Nov. 17, 1959 J. C. NORRIS ET AL 2,913,543

IGNITION DEVICE

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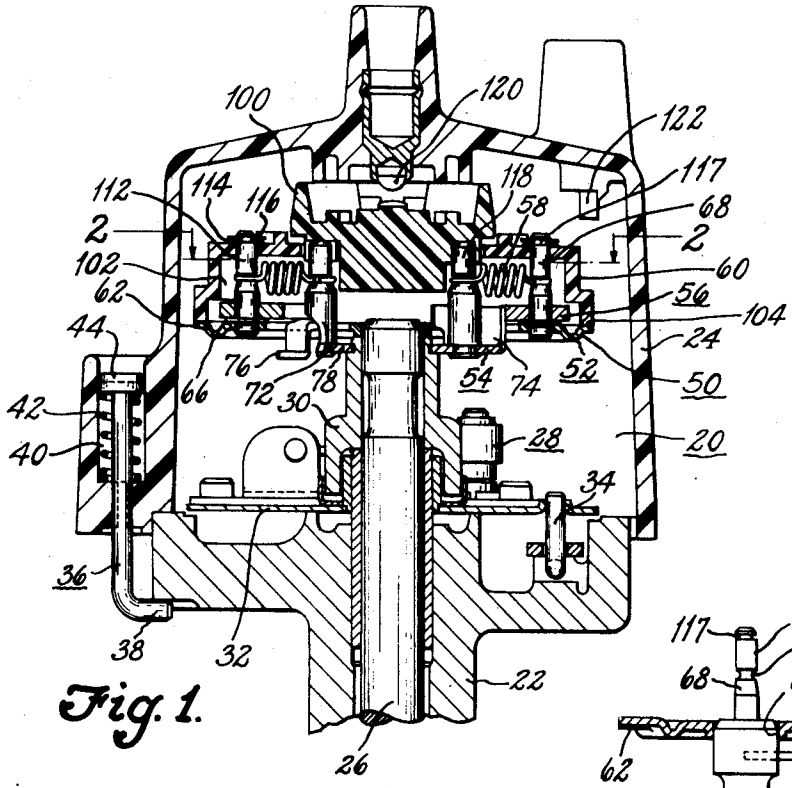


Fig. 1.

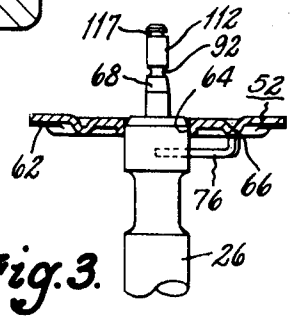


Fig. 3.

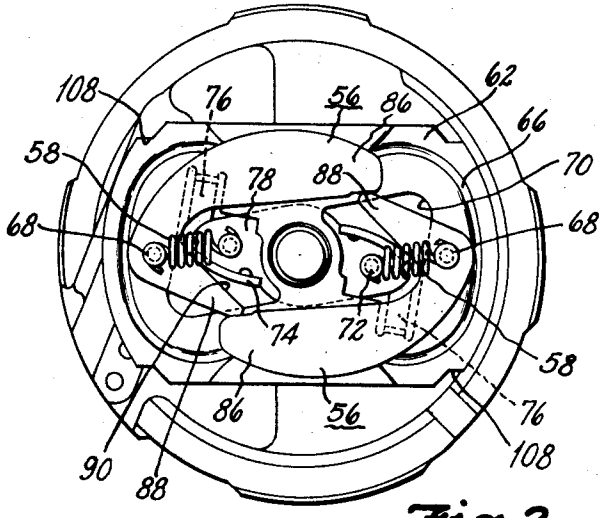


Fig. 2.

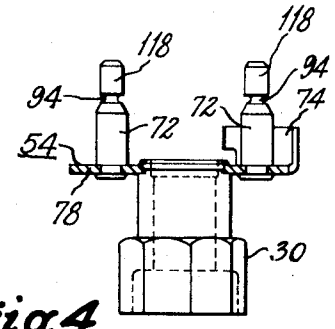


Fig. 4.

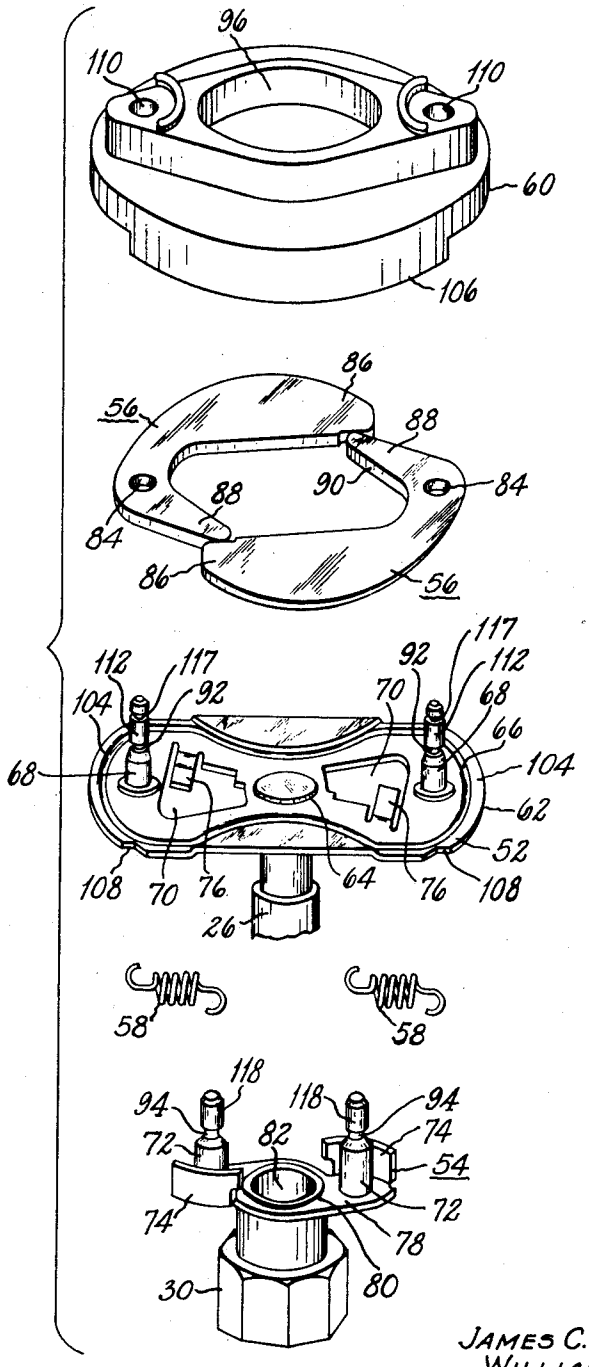
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Fig. 5.



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United States Patent Office 2,913,543
Patented Nov. 17, 1959

2,913,543

IGNITION DEVICE

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Application May 7, 1957, Serial No. 657,554

8 Claims. (Cl. 200—31)

This invention relates to ignition distributors for internal combustion engines and is more particularly concerned with a distributor structure wherein the breaker point assembly and distributor rotor are separated by a centrifugal advance mechanism.

The type of distributor to which the present invention relates is fully disclosed in application Serial No. 608,275, filed September 6, 1956, now Patent No. 2,872,537, which has been assigned to the assignee of the present invention. In the distributor disclosed in the above application, the cam plate of the centrifugal advance mechanism is secured to the distributor shaft and the weight plate is secured to the operating cam which actuates the circuit breaker. The distributor rotor, in turn, is secured to the weight plate. This rotor is used to complete a circuit through the engine spark plugs at the proper instant to cause ignition of the combustible mixtures in the engine cylinders. While the distributor described in the application has proved to be highly satisfactory, it has been found that with certain engines it is somewhat susceptible to pulsations in the rotating driving shaft. A study of the distributor structure will reveal that the only portion of the centrifugal advance mechanism which is secured to the distributor shaft is the cam advance plate. The remaining components which include the weight plate, the distributor weights, the rotor, and the circuit breaker cam all are maintained in position relative to the distributor shaft and cam plate by the springs which are under tension and are connected between the cam and weight plates. Thus the high moment of inertia of the parts not secured to the shaft makes the distributor more susceptible to malfunctions due to engine vibrations and torsions. Thus, whenever a rapid change occurs in the rotation of the distributor shaft, the advance mechanism may not respond as quickly as may be desired in the change. This susceptibility in the advance mechanism is a result of the relatively high moment of inertia of the parts which are not secured to the shaft.

In view of the above, it is an object of the present invention to provide an improved centrifugal advance mechanism for an ignition distributor having the centrifugal advance mechanism positioned between the breaker point assembly and the distributor rotor.

It is a further object of the present invention to increase the responsiveness of the centrifugal advance mechanism in a distributor of the character described by reducing the number of parts which are connected with the breaker cam of the distributor.

Another object of the present invention is to rearrange the parts of a centrifugal advance mechanism for a distributor of the character described so a greater number of parts will be carried by the shaft of the distributor.

A still further object of the present invention is to reduce the effect of the inertia in the centrifugal advance mechanism for a distributor wherein the advance mechanism is positioned between the breaker point assembly and the distributor rotor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Figure 1 is a cross-sectional view of a distributor embodying a centrifugal advance mechanism according to the present invention.

Figure 2 is a view taken along line 2—2 in Figure 1.

Figure 3 is a view, partly in section, showing the attachment between the weight plate and distributor shaft in the distributor in Figure 1.

Figure 4 is a view, partly in section, showing the attachment between the cam plate and breaker cam in the distributor in Figure 1.

Figure 5 is an exploded view showing in perspective the various parts for the distributor centrifugal advance mechanism in Figure 1.

In the drawings, the numeral 20 designates a distributor which has a cast base or housing 22, a distributor cap 24, a rotatable shaft 26, a breaker point assembly 28 which is actuated by means of a cam 30, a breaker point base 32 which is rotatably moved by means of the vacuum advance mechanism 34. The function and operation of all these parts are clearly set forth and described in the application mentioned supra. The cap 24 is secured in position by means of clamps 36. These clamps basically consist of an L-shaped rod member which has one of its ends 38 bent as shown to engage the base 22. The other end of the rod member 36 is spring-biased in a recess 40 which is molded in the cap 24. The spring 42 has one of its ends resting on the bottom of recess 40 and its other end resting on an enlargement 44 on the rod which has a screw driver slot formed thereon so that the rod may be rotated when it is desired to remove the cap from the base 22.

The centrifugal advance mechanism and rotor construction for the distributor shown in Figure 1 will now be described. The centrifugal advance mechanism 50 includes a base assembly 52 which is most clearly shown in Figures 3 and 5, a cam assembly 54 most clearly shown in Figures 4 and 5, weights 56 shown in Figures 2 and 5, a pair of springs 58 shown in Figures 1 and 5, and a cover 60 also shown in Figures 1 and 5.

The base assembly includes a weight plate 62 which is formed as shown to have a central opening 64 which receives the end portion of shaft 26. This opening will permit the plate 62 to be suitably secured to the ends of the shaft 26 by welding or brazing. The plate 62 is also formed with a raised ridge 66 which will increase the resistance of the plate to bending, etc. Included also in the plate 62 are a pair of suitably located apertures wherein pins 68 are secured. Located between pins 68 and the central opening 64 are a pair of openings 70. These openings 70 are sized and arranged so the pins 72 and the lugs providing the cam surfaces 74 on the cam assembly may project therethrough. Depending downwardly from the material of plate 62 which defines the periphery of opening 70 are tangs 76. These tangs are arranged to act as stops to limit the relative rotation between plates 78 and 62 and limit the vertical movement between plates 62 and 78 when the cam surfaces 74 and pins 72 are positioned in openings 70. The openings 70, of course, are sized to permit rotative movement between the cam assembly 54 and the base assembly 52 after plates 62 and 78 are assembled.

The cam assembly 54 includes the cam plate 78 which is apertured at 80 to permit the breaker cam 30 of the distributor to be secured thereto. The plate 78 is also provided with suitably located openings wherein pins 72 are secured. The cam surfaces 74 which are provided by the

upstanding flanges on plate 78 each have an outer surface of a predetermined contour to provide the distributor advance mechanism with the proper advance characteristics depending upon the engine application involved as is well known to those skilled in the art.

As can be clearly seen from the drawings when the parts of the distributor advance mehcanism are to be assembled, shaft 26 is passed through the bore 82 of the breaker cam 30. The openings 70 are sized so the cam surfaces 74 and the pins 72 may project above the top surface of plate 62. After the parts are thus positioned, a slight relative rotation therebetween will cause portions of the plate 78 to pass between the tangs 76 and the bottom surface of plate 62. When the base assembly 52 and the cam assembly 54 are thus positioned relative to each other, the weights 56 which are hook shaped and have suitably located pivot openings 84 at the roots of the hook which receive pins 68. The weights 56 each have an enlarged portion 86 and an integral cam portion 88. Each of the cam portions 88 has a surface 90 shaped to a predetermined contour which will ride upon the cam surfaces 74. After the weights 56 are positioned on the base assembly 52 the springs 58 are secured on the assembly by hooking the end portions thereof in grooves 92 on pins 68 and grooves 94 on pins 72 respectively. When the springs are thus secured, they will constantly urge the weights 56 and the parts of the centrifugal advance mechanism to the position shown in Figure 2 of the drawings. When, however, the shaft 26 is rotated above a predetermined speed, the action of centrifugal force on the weights 56 will cause relative rotation between the assemblies 54 and 52 to occur in the well-known manner.

The cover 60 for the centrifugal advance mechanism is most clearly seen in Figure 5. This cover, preferably formed of a molded phenolic condensation product such as Bakelite, has a central opening 96 sized to receive the hub portion of the distributor rotor shown on Figure 1. The cover 60 has an inner chamber like portion 102 which will enclose the springs 58 and the weights 56 of the advance mechanism. The cover is preferably sized to rest on the portions 104 of the plate 62 and has downwardly extending flange portions 106 which are sized to be received between the notches 108 in plate 62 to provide a positive driving connection between the cover and the plate 62. The cover also has suitably located openings 110 which receive the portions 112 of pin 68 to provide a further driving connection between the plate 62 and the cover. The cover is held in position on base assembly 52 by suitable means which will engage the pins 68 and the top surface of the cover 60. In the particular diagram shown, a pair of springs 114 and well known U-shaped springs 116 are used. The springs 116 are received in the annular grooves 117 in the pins 68. The hub portion of the rotor 100 which is received in opening 96 is provided with a pair of suitably located openings which will receive the portion 118 of pins 72 to provide a driving connection therebetween. The remaining components of the rotor includes a contact which constantly engages the contact 120 of the distributor cap and a suitably located contact not shown which will sweep past the radially located contacts 122.

From the above it is apparent that the portions of the centrifugal advance mechanism which are directly connected to rotate with shaft 26 include the base assembly 52, the weights 56, and the cover 60. This arrangement will provide a distributor which is very responsive to instantaneous variations in speed in the shaft 26.

What is claimed is as follows:

1. In a device of the character described, the combination comprising; a rotatable shaft, a weight plate secured to one end of said shaft for rotation therewith, a circuit breaker cam journaled on said shaft at a point located intermediate the weight plate and the other end of said shaft, a cam plate secured to said circuit breaker cam, and a centrifugally responsive weight pivoted to said weight plate reactive between said cam plate and weight plate for rotating the circuit breaker cam relative to said shaft in response to the rotation of said shaft, said cam plate being located below said weight plate and having an upwardly extending cam lug extending through the plane of the weight plate and engaging said weight.

2. In a device of the character described, the combination comprising; a distributor housing; a shaft journaled in the housing and having an end projecting above a bottom wall of the housing, a circuit breaker plate in clearance relation to the shaft and rotatably supported by the housing adjacent the bottom wall thereof, a weight plate secured to the end of the shaft for rotation therewith, a cam plate disposed between said weight plate and circuit breaker cam and fixed to said circuit breaker cam, and centrifugally responsive weights pivoted to said weight plate reactive between the cam plate and weight plate for rotating the circuit breaker cam relative to the shaft in response to the rotation of the shaft, said cam plate being located below said weight plate and having upwardly extending cam lugs extending through the plane of the weight plate and engaging said weights.

3. In a device of the character described, the combination comprising; a shaft, a circuit breaker cam surrounding the shaft, a weight plate secured to one end of the shaft for rotation therewith, said weight plate having spaced openings therein and a pair of spaced pins extending upwardly therefrom, a cam plate secured to the circuit breaker cam located between said weight plate and the opposite end of said shaft, cam lugs on said cam plate extending through the openings in said weight plate, and centrifugally responsive weights pivotally carried on said pins and reacting against said cam lugs for rotating said cam relative to said shaft in response to the rotation of said shaft.

4. In a device of the character described, the combination comprising; a rotatable shaft, a breaker point assembly including; a rotatable cam and a breaker arm carried by a breaker plate, a rotor arranged to rotate and deliver electrical energy to a plurality of circuits, and a centrifugally responsive means positioned between said breaker point assembly and rotor, including; a weight plate attached to an end of said shaft for rotation therewith, a cam plate attached to said came and centrifugally responsive weights pivoted to said weight plate reactive between said cam plate and weight plate for varying the angular position between said shaft and cam in response to the speed of rotation of said shaft, said cam plate being located below weight plate and having upwardly extending cam lugs extending through the plane of the weight plate and engaging said weights.

5. In a device of the character described, the combination comprising; a rotatable shaft, a distributor rotor having a pair of spaced recesses therein, a centrifugal advance mechanism having; a weight plate secured to said shaft for rotation therewith, a cam plate journalled on said shaft, centrifugally responsive weights pivoted on said weight plate and reactive against said cam plate in response to centrifugal force, a pair of spaced pins supported by said cam plate arranged to provide a spring anchor for a pair of springs which oppose the centrifugal action of said weights and extensions on said pins arranged to be received by the recesses in said rotor for providing a driving connection between said rotor and cam plate.

6. In a device of the character described, the combination comprising; a base, a rotatable shaft journaled in the base, a breaker point assembly including; a movable breaker plate carried by said base, a rotatable cam concentric to said shaft and a breaker arm carried by the breaker plate, a distributor rotor arranged to deliver electrical energy to a plurality of circuits, and a centrifugally responsive means positioned between the rotor and breaker plate having; a weight plate pivotally supporting said centrifugally responsive means secured to one end of the shaft for rotation therewith and a cam plate operably connected to both the rotatable cam and

rotor, said cam plate being located below said weight plate and having upwardly extending cam lugs extending through the plane of the weight plate and engaging said centrifugally responsive means.

7. In a device of the character described, the combination comprising; a rotatable shaft, a breaker point assembly including a rotatable cam concentric to said shaft, a distributor rotor arranged to sequentially complete a plurality of electrical circuits, and a centrifugally responsive means disposed between said cam and rotor having a weight plate attached to the shaft for rotation therewith and a cam plate connected to said cam and rotor, said centrifugally responsive means being pivoted to said weight plate and said cam plate being located below said weight plate and having upwardly extending cam lugs extending through the plane of the weight plate and engaging said centrifugally responsive means.

8. In a distributor, the combination comprising; a housing, a shaft journalled for rotation in said housing having an end projecting above the bottom wall of said housing, a circuit breaker plate in clearance relation to the shaft and rotatably supported by the housing adjacent the bottom wall thereof, a weight plate secured to the said end of said shaft for rotation therewith having

spaced openings therein and a pair of first spaced pins extending upwardly therefrom, a weight member pivoted to each of said pins, a circuit breaker cam surrounding said shaft and movable relative thereto, said cam being located adjacent said breaker plate, a cam plate secured to the circuit breaker cam and located between said weight plate and breaker plate, cam lugs on said cam plate extending upwardly through the openings in said weight plate and engaging said weights, a second pair of spaced pins carried by said cam plate and projecting upwardly through the openings in said weight plate to a point located above said weight plate, and a pair of springs each connecting a pin on said weight plate with a pin on said cam plate.

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