrown out by the individual

rotation of the brush. The brush will thus always function to effectively close the low tension circuit through the usual induction coils of the ignition system so that the time lag, which would otherwise be experienced through faulty functioning of said coils, will be avoided.

Since the raceway 28 faces forwardly at a right angle to the axis of the timer shaft, oil fouling of this raceway will be greatly minimized and even though the raceway 38 faces inwardly, it has been found that, due to the protected position of this latter raceway, in parallel relation to the former raceway, oil fouling of the latter raceway is also largely minimized. Either raceway may be readily cleaned simply by removing the cap 37, and should either of the raceways become worn, said raceways may be readily turned to a flat surface, it being observed that in order to thus turn the raceway 28, removal of the contacts 22 and associated parts is unnecessary. The device will thus provide almost a permanent accessory, save perhaps an occasional renewal of the brush.

As is well known, a certain amount of side and end play often develops in the timer shaft of a Ford engine and since, in the usual commutator, the brush is rigidly connected with the timer shaft, such side and end play directly affects the functioning of the commutator. However, in the present device, side play of the timer shaft will only vary the path of travel of the brush between the raceways and, due to the loose mounting of the brush, cannot affect the action thereof. Likewise, when the shaft shifts endwise, the brush will remain in engagement with both raceways while the arm 34 will slide along the brush to accommodate the endwise movement of the shaft. I thus provide a very efficient construction for the purpose set forth and while I have illustrated and described the preferred embodiment of my invention in connection with a Ford engine, still, as will be appreciated, various changes in structural details may be made while the device may also be easily adapted for use in connection with engines of other makes and I do not, therefore, wish to be limited in these respects but reserve the right to all variations and modifications of the invention as may fall within the spirit of the appended claims.

Having thus described the invention, what I claim is:

1. A commutator including a base having a raceway, contacts located in said raceway, insulating means seating the contacts and insulating said contacts with respect to the raceway, insulating means overlying said contacts, a ring overlying the last-mentioned insulating means and clamping the contacts between said two insulating means, and circuit closing means movable over said raceway to successively cooperate with said contacts.

2. The combination with an engine block and a timer shaft, of a commutator operatively associated with said shaft and including spaced raceways, one of which is electrically grounded to the engine block, a contact located in one of said raceways, and a brush consisting of tubular sections telescopically fitted together and yieldably held extended to coact with said raceways and driven by the timer shaft for intermittently closing a circuit through said contact, said brush having constant ground connection through said grounded raceway with the engine block.

3. A commutator including a base provided with a raceway electrically grounded, a contact located in said raceway but insulated therefrom, a cap mating with the base and provided with a raceway electrically grounded through said cap and base, an arm provided with an opening, an a lineally expansible brush slidably fitting through said opening and confined between said raceways to coact therewith, said brush being movable for intermittently closing a circuit through said contact, said brush having constant ground connection through the latter raceway.

In testimony whereof I affix my signature.

ROBERT B. BRETZ. [L. S.]