May 21, 1963 J. FEINS 3,090,842

MULTI-SURFACE CONTACTS FOR INTERRUPTERS

Filed Jan. 30, 1961

FIG.1

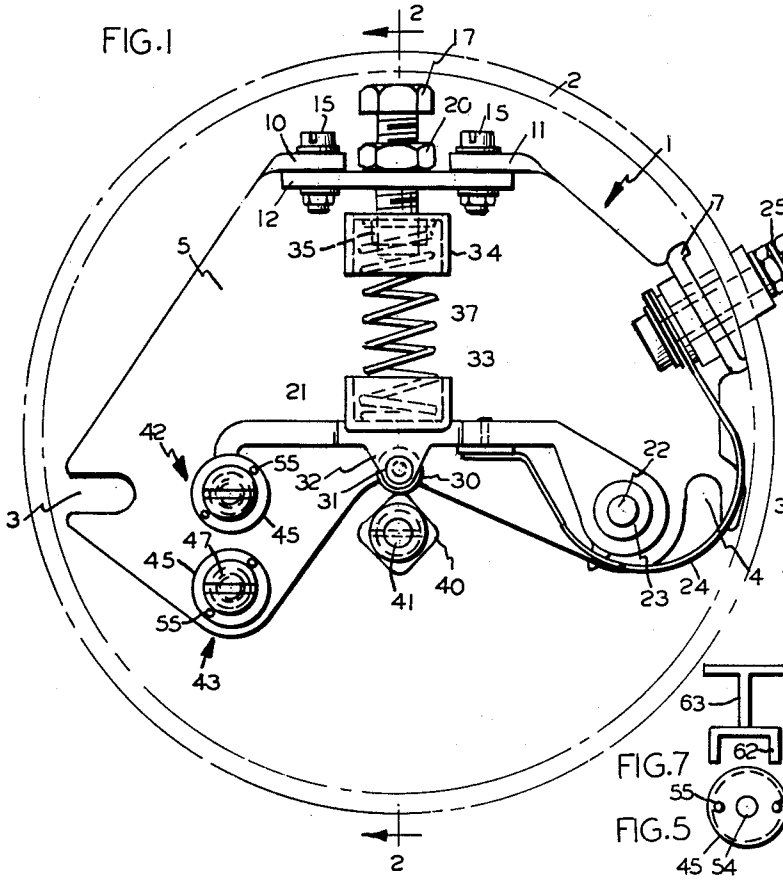


FIG.2

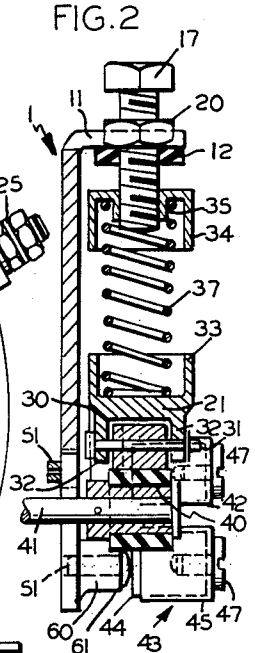


FIG.7

FIG.5

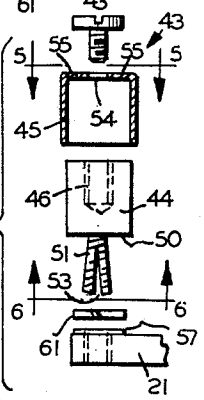


FIG.4

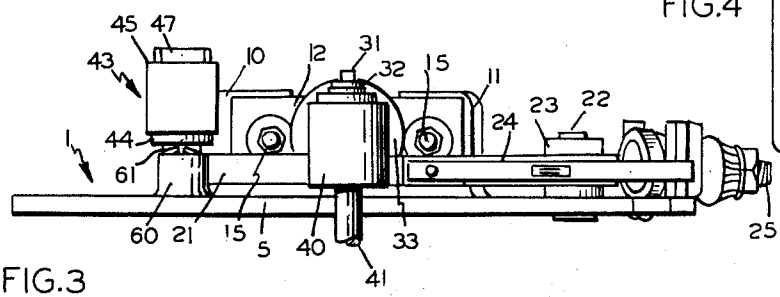


FIG.3

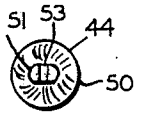


FIG.6

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MULTI-SURFACE CONTACTS FOR INTERRUPTERS

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The present invention relates to improvements in interrupters which are designed to open and close an electric circuit alternatingly many times during predetermined periods of time. Such interrupters are used in vibrators, buzzers, bells, electromagnets, gas engine distributors, aircraft and turbine electrical systems, solenoids, clocks, timers, cyclers, governors, relays, switches, circuit breakers, voltage and current regulators and most any device employing contact points to open and close an electrical circuit either by a cam rotating or a plunger or rod pulsating or by pressure or vacuum action or by electric magnetism, and in many other mechanical, electrical and electronic devices. The hitherto most commonly used types of contact points consist almost exclusively of a pair of small disk members or hard conductive material of which one usually is stationary and the other is movable so that it, from time to time, touches the stationary contact point. It is important that the so-called "mating surfaces" or the contact area of each pair of contact points are free from any deformations and that the points are so positioned that said mating surfaces touch each other completely and exactly on a major area of each surface each time they are to close an electrical circuit. When the slightest portion of that contact area is burned, etched, oxidized, worn, pitted, or adulterated with foreign material affecting the electrical conductivity and resistance, the complete set of points must be replaced as a unit.

It has been attempted to overcome the rapid wear of the above described hitherto known contact points by providing each point with a hole, so as to change the disk shape to a ring shape for the purpose of obtaining a better cooling effect and thus prolonging the useful life of the points. However, this arrangement has been found as not being satisfactory, particularly in the case of distributor contact points in internal combustion engines where these contact points bear against each other and, thus, make contact with one another usually only on a fraction of the area which is intended as contact area. The reason for these shortcomings is the inherent design of the usual contact point mounting and arrangement. The contact points in modern high-compression internal combustion engines which have to close and to open a circuit of high voltage (up to 30,000 volts) in many cases ten thousand times per minute are for economical reasons, not made with such a precision as is required for perfect permanent functioning, and they are made of materials which are so hard that the points cannot be cleaned or smoothened by filing or by the application of sand paper, so that they must be replaced when they are worn or burned even to a very slight degree. Usually the contact points are not easily accessible, so that a replacement thereof is time consuming and expensive.

Therefore, one object of the present invention is the provision of roller-like contact members which are constructed and arranged for tangential contact, and which allow a changing of worn or defective contact surfaces without an exchange even without a removal and replacement of any contact elements, but simply by turning one or both contact elements of a pair of contacts at an angle of a few degrees, an operation which requires less time and skill as well as the use of fewer and simpler

tools than the replacement of the hitherto known contact points.

Another object of the present invention is the provision of roller-like contact members which are more reliable in operation, more durable and less exposed to damage by burning, deformation or misalignment than the hitherto known disk-or-ring-shaped contact point elements.

A further object of the present invention is the provision of roller-like contact members which are opened and closed by cam-engaging anti-friction means, so as to preserve the exact curvature of the actuating cam element, and which are provided with easily adjustable resilient means that eliminate to the largest possible degree a bouncing or an unwanted swinging or vibrating of moving parts.

Yet still another object of the present invention is the provision of roller-like contact members which are easily accessible, which after adjustment are safely retained in position so that any unwanted movement relative to mounting or driving elements will be avoided, which are simple in construction, sturdy and well adapted for the purpose for which they are intended and which can be maintained easily and inexpensively in perfect condition.

With the foregoing and other objects which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangements of parts of the embodiment disclosed without departing from the spirit of the invention as claimed.

In the accompanying drawing I have set forth an illustrative embodiment of my invention.

In said drawing:

FIGURE 1 is a top plan view of a preferred embodiment of my invention;

FIG. 2 is a sectional view on the line 2—2 of FIG. 1;

FIG. 3 is a side elevation;

FIG. 4 is a detailed exploded view of a contact roller assembly;

FIG. 5 is a detailed plan view upon a bushing seen in the direction of the arrows 5—5 of FIG. 4;

FIG. 6 is a detailed bottom plan view of a roller core member seen in the direction of the arrows 6—6 of FIG. 4; and,

FIG. 7 is a detailed side view of a tool preferably used for adjustment purposes.

Similar reference characters refer to similar parts throughout the several views.

In the drawing the numeral 1 denotes a so-called breaker plate, which in a well-known manner can be mounted within a distributor 2 (FIG. 1) or the like by means of screws (not shown) engaging open slots 3 and 4 in the plate 1. The plate 1 has a flat main portion 5 and angularly bent lug portions 7, 10 and 11. An insulating member 12 is secured to the lug portions 10 and 11 by means of screws 15 or the like, and a set screw 17 is screwed through a threaded hole in the plate 12 and is retained in adjusted position by means of a nut 20.

A conductive hammer or an arm member 21 is pivoted to the plate 1 at 22 and is insulated therefrom by an insulating bushing 23. A resilient conductive member 24 connects the member 21 conductively to an insulated terminal 25.

A roller 30, or any other anti-friction means, is rotatably mounted on one side of the arm member 21, preferably by means of a pin 31 extended through the roller 30 as well as through a pair of lug portions 32 extending from a cup-shaped portion 33 of the member 21. A cup member 34 has an internally threaded center

portion 35 through which is screwed the threaded stem portion of the screw 17, and a spring 37 interposed between the cup member 34 and the arm member 21 has a tendency to move the arm member 21 in a counterclockwise direction toward a cam member 40, which is mounted on a shaft 41 and is in engagement with the roller 30. A first roller-like contact member 42 is mounted on the outer end of the arm member 21, and a second contact member 43 is mounted stationarily on the plate 1, or on a stationary contact support (not shown) secured to the plate 1.

These contact members 42 and 43 are one of the most important features of my invention. Although they can be made as simple cylindrical, polygonal, triangular or square bolts, I prefer to make each in the manner shown in detail in FIGS. 4 to 6. There it will be seen that each one of the members 42 and 43 consists of a core 44 of aluminum or the like and of a bushing 45 of platinum or of any other hard, heat-resistant material, and of a set screw 47. The core 44 preferably has a knurled or roughened lower section 50 (FIGS. 4 and 6) and a threaded stem portion 51 is extended from the same. The stem portion 51 preferably is provided with a slot 53 and is somewhat resilient, having a tendency to spread out at both sides of the slot 53, so that the core 44 will be attached non-rotatably and safely to any element which has a threaded hole into which the stem portion 51 has been screwed. The core 44, which can be cylindrical, as shown, or triangular, square, polygonal, or of any other suitable shape or design, is provided with a threaded bore 46, and the bushing 45, which is shaped and dimensioned so as to fit tightly upon the core 44, has in its head portion holes 54 and 55 (FIGS. 4 and 5). A knurled or roughened face section 57 is also provided on that portion of the arm member 21 and of a raised portion 60 of the plate 1 upon which the cores 44 are to be screwed, and a resilient washer 61, or any other suitable friction increasing device, is interposed between said face section 57 and the core 44.

When the cam member 40 rotates, the arm member 21 will be oscillated, so that the members 42 and 43 alternatingly will touch each other. Thereby they offer longitudinal, perfectly aligned contact surfaces, so as to open and close an electrical circuit reliably with the greatest precision. The fact that the elements 44 and 45 consist of different materials with various heat conductivities, will result in a highly efficient cooling of the contact surfaces. If ever cooperating contact areas become worn or damaged, the screw 47, which is screwed into the threaded bore 40 and which fastens the bushing 45 to the core 44, is loosened, prongs 62 of a spanner 63 (FIG. 7) are inserted into the holes 55 of the bushing 45, the bushing is turned one or more degrees, and the screw 47 is re-tightened. This is all that is necessary to renew contact areas, so that no removal and exchange of parts is necessary. Moreover, a large number of such adjustments can be made, each time renewing the contact surfaces of one and the same pair of bushings 45. Should ever a bushing 45 be burned or damaged, it can be exchanged for another bushing easily and quickly after unscrewing the screw 47.

Since certain changes may be made in the above article and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which as a matter of language might be said to fall therebetween.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent is:

1. In a distributor which has a rotary cam member and a breaker plate as well as a contact arm member one end of which is pivoted to the breaker plate, a multi-surface contact arrangement consisting of an insulating member secured to the breaker plate and having a threaded hole, a threaded bolt screwed through said insulating member, a cup member having a threaded bore and being screwed upon a portion of said bolt which extends beyond said insulating member, antifriction means mounted on the contact arm member of the distributor being adapted for engaging the cam member of the same, resilient means interposed between said arm member and said cup member tending to swing the arm member toward the aforementioned cam member, a pair of parallel core members one of which is secured to said arm member while the other is secured to said breaker plate, a sleeve member attached to the outer side of each core member having a wall portion and a perforated head portion, and a retaining screw screwed through the head portion of each sleeve member into a core member, said core members being constructed and arranged for allowing a tangential engagement of said sleeve members with each other whenever said arm member is in a predetermined end position of its swinging movement.

2. A device of the character described comprising a breaker plate having a flat main portion and angularly to the main portion disposed lug portions, an insulating member secured to lug portion of said breaker plate having a threaded hole, a threaded bolt screwed through said insulating member, a cup member having a threaded bore being screwed upon a portion of said bolt which extends beyond said insulating member, an arm member having one of its ends pivoted to said breaker plate, antifriction means adapted for engaging a cam member being mounted on said arm member, resilient means interposed between said arm member and said cup member tending to swing the arm member toward the aforementioned cam member, a pair of parallel core members one of which is secured to said arm member while the other is secured to said breaker plate, a sleeve member attached to the outer side of each one of said core members having a wall portion and a perforated head portion, and a retaining screw screwed through the head portion of each sleeve member into a core member, said core members being constructed and arranged for allowing a tangential engagement of said sleeve members with each other whenever said arm member is in a predetermined end position of its swinging movement.

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