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APPARATUS FOR REMOVING OXIDES AND PREVENTING PITTING OF ELECTRICAL CONTACTS

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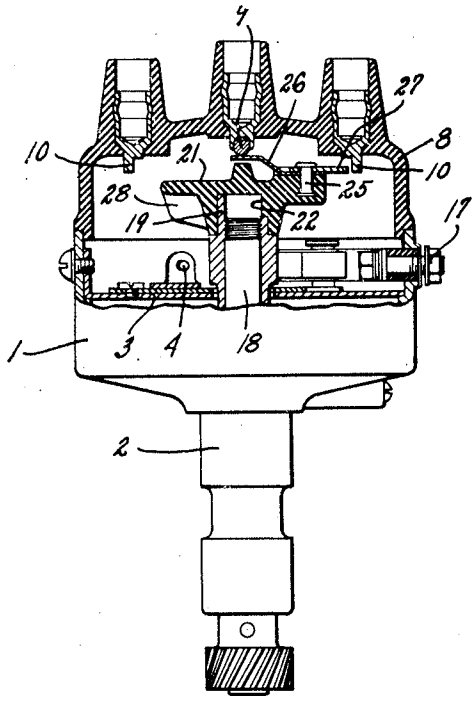


FIG. - 1

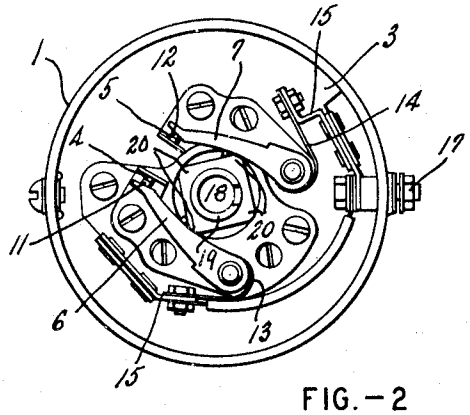


FIG. - 2

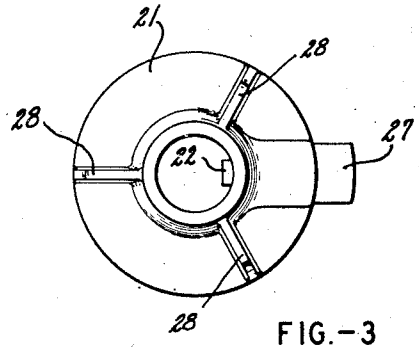


FIG. - 3

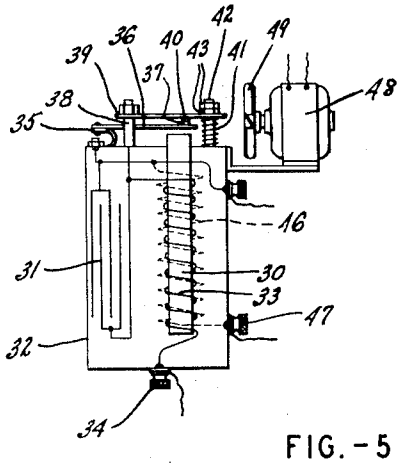


FIG. - 5

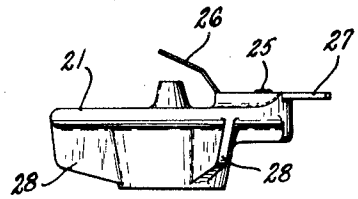


FIG. - 4

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APPARATUS FOR REMOVING OXIDES AND PREVENTING PITTING OF ELECTRICAL CONTACTS

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3 Claims. (Cl. 200—19)

My invention relates to an improved apparatus for preventing or minimizing the oxidation and pitting of electrical contacts utilized in electrical systems in which an arc is formed or in which the contacts are moved to make or break a circuit, and more particularly to apparatus for agitating, stirring or moving the air in the vicinity of such contacts to remove oxides which are formed and to prevent localizing or centering of the electric arc.

In electrical systems in which an arc is formed or in which contacts are repeatedly made and broken, such as those employed in the automotive industry, considerable difficulty has been experienced because of the pitting of the contacts or the formation of oxides upon the surface of such contacts. When such oxides are formed, their deleterious effect is accentuated by the constant making of the contacts which hammers the oxide into the surface of the contact, thereby roughening the surface which decreases the area of contact and increases the electrical resistance.

The oxidation of electrical contacts in the automotive industry in which the contacts are repeatedly made and broken to supply the ignition spark is of particular annoyance because it decreases the efficiency of the engine and necessitates frequent cleaning and filing of the contacts.

To prevent the oxidation of the contacts, it has therefore been the practice of ignition engineers to maintain the contacts as free from air and moisture as possible. The casing in which the contacts operate has therefore been maintained as nearly air-tight as the construction would permit which required accurate machining processes.

In almost direct contradistinction to this theory, however, I have made the discovery that by agitating or moving the air in the vicinity of the contacts, oxides which are formed upon the surface of the contacts will be removed. The circulation or movement of the air also cools the contacts and tends to prevent the centering or localizing of the arc for long periods upon a particular spot on the contact. Overheating and pitting particular spots on the contacts consequently is prevented.

It is therefore an object of my invention to provide an improved means for preventing the oxidation and the pittting of electrical contacts in electrical systems in which the contacts are utilized in forming electrical arcs or in making or breaking electrical circuits.

Another object is to provide an improved means in which the air in the vicinity of contacts utilized in forming an arc or making or breaking an electrical circuit is agitated or circulated to remove oxides and prevent the centering of the arc in any one particular point upon the contact surface.

A further object is to provide means in combination with electrical contacts in which an arc is formed or electrical contacts are made and broken for moving, stirring or circulating air to remove any oxides which are formed upon the contacts and to prevent the centering or localizing of the arc.

Another object of the invention is to provide an improved means for agitating or moving the air in the vicinity of electrical contacts utilized in automotive ignition systems, to maintain the contacts substantially free from oxides and to prevent or minimize pitting of the contacts.

A still further object of my invention is to provide an improved distributor arm or rotor which is effective in stirring or moving the air in the vicinity of the electrical contacts which are normally maintained closed and which are opened by the movement of a cam on the timer shaft.

My invention will be better understood when taken in conjunction with the accompanying drawing in which

Fig. 1 is an elevational view partly in section of a distributor-timer unit;

Fig. 2 is a plan view of the apparatus shown in Fig. 1 with the head and rotor removed;

Fig. 3 is a lower plan view of the rotor or distributing arm;

Fig. 4 is a side elevational view of the rotor; and

Fig. 5 is an elevational view of an ignition coil for making and breaking electrical contacts, and a motor driven fan for circulating the air, the electrical connections being shown diagrammatically.

Referring to the drawing, Fig. 1 discloses a breaker-distributor assembly comprising a casing 1 provided with a tubular base 2, a support 3 for stationary contacts 4 and 5 and breaker arms 6 and 7, and a distributor head 8 provided with a central distributor terminal 9 which leads to one terminal of a secondary winding and a plurality of high tension terminals 10 arranged around the outer periphery of the distributor head and in spaced relationship to each other. In ordinary practice each of the high tension terminals 10 are connected to a spark plug and

from thence to the other terminal of the secondary winding.

The breaker arms 6 and 7 are also provided with contact points 11 and 12 which are normally maintained in engagement with stationary contacts 4 and 5 by means of springs 13 and 14 which are fixed to supports 15, both of which lead to the terminal 17 which under ordinary practice is connected to one terminal of the battery through the primary coil, the stationary contacts being grounded through the engine frame to the other terminal of the battery. The electrical connections are not shown as they are well known to those skilled in the art and do not constitute any part of the present invention.

Extending upwardly through the base 2 is a timer shaft 18 which may be driven by a separate shaft or by a spiral gear on one end of the generator shaft. A cam shaft 19 threaded to the timer or distributor shaft and rotatable therewith has four lobes 20 which during the rotation of the shaft 18 serve to selectively break the contacts. Fitted upon the cam shaft 19 is my improved distributor rotor 21 which is provided with a lug 22 for engaging a recess in the cam shaft, thereby preventing movement of the rotor with respect to the cam shaft. As illustrated, the rotor and distributor are made of electrical insulating material, such as a molded composition bound together with a phenolic condensation product. Formed upon the upper surface of the rotor and attached to the rotor by means of a stud 25 is a spring contact 26 which engages the central distributing contact 9 and a contact 27 which selectively comes in close proximity to the contacts 10 during the movement of the distributing arm as contacts 4 and 11 or contacts 5 and 12 are broken.

In accordance with my invention the rotor is provided with a fin or blade or a plurality of fins or blades 28 which extend downwardly and are mounted upon the rotor 21. The fins may be molded directly to the rotor 21 or may be attached by any suitable means such as rivets. These fins attached to the rotor serve to agitate or circulate the air inside of the casing and oxides which are formed during the engagement and breaking of contacts 4 and 11 and contacts 5 and 12 are removed. The circulation of the air also serves to prevent centering of the arc between the contacts thereby preventing localizing of the arc. The fin or fins upon the distributing arm or rotor also serve to remove the oxides caused by the formation of an arc between contacts 27 and 10, thereby decreasing the resistance in the secondary circuit.

My invention is particularly adaptable for use when the contacts are formed of tungsten or tungsten alloys although it will be understood that I do not desire to limit my invention in this respect as the contacts may be formed of copper alloys, such as brass, platinum-iridium or other metals or alloys. Tungsten is especially suitable in the automotive industry because of its extreme hardness which withstands the hammer blows caused by the high spring tension which is necessary in high speed interrupters to prevent chattering and to obtain good contact at the surface. Tungsten, however, has a tendency to oxidize readily which increases the resistance of the primary circuit. In former practice when tungsten contacts were employed with an electromotive force of 6 volts, the coils in the primary circuit were wound to provide a current of 1½ to 2¼ amperes because the performance of the contacts was not satisfactory with a higher amperage. It was therefore the practice to limit the current to a value less than 2¼ amperes and preferably less than 2 amperes. By preventing pitting and constantly removing the oxides from the contacts however a current value of 4 amperes may be provided in the primary circuit with an electromotive force of 6 volts without adversely affecting the contacts. When the current is broken in the primary circuit a much higher voltage may therefore be provided in the secondary circuit. A better spark will therefore be provided in the ignition chamber. This is of considerable advantage in high compression motors because a higher voltage is necessary to force the spark across the terminals of the spark plug.

In Fig. 5 of the drawing, a fan propelled by a motor is utilized for moving the air in proximity to the make and break contacts of a vibrator coil. In this figure, a core 30 and a condenser 31 are shown enclosed in a casing 32. The core is surrounded by a primary winding 33 connected to a terminal 34. Supported upon the casing is a stud 38 which supports one end of an arm 39 provided with a contact 40. The other end of arm 39 is supported by a spring 41 surrounding a stud 42 which is provided with adjustable nuts 43 by means of which contacts 37 and 40 may be maintained in the proper relative position. In the operation of the coil, current from a suitable source of potential is passed through the primary circuit 33, stud 38, arm 39, contacts 37 and 40, support 35 to the primary terminal. The magnetizing of core 30 draws the arm 36 in contact with the core, thereby breaking the primary circuit. When the primary circuit is broken, a current is induced in the secondary coil 46, the terminal 47 of which may be attached to a spark plug or other device. Core 33 then demagnetizes and arm 36 assumes its original position with contacts 37 in engagement with contact 40. In this structure I have shown a motor 48 operating a fan 49 which removes any oxides which are formed on the contact and prevents the arc from becoming centered or localized in one particular spot.

While I have described my invention as being applied to moving or stirring the air in proximity to contacts which are made and broken to induce a spark in a secondary coil, it will be understood that I do not desire to limit my invention in this respect because it may be utilized in various applications, such as alternating or direct current rectifiers for radio or industrial purposes or any type of apparatus where contacts are made or broken or in contacts of the open type where an electric arc is formed between the contacts.

From the foregoing description, it will be seen that I have provided an improved process for removing oxides formed during the making and breaking of contacts which also prevents localized pitting of the contacts. My improved process is not only effective in removing the oxides as they are formed but is also effective in removing oxides which have previously been formed upon the contacts. For instance, if a tungsten contact which has been oxidized is placed in service in an electrical ignition system and air is blown or circulated in proximity to the contacts, the oxides will be removed. It is also apparent that by preventing pitting of the contacts in service they will have a longer life and will be much more efficient.

To those skilled in the art many modifications

of and widely differing embodiments and applications of my invention will suggest themselves without departing from the spirit and scope thereof. My disclosure and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In combination, a pair of contacts containing tungsten which are adapted to be connected in an electrical circuit, means including an interrupter for intermittently opening and closing said contacts to make or break the electrical circuit, said contacts and interrupter being mounted in a closed casing, and blade means operable coincidently with said interrupter for moving sufficient air in said casing between said contacts while they are opening to remove volatile oxides formed by the arc created by back electromotive force when the circuit is being opened and to prevent localizing of the arc between the same spots on said contacts.

2. In combination, a pair of contacts formed of a metal or alloy containing tungsten, surface particles of which volatilize in air to form oxides when hot, said contacts being adapted to be connected in an electric circuit, means including an interrupter for intermittently opening and closing said contacts to make and break the electrical circuit, said contacts and interrupter being mounted in a closed casing, and a rotor associated with said interrupter having blades arranged to move sufficient air between said contacts to remove oxides formed by the arc created by back electromotive force while the contacts are opening and to prevent localizing of the arc between the same spots on the contacts.

3. In combination, a pair of contacts formed of a metal or alloy containing tungsten and being adapted to be connected in an electrical circuit, a closed casing, said contacts being arranged in said casing, means including a rotatable interrupter arranged in said casing for closing and opening said contacts to make and break the electrical circuit, a rotor secured to and rotatable with said interrupter, said rotor being located in said casing above said contacts and having a substantially flat top portion and a plurality of downwardly extending blades, whereby when said interrupter is rotated to break the electrical contacts air is moved downwardly between said contacts in a sufficient amount to remove volatile oxides which are formed by the back electromotive force when the contacts are broken and to prevent localizing of the arc between two points on the contacts.

LUTHER E. OBERDICK.