

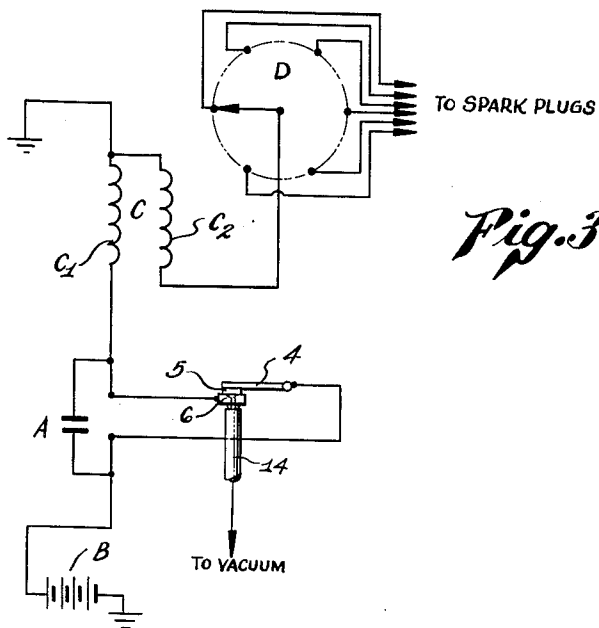
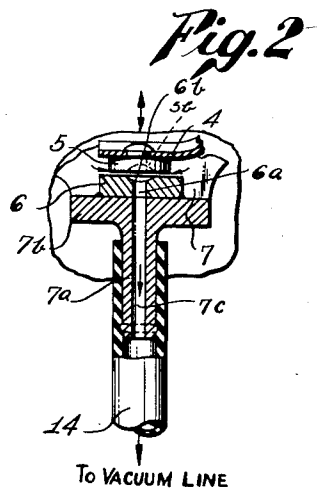
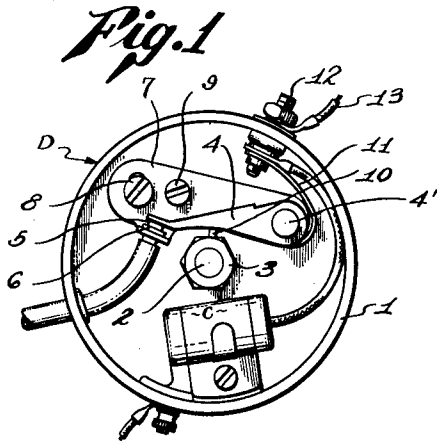
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CONTACT DEVICE FOR ELECTRIC CIRCUITS

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CONTACT DEVICE FOR ELECTRIC CIRCUITS

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This invention relates in general to electric systems including positive make and break devices for respectively closing and opening a circuit, but particularly applicable to ignition systems for internal combustion motors such as are used on automotive vehicles, and has for an object the provision of improved contact or breaker points adapted to distributors embodied in the ignition circuits of such motors for successively applying energy at timed intervals to the spark plugs associated with a plurality of cylinders, and by combustion thereby regulating and effecting the application of power to the several pistons in predetermined sequence.

An object is to provide a set of contacts particularly adapted to automotive and aeromotive ignition systems and so arranged that the contacts will be held positively engaged during circuit closing intervals by the application of a force supplemental to that of the usual springs; the surfaces of the contact elements will at all times remain clean and free of accumulations or pits; rebound of the movable contact will be prevented or at least minimized at high speeds in their hammer- and anvil-like operations; will permit closer setting of the contacts than ordinarily; and more time will be afforded for building up a maximum electrical charge by the associated condenser of ignition systems. It will be understood that the electrical charge of the condenser is built up during the time the breaker points are in closed position. At the moment the breaker points open the electrical discharge from the condenser causes a voltage rise in the primary winding of the coil which in turn produces a corresponding voltage rise in the secondary winding of the coil depending on the ratio of the coil windings which jump to ground through the spark plug. The duration of contact intervals is determined primarily by the cam angle and point setting, i. e., the air gap between the points and positive arc snuffing will be introduced by movement of the dielectric fluid across and between the contact surfaces of the points. Hence it is an object to provide means that will enable the system to operate at higher frequencies and improve the efficiency throughout the normal frequency range.

Because the breaker points of the distributor in an ignition system or contact points in other systems at times more or less frequently fail to function at all or but mildly and inefficiently, due to varied causes which have heretofore been recognized in the art but only partially corrected, if at all, it is important that means be incorpo-

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rated in or at the breaker or contact points which will be reliable and will insure against failure or inefficiency of the breaker points not only under normal conditions but also under abnormal conditions of emergency and overloads.

At least one defect in conventional breaker or contact points is the tendency of the points under rapid operation to char, pit and accumulate alien matter on one or both points to an extent which greatly impairs completeness of successive contacts therebetween and correspondingly reduces their efficiency for transferring electrical energy to and for energizing the spark plugs by application of requisite potential whereby combustion of fuel and the power output of a motor are correspondingly maximized, or by reason of imperfect or incomplete engagement of the contact surfaces of various types of contacts the transferred potential from one to another point is greatly impaired.

It is known that breaker or contact points arc as they separate and it appears that pitting, charring or accumulating of alien matter on the contact surfaces of the points occur at the moments of separation to a variable extent influenced by factors such as potential, amperage and rapidity of contacts.

In the opinion of some technicians, as the points are actuated by movement, one toward and away from the other, fluid elements as well as moisture from the atmosphere is drawn from the area around the points together with particles of alien matter, which tend to lodge and seat on the contact surfaces of the points and thus corrode and build up a crust or scale which, by constant hammering or even momentary contact of the movable point on the fixed point becomes impacted and thereby impairs transmission of a full charge of electric energy at each momentary contact. It has been sought to remedy such a condition by merely providing a central passage through one of the breaker or contact points through which the induced flow of air or other fluid element and alien matter in the direction of the points may be exhausted at each contact making operation, instead of lodging on the contact surfaces. While such means may be moderately effective, it is still inadequate and unreliable under normal conditions and hence would fail under abnormal conditions.

I have, therefore, devised and tested under both normal and extreme conditions, and it is an object hereof to provide, an arrangement of the breaker or contact points which will afford maximum efficiency under all operating conditions

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and which in its broadest aspect contemplates the constant application of vacuum to the contact surfaces of electrical breaker or contact points whereby upon closing of the points the movement of a fluid dielectric from inside the distributor housing is effected and restricted due to the valve-like characteristics of my novel form and arrangement of parts, thereby removing all foreign matter from the presence of the contacts and preventing accumulation thereof on the contact surfaces of the points, while at the same time the induced movement of the fluid dielectric serves to dissipate arcs occasioned by the movement of one point toward or away from the other point, and thereby reduce, if not quite completely eliminate, the possibility of charring and pitting of the contact surfaces.

Another object is to provide means for effecting the flow of a fluid dielectric at a normal external pressure (atmospheric) from the presence of the contact surfaces to a vacuumized passage or chamber of substantially less than the external pressure, as for example, one contact may have a concave chamber on its contact surface in communication with a passage through the contact to which a vacuum line is permanently connected, or the contact surfaces of both contacts may have mating concavities forming a chamber which when and as the contacts close is vacuumized and through the action of vacuum expedites closing of the contacts.

More specifically, it is an object to provide one of the breaker or contact points—preferably the fixed point—with an axial passage to which a flexible tube may be affixed for connecting said passage with a suitable source of vacuum, directly with the intake manifold of a motor, or indirectly therewith through the vacuum line to the windshield wiper of a vehicle.

As herein shown and described, I have illustrated my invention in connection with well known elements of a conventional ignition system and said elements constitute no part of my invention apart from their combination with my improvements for attaining the aforesaid and other objects which may appear as the description of my improvements progresses.

I have shown a preferred form and arrangement of elements of my invention combined with old and well known elements of an ignition system, in the accompanying drawing, subject to modification within the scope of the appended claims, without departing from the spirit of my invention. In said drawing:

Fig. 1 is a plan view of an automotive distributor with its cover removed and showing features of my invention applied thereto;

Fig. 2 is an enlarged elevation, partly in section on line 2—2 of Fig. 1, showing means for applying vacuum to the fixed breaker point of the distributor; and

Fig. 3 is a circuit diagram showing the elements of a conventional ignition system, together with elements of my invention, and showing one type of circuit not altogether in conformity with a conventional circuit.

Referring first to Fig. 3, there is shown a typical circuit including a distributor D, a coil C having a primary and secondary windings C₁ and C₂, respectively, a condenser A and a battery B, all of which elements are connected in a conventional and well known manner which needs no description in this instance.

As shown in Figs. 1 and 2, however, the distributor D will be described for the purpose of ex-

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plaining the addition of my improvements thereto. Said distributor includes a case 1 with an axially disposed shaft 2 adapted to be operatively connected with a driving element of the motor (not shown) and carries a plural faceted cam 3 arranged to intermittently swing a movable arm 4 pivoted on housing 1 at 4' and bearing a breaker point 5 for intermittent contact with a fixed breaker point 6 which is borne by a fixed arm 7 pivoted on a screw 8' secured to housing 1 and held stationary by a screw 9.

Arm 4 carries a follower pin 10 which rides over the facets of the continuously rotating cam 3 and thus contact between the points 5 and 6 is alternately made and broken. Arm 4 is tensioned by a spring 11 for holding the contacts 5 and 6 engaged, while also serving to hold follower 10 engageable with the cam. Said spring also serves as a conductor between the arm and a terminal 12 borne by a wall of housing 1 and having a conductor 13 leading therefrom to an appropriate point in the circuit. Coil C, condenser A, battery B and distributor D are conventionally interconnected as shown or otherwise, in a manner not directly necessary to my invention.

In Fig. 2 there is shown a particular arrangement of one of the breaker points—in this case, but not necessarily, the fixed point 6—but equally adapted to the movable point 5 except for less convenience—whereby vacuum from the intake manifold of a motor or other source may be applied to the surface of the points. A suitable arrangement for such purpose includes the provision of a stem 1a on a portion 7b of arm 7 which has a central passage 7c, and the provision in point 6 of a mating passage and a concave depression 6b central with said passages and formed in the contact surface of the point 6. Point 6 is usually fixed to its mounting 7 by welding; hence the passages 7a and 7c form a continuous passage through which air or other fluid element flows outwardly through the passages 6a and 7c and thence through a flexible vacuum hose 14 to and through a pump or motor (not shown) for exhaust to the atmosphere. Thus, it is apparent that with atmospheric pressure on the open end of passage 6a and vacuum pull in the tube 14 and stem 1a, the fluid constituents of the air surrounding the points will constantly flow from the vicinity of the points 5 and 6 and all foreign particles as well as moisture will be drawn off, cooling of the points will be hastened after each contact, arcing of the points will be minimized, the arcs if any quickly dissipated and impairment of the contact surfaces and consequent charring, pitting or accumulating of foreign matter will be prevented, and the efficiency of the points will be substantially improved by reason thereof. Moreover, by the application of vacuum to the contact surfaces positive and sustained engagement of the contact surfaces is effected without increasing the tension of spring 11, rebound of the movable contact when striking the fixed contact at high frequency is reduced if not prevented and it is possible to more closely set the contacts than when conventionally or otherwise arranged.

It is obvious that while the present improvements are particularly adapted for use in connection with ignition systems, they are equally applicable to various types of contacts employed in other electrical systems where the contact surfaces are prone to corrode, char, pit or accumulate foreign matter from the surrounding atmosphere.

Inasmuch as it is desirable to provide a vacuum

chamber in the contact plane of the breaker point surfaces, I may provide a concavity 5b only in the fixed point 5, or also in the movable point 6 as at 5b. When both points 5 and 6 are thus formed, the two mating concavities 5b and 6b form a single vacuumized chamber of greater area than that of the passage 7c and hence of greater effect than said passage alone for moving a fluid dielectric such as air from the presence of the contacts 5 and 6, due to the substantial difference between the external or atmospheric pressure and the internal pressure of said chamber.

In operation, contact points when formed and arranged as herein shown function not greatly unlike a valve, because when the contact surfaces of the elements 5 and 6 are closed, the suction in passages 6a and 7a and chamber 5c-6b tends to draw and hold the surfaces together and when the contacts are open, air, gas, moisture or other fluid elements are drawn off through said passages, which results in a thorough scavenging of the contact surfaces. It is notable that a maladjustment of the contact points prevents an overall engagement of the contact surfaces which occasions segmentary charring and pitting or accumulation of foreign matter, thereby aggravating an already damaging condition, with a greater loss of delivered potential and greater failure at the spark plugs. When the points 5 and 6 are properly adjusted, they contact throughout the area of their adjacent surfaces and the cleaning effect of the applied vacuum contributes substantially to maintenance of perfect contact in spite of rapidity of the make and break operations and poor conditions of the atmosphere around the contacts and regardless of the presence of smoke, fumes, gases or moistures. In its broadest aspect my invention establishes a condition at the contact surfaces of the breaker points wherein there is a substantial difference in the prevailing external pressure of the surrounding area and the pressure of an internal chamber or cavity, adjacent the contact plane.

It is well known that the frequency of the make and break operations in a distributor of the character shown and described affects the efficiency of the unit. Frequently at high speed and regardless of the air gap between the points, efficiency of a unit is impaired because of the hammer-on-anvil effect of the movable point when striking the fixed point due to the rebound of the movable point under the influence of its spring 11, thereby shortening the contact interval to an extent of ineffectiveness and resulting in an interruption of rhythmical balance.

Hence, I have provided and have disclosed here-

in an ignition system which under the influence of vacuum at the contact surfaces affords ready relief for frequent impairment of the operation of the breaker points and is equally applicable to some if not all standard distributors with economy.

I claim:

1. In a high frequency ignition system having means for removing and preventing accumulation of alien particles from the vicinity of intermittently operative circuit opening and closing contacts: a circuit connected with a source of energy, a pair of contact points in said circuit, of which one point is movable relative to the other for opening and closing said circuit, one of said contact points having a passage therein open at its contact surface, and a tubular connection between said passage and a source of vacuum, whereby fluid elements and resident alien particles of matter are withdrawn from the contact surfaces of said points during the circuit opening and closing operations of said points, the contact point having said air passage being formed with a shallow cavity on its contact surface surrounding the opening of said passage.

2. In a high frequency ignition system having means for removing and preventing accumulation of alien particles from the vicinity of intermittently operative circuit opening and closing contacts: a base, first contact fixed thereon, a second contact movable thereon, said first contact having a passage therethrough open at its contact surface, a connection between said passage and a source of vacuum, means for applying forces to and for moving the second contact into and from engagement with the first contact, said first contact being formed with a shallow chamber below the contact plane and in communication with said vacuumized passage, whereby a dielectric fluid in the presence of said contacts is withdrawn through said passage for dissipation remote from the contact.

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