United States Patent [19]

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[11] **3,757,061**

[45] **Sept. 4, 1973**

[54] **SNAP ACTION IGNITION CONTACT ASSEMBLY**

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[22] Filed: **Dec. 20, 1971**

[21] Appl. No.: **212,138**

[52] **U.S. Cl.** ..... **200/19 A**, 200/30 R, 200/30 A

[51] **Int. Cl.** **H01h 19/60**

[58] **Field of Search** ..... 200/19 R, 19 A, 21, 200/27, 30 R, 30 A, 27 R

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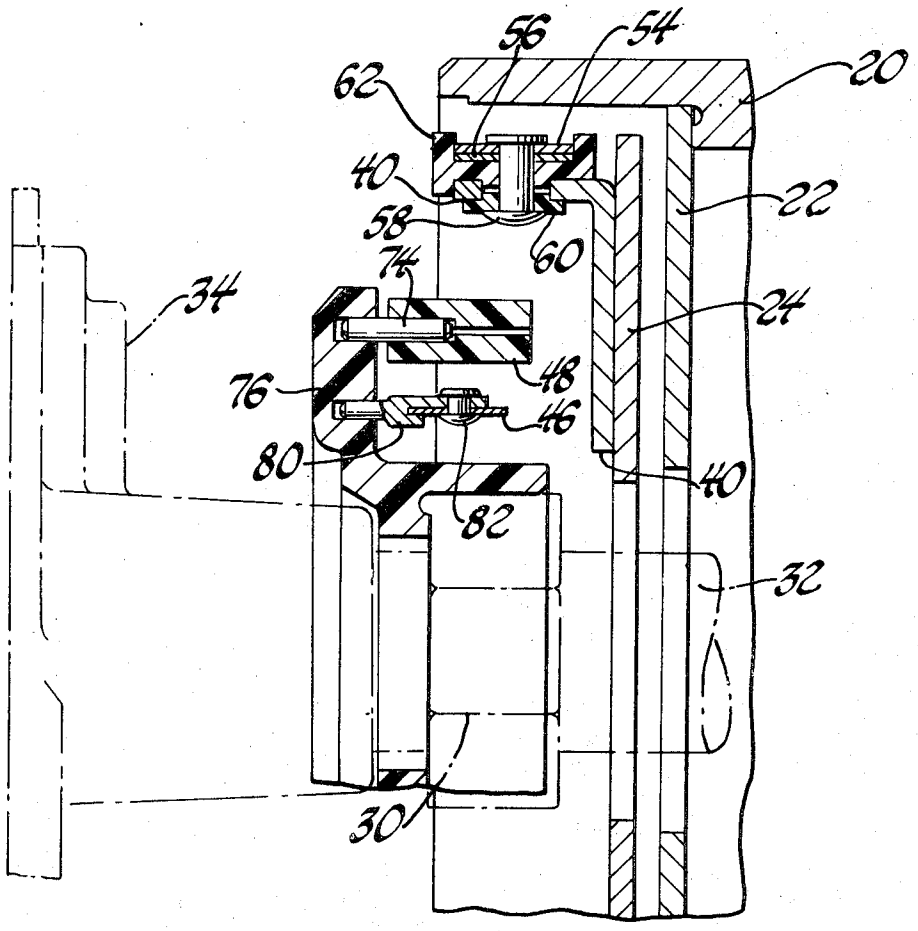
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[57] **ABSTRACT**

An ignition system distributor is provided having snap action contact closure and separation. A movable contact carried by a resilient cantilever is snapped into and out of contact with a fixed contact under the control of a cam arrangement. A first cam and cam follower alternately bias the resilient cantilever to urge the movable contact toward and away from the fixed contact. A second cam and cam follower restrain movement by the movable contact except during predetermined times. The two cams and cam followers cooperate such that the movable contact is biased toward the fixed contact but restrained from moving into engagement until a predetermined time when it is snapped into engagement. Subsequently, the movable contact is urged away from the fixed contact but restrained from separating until a predetermined time when separation is accomplished by snap action. Accordingly, snap action closure and separation of the ignition contacts is effected.

6 Claims, 6 Drawing Figures



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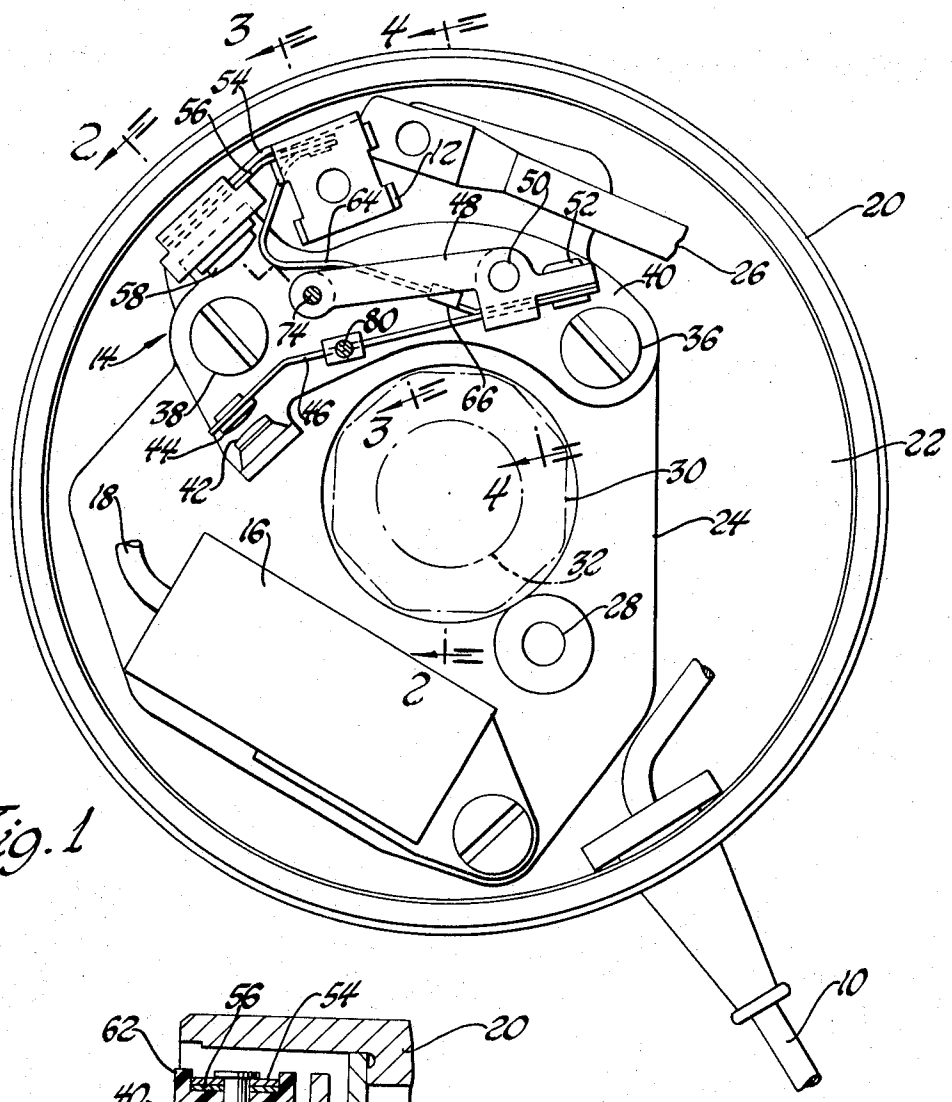


Fig. 1

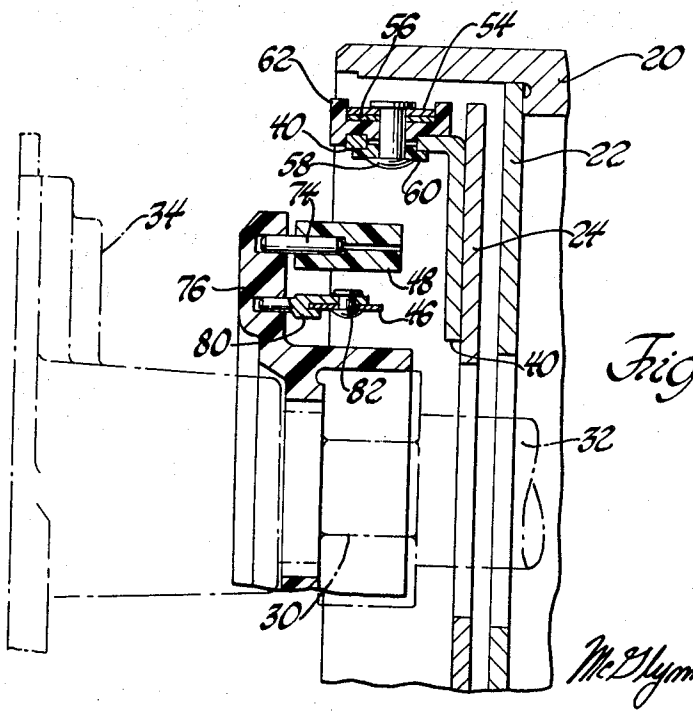


Fig. 2

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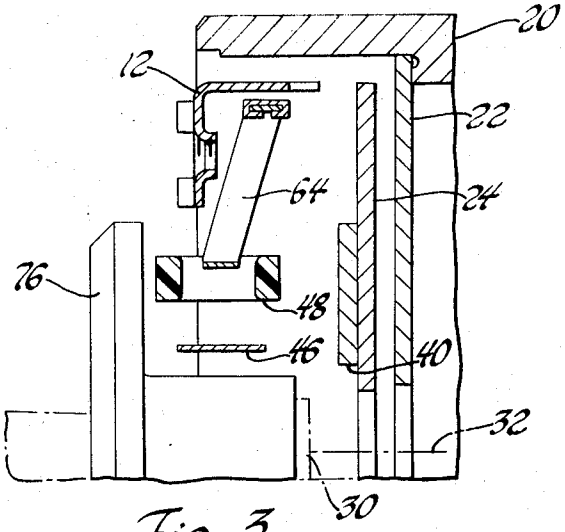


Fig. 3

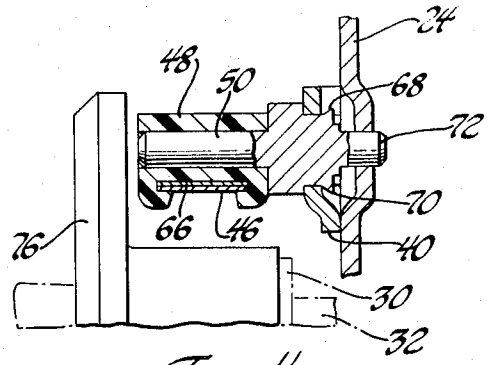


Fig. 4

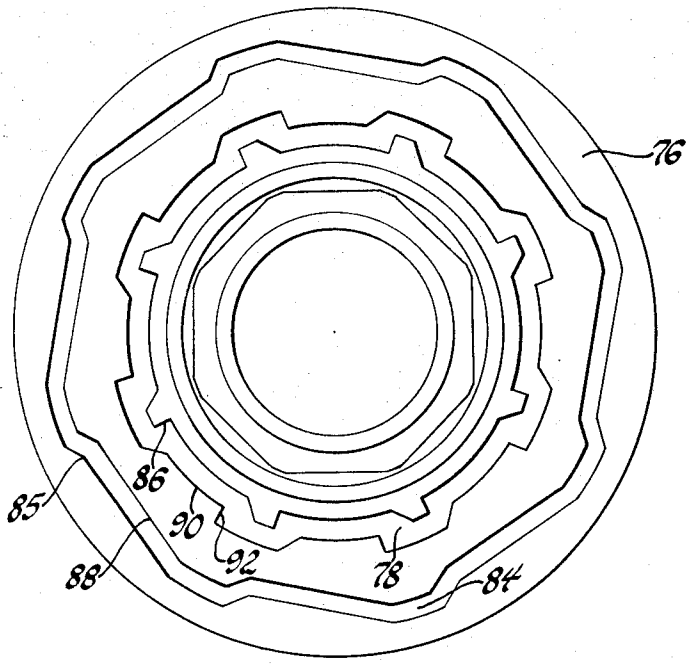


Fig. 5

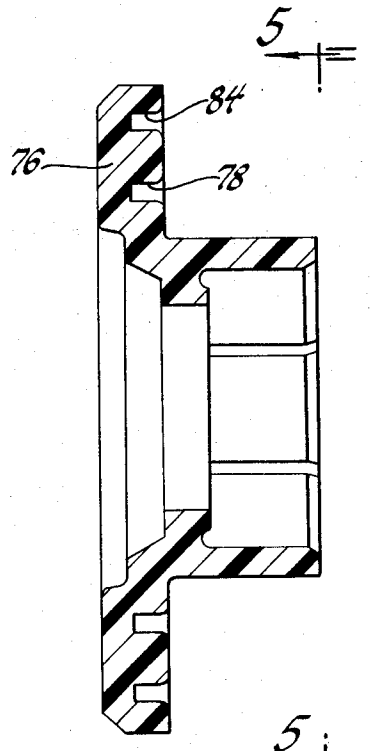


Fig. 6

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SNAP ACTION IGNITION CONTACT ASSEMBLY

This invention relates to an ignition system distributor providing snap action closure and separation of ignition contacts.

Prior art ignition contact arrangements provide a continuous bias tending to close ignition contact points while relying on a periodic countervailing force to interrupt coil current at predetermined times. Typically, a cam and cam follower combination provides the requisite countervailing force, and the closure and separation rate of the ignition contacts is determined by the cam configuration.

Inasmuch as the dimensions of the cam follower determine the gap set in most conventional distributor contact assemblies, periodic adjustment is necessary to maintain a uniform gap set in view of frictional wear of the cam follower. In addition, on the occasion of the replacement of ignition contacts, it is necessary to accurately set the gap separation by adjustments provided for that purpose. To accomplish either of the foregoing gap set adjustments, it is beneficial to use special instrumentation generally available and specifically designed for that purpose.

In contrast with the ignition contact assemblies generally known in the prior art, the present invention provides an ignition contact assembly wherein contact closure and separation is accomplished with snap action. In this manner, arcing is minimized in accordance with the more rapid closure and separation of the contacts. Also, a more positive make and break in the ignition circuit is effected with the snap action operation to thereby prolong contact life.

Snap action control of ignition contact closure and separation is effected by preloading the movable ignition contact to urge it toward the fixed ignition contact while restraining the movable ignition contact to prevent closure. Subsequently, during the time in which the movable contact is still under preload, the restraining force is removed and the movable contact snaps into engagement with the fixed contact. In a similar manner, the movable contact is preloaded to urge the movable contact away from the fixed contact while restraining movement by the movable contact to continue contact engagement. Subsequently, while the movable contact is still subject to the separation force, the restraining force is removed and the contacts separate with snap action. This operation, as more fully described hereinafter, can be accomplished with coacting cam and cam follower controls permitting synchronization with engine operation.

The dual cam-cam follower concept of the instant invention permits the use of a resilient cantilever having less spring force than is required in conventional contact assemblies. This reduction in cantilever spring force results from the operation of the instant invention and, in particular, from biasing the cantilever to augment the spring force at the time of contact closure. A lower spring force reduces friction and wear to extend the mechanical life of affected ignition system components.

Positive location of the ignition system contacts is effected by the dual cam-cam follower arrangement of the present invention. Accordingly, gap set and dwell are preset by the relationship between the cams; no adjustments are necessary or required when new contact points are installed; and no special tools or instrumentation are required to replace contact points.

It is an object of the present invention to provide in an ignition system distributor, a snap action ignition contact assembly having a first electrical contact movable into and out of engagement with a second electrical contact wherein the first electrical contact is alternately preloaded to urge the first electrical contact toward and away from the second electrical contact while restrained by a control which causes the first electrical contact to snap into and out of engagement with the second electrical contact at predetermined times.

Another object of the present invention is to provide an ignition system distributor including a snap action ignition contact assembly wherein a first electrical contact is carried by a resilient cantilever such that the first electrical contact is movable into and out of engagement with a second electrical contact under the control of a preloading and restraining system causing snap action closure and separation of the ignition contacts.

Another object of the present invention is to provide an ignition system distributor including a snap action ignition contact assembly wherein a first electrical contact is carried by a resilient cantilever connected with a second cantilever pivotally operative to preload the resilient cantilever in accordance with the control of a cam engaging a cam follower at a distal point on the second cantilever such that the resilient cantilever is alternately biased to urge the first contact into and out of engagement with a second contact and wherein a cam follower on the resilient cantilever engages a second cam to controllably restrain movement by the second contact to provide snap action closure and separation of the ignition contacts.

The novel features believed to be characteristic of the present invention are set forth in the claims appended hereto. The invention itself, however, together with further objects and advantages thereof, can be best understood by reference to the following description of the preferred embodiment taken in connection with the accompanying drawings, in which:

FIG. 1 is a plan view of an ignition system distributor including a snap action ignition contact assembly according to the present invention;

FIG. 2 is a partial section view of the ignition system distributor of FIG. 1 showing in particular the pin cam followers and the associated cam tracks providing the requisite control to develop snap action in the ignition contact assembly;

FIG. 3 is a partial section view of the ignition system distributor and snap action ignition contact assembly of FIG. 1;

FIG. 4 is a partial section view of the pivot pin included in the snap action ignition contact assembly of FIG. 1;

FIG. 5 is a plan view of the cam tracks used in the ignition system distributor of FIG. 1 in conjunction with an eight-cylinder engine; and

FIG. 6 is a partial section view of the dual cam tracks of FIG. 5.

Reference should now be made to the drawings and in particular to FIGS. 1 through 4 which show an ignition system distributor including a snap action ignition contact assembly according to the present invention. Common reference numerals are used for common parts in all four views. It should be noted that the plan view of FIG. 1 includes neither the rotor nor the cam

required for operation; however, these components are included in the sectional views. The following description is directed generally to the distributor as shown in FIG. 1 with particular reference to details in the associated views where helpful.

In the drawing of FIG. 1, a conductor 10 interconnects an ignition coil (not illustrated) with a terminal 12 of the ignition contact assembly generally designated 14. A capacitor 16 is also connected by a conductor 18 with the terminal 12. Both the conductor 10 and the conductor 18 are shown foreshortened in the drawing to provide visibility of the distributor; accordingly, neither is shown actually connected with the terminal 12.

With regard to the electrical process for developing ignition voltages, the ignition contact assembly 14 operates in a manner substantially similar to conventional ignition contacts. Accordingly, the development of ignition voltage pulses for the internal combustion engine (not illustrated) associated with the distributor of the drawings is neither shown nor discussed herein.

Aside from the snap action ignition contact assembly, the distributor shown in the drawings is substantially conventional including a housing 20 and means comprising plates 22 and 24 as well as a vacuum line 26 for centrifugal and vacuum advance. Ignition advance is effected in the distributor in a conventional manner neither shown nor discribed in detail herein. An alignment pin 28 determines the relative positions of the plates 22 and 24 at the start of operation.

A conventional ignition contact control cam 30 is included in the distributor and by means of the shaft 32 integral therewith, the operation of the ignition contacts is synchronized with the operation of the associated internal combustion engine. This synchronization is developed pursuant to an interconnection between the shaft 32 and the cam shaft (not illustrated) of the internal combustion engine.

Ignition pulses are selectively distributed to appropriate spark plugs by the distributor in a conventional manner. To this end, a rotor 34, illustrated in FIG. 2, is included in the distributor. The rotor 34 is keyed in a predetermined relationship with the shaft 32.

The ignition contact assembly 14 of FIG. 1 is secured to the plate 24 by mounting screws 36 and 38 through a based plate 40 to which all other members of the ignition contact assembly are secured directly or indirectly.

A first electrical contact 42, fixed in relation to the base plate 40 of the ignition contact assembly, provides an electrical ground connection for the ignition coil when the ignition contacts are closed at predetermined times. A second electrical contact 44 is movable into and out of engagement with the first electrical contact 42 in response to control developed as described more fully hereinafter. The electrical contact 44 is urged toward or away from the electrical contact 42 by a spring coupled therewith. As shown in FIG. 1, the spring comprises a resilient cantilever 46 with the contact 44 at the distal end thereof. In the present invention, the resilient cantilever 46 is controllably biased to alternately urge the contact 44 toward and away from the contact 42. The bias means ocmprises a second contilever 48 pivotally mounted on a pin 50 and together with the resilient cantilever 46 comprises a preloading means for the contact 44. A rivet 52 joins the resilient cantilever 46 to the cantilever 48; additionally, the rivet 52 completes an electrical connection between the resilient cantilever 46 and the terminal 12.

Concurrent consideration of FIGS. 1 and 3 facilitates understanding the electrical connection between the terminal 12 and the resilient cantilever 46 as well as the structural design of the cantilever 48. Terminal 12 has an integral extension 54 connected with an electrical terminal 56 by a rivet 58 at an integral extension of the base plate 40. As shown in FIG. 2, the rivet 58 and the two electrical conductors 54 and 56 are electrically isolated from the base plate 40 by appropriate insulating members 60 and 62. A conductor 64, shown in FIGS. 1 and 3, connects the terminal 56 with a terminal 66 secured in electrical contact with the resilient cantilever 46 by the rivet 52. In this manner, an electrical circuit is completed from the ignition coil to the cantilever 46, which circuit is completed to ground, as noted above, at predetermined times through contacts 42 and 44, when these contacts are in engagement. As shown in FIG. 3, the cantilever 48 has a passage through which the conductor 64 passes to interconnect terminals 56 and 66.

FIG. 4 shows the pin 50 and a cross section of the cantilever 48 carried thereon. A pair of tangs 68 and 70 secure the pin 50 to the base plate 40 of the ignition contact assembly. Cantilever 48 is pivotally mounted on the pin 50, and terminal 66 and resilient cantilever 46 are slidably contained within channels of the cantilever 48. Pin 50 also includes an integral alignment pin 72 for alignment with the plate 24.

To develop snap action closure and separation of the contacts 42 and 44 in accordance with the present invention, contact 44 is alternately urged toward and away from contact 42 while under the control of a control means permitting contact 44 to snap into and out of engagement with contact 42 only at predetermined times. The requisite biasing of resilient cantilever 46 to urge contact 44 toward and away from contact 42 is effected by rotating the cantilever 48 pivotally about pin 50. Restraint and release of contact 44 is accomplished by coacting control means to permit snap action closure and separation of contacts 42 and 44 at predetermined times. The control means controls movement of the resilient cantilever 46.

The preloading means includes, in addition to the pivotally mounted cantilever 48 and the resilient cantilever 46, a cam follower in the form of a pin cam follower 74 and a cam in the form of a track for the pin follower 74. The pin follower 74 is located at a distal point on the cantilever 48 such that the pivot at pin 50 is intermediate the cam follower and the rivet 52 joining cantilevers 46 and 48. The cam track is included in a member 76 shown in plan view in FIG. 5 and in section view in FIGS. 2, 3, 4, and 6. In FIG. 5, cam track 84 is the track associated with pin follower 74. A description of the operation of the preloading means is included hereinafter.

Pin follower 74 is made of hardened steel to provide long life. The cantilever 48 and the member 76 can be made of nylon or acetyl resin, for example. Using these materials, an ignition contact assembly characterized by long life is provided.

The control means which restrains movement by the contact 44 until a predetermined time includes a cam follower in the form of a pin cam follower 80 and a cam in the form of a track for the pin follower 80. The pin follower 80 is located on the resilient cantilever 46 in-

termediate the contact 44 and the rivet 52. A rivet 82 attaches the hardened steel pin follower 80 to the resilient cantilever 46 as shown in FIG. 2. The cam track for the pin follower 80 is cam track 78 of FIG. 5.

Obviously, the cams for pin followers 74 and 80 do not have to be carried by a common member. However, as revealed by a consideration of the drawings and the description herein, it is necessary to provide means to synchronize the action of the two cam followers with one another and with the engine. Therefore, the common member 76 keyed onto the conventional 30 is particularly expedient.

The coaction of cam followers 74 and 80 in developing snap action closure and separation will now be explained. Considering the cam configuration of FIG. 5 in conjunction with the ignition contact assembly of FIG. 1, the operation of the snap action contact arrangement is as follows. Assuming the contacts have just opened, preloading of contact 44 occurs when cam track 84 causes pin follower 74 to move radially inward, for example, along the segment 85 biasing resilient cantilever 46 to urge contact 44 toward contact 42. However, as shown in FIG. 5, control cam track 78 restrains movement by contact 44 preventing contact closure until a predetermined time when the segment 86 of the cam track 78 is reached at which time cam track 78 permits movement by pin follower 80 to allow contact 44 to snap into engagement with contact 42. During the next succeeding interval 88 of cam track 84, contact 44 is preloaded as pin 74 is moved radially outward biasing resilient contilever 46 to urge contact 44 out of engagement with contact 42. However, during this time interval control segment 90 of cam track 78 restrains pin follower 80 to prevent separation of contacts 42 and 44. When the segment 92 is reached in the cam track 78, the pin follower 80 is permitted to move radially outward to separate the contacts 42 and 44 with snap action. This cycle is repeated 8 times in each traversal of the cam track for the operation of the eight-cylinder engine of the embodiment.

Although the foregoing has proceeded in terms of a particular preferred embodiment, it should be understood that various changes and modifications could be engrafted thereon by one skilled in the art within the spirit and scope of the appended claims.

The embodiments of the invention in which an exclusive property or priviledge is claimed are defined as follows:

1. In an ignition system distributor, a snap action ignition contact assembly, comprising: a first electrical contact; a second electrical contact movable into and out of engagement with said first electrical contact; a resilient cantilever carrying said second electrical contact at the distal end thereof; a first cam connected with said resilient cantilever; a first cam follower engaging said first cam and controlling movement thereof to alternately urge said second electrical contact toward and away from said first electrical contact at predetermined times; a second cam connected with said resilient cantilever; a second cam follower engaging said second cam and controlling movement thereof to thereby restrain movement by said second electrical contact during predetermined times; and means for synchronizing the action of said first cam follower and said first cam with the action of said second cam follower and said second cam to permit snap action closure and separation of said electrical contacts at predetermined times.

2. A snap action ignition contact assembly as in claim 1, wherein said synchronizing means comprises a member commonly carrying both of said cams.

3. A snap action ignition contact assembly as in claim 1, wherein said first cam follower and said first cam coact with said second cam follower and said second cam to urge said second electrical contact, while restrained, toward said first electrical contact and then unrestrain said second electrical contact to effect snap action closure of said contacts and to subsequently urge said second electrical contact, while restrained, out of engagement with said first electrical contact and then unrestrain said second electrical contact to effect snap action separation of said contacts and to periodically repeat this process of closure and separation.

4. A snap action ignition contact assembly as in claim 3, indluding means adapted to synchronize contact closure and separation with the operation of an engine.

5. In an ignition system distributor, a snap action ignition contact assembly, comprising: a first electrical contact; a second electrical contact movable into and out of engagement with said first electrical contact; a first resilient cantilever carrying said second electrical contact at the distal end thereof; a second cantilever connected to said first resilient cantilever; a first cam follower on said second cantilever at a distal point from the connection between said first resilient cantilever and said second cantilever; a pivot point on said second cantilever intermediate said first cam follower and the connection between said first resilient cantilever and said second cantilever; a first cam engaging said first cam follower to cause movement thereby to urge said second electrical contact toward and away from said first electrical contact; a second cam follower on said first resilient cantilever intermediate said second electrical contact and the connection between said first resilient cantilever and said second cantilever; and a second cam engaging said second cam follower to restrain movement by said second electrical contact during predetermined times to permit snap action closure and separation of said electrical contacts at predetermined times.

6. A snap action ignition contact assembly as in claim 5, wherein both said first and second cam followers are pin followers and wherein both said first and second cams are tracks respectively accepting said pin followers.

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