Jan. 16, 1940. J. L. ARTHUR 2,187,070

IGNITION DISTRIBUTOR

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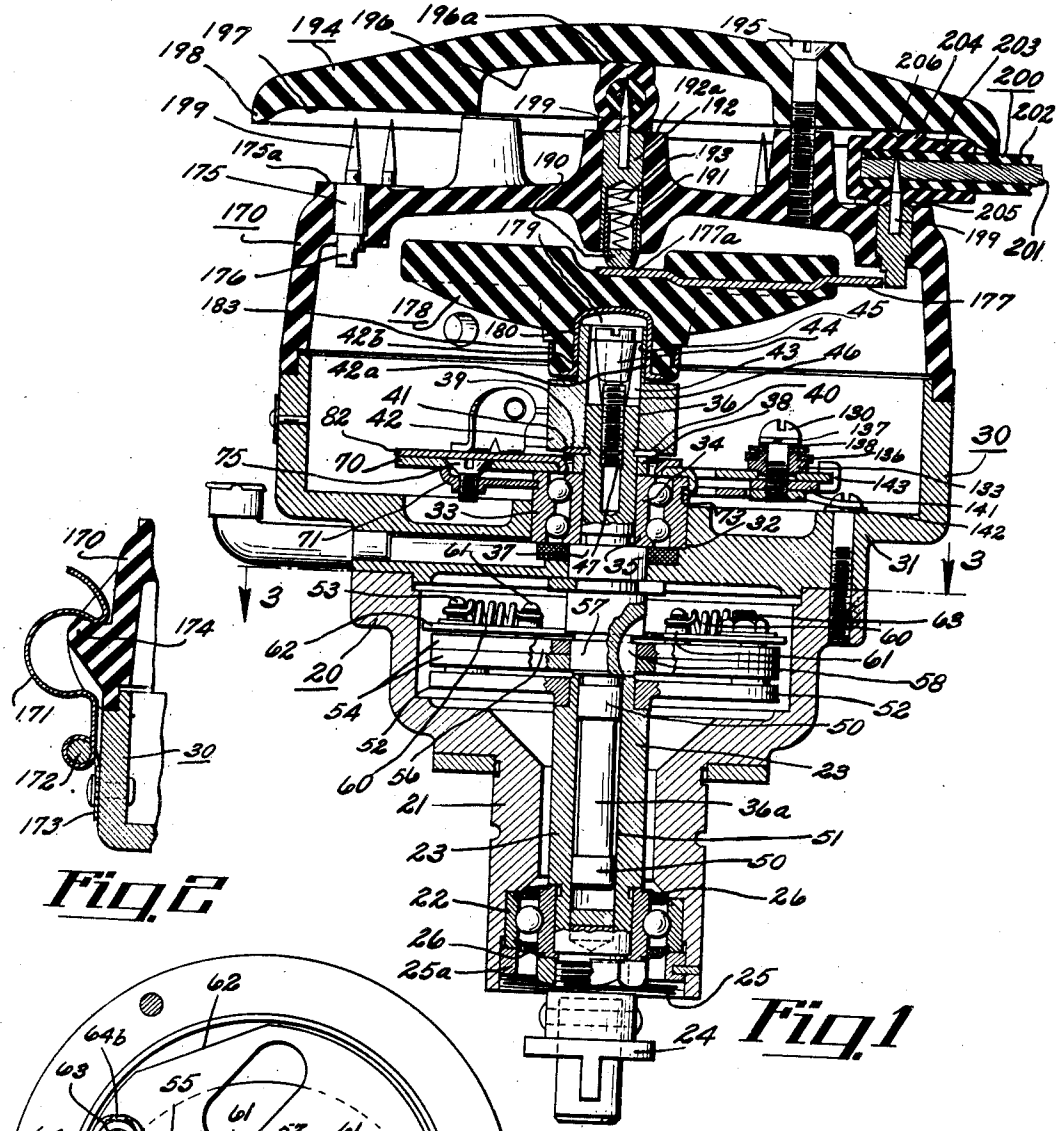


Fig. 1

Fig. 2

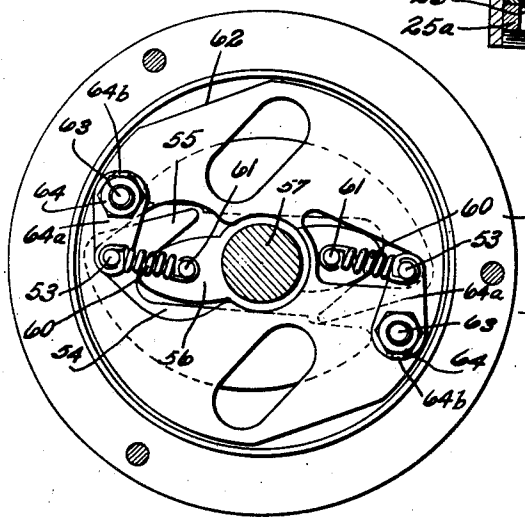


Fig. 3

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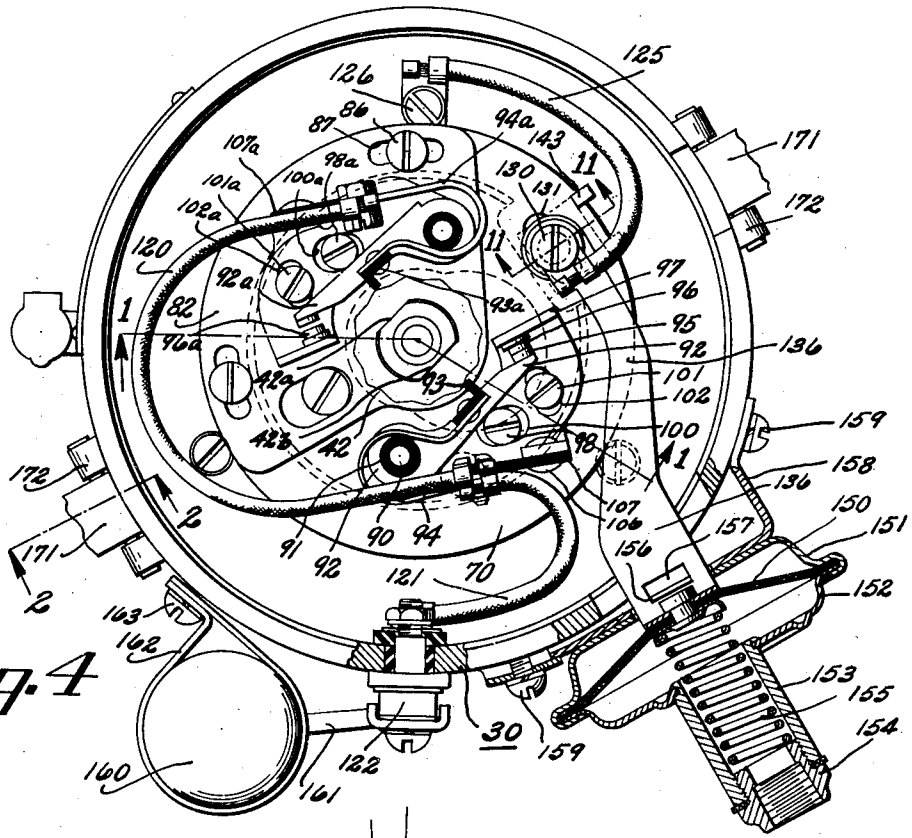


Fig. 4

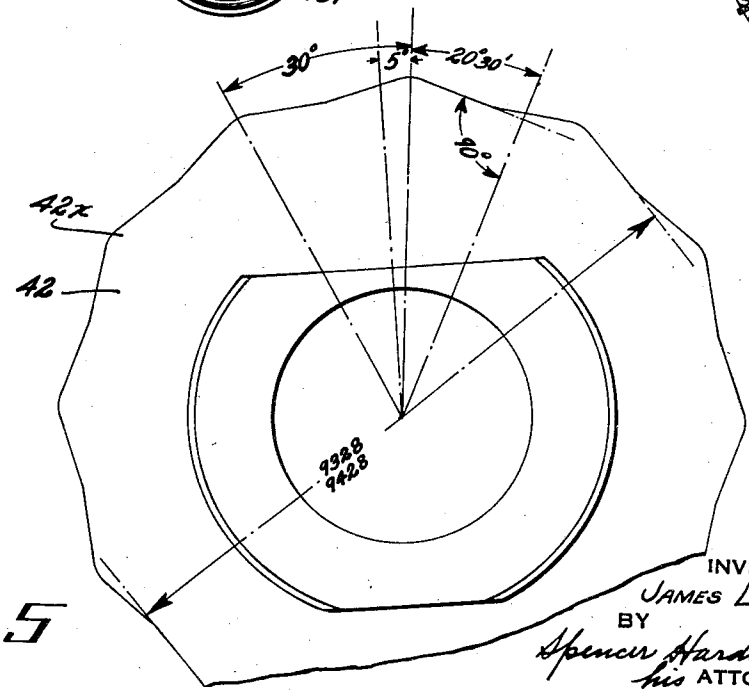


Fig. 5

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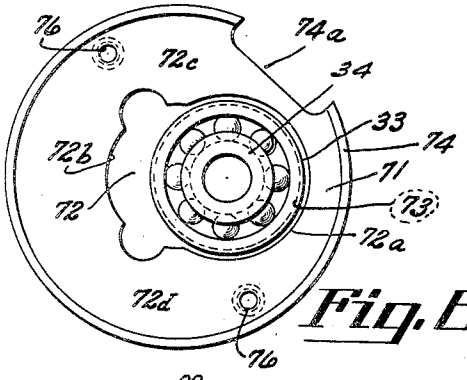


Fig. 6

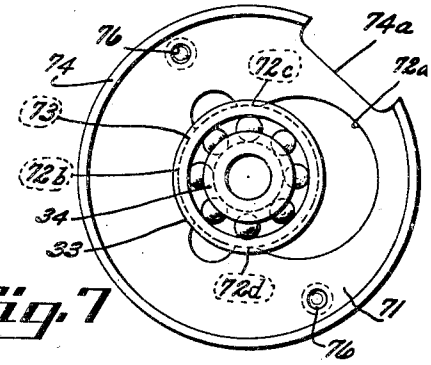


Fig. 7

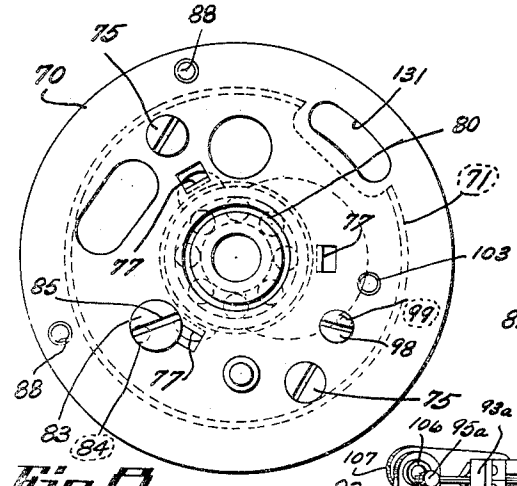


Fig. 8

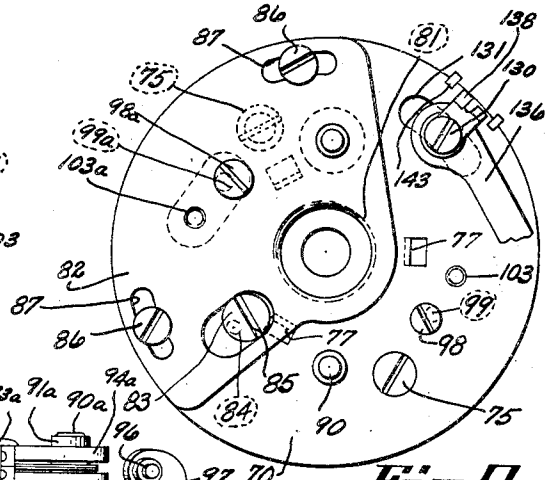


Fig. 9

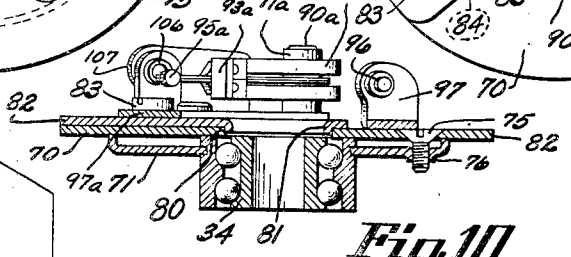


Fig. 10

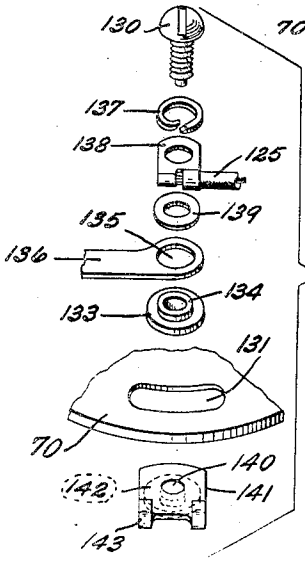


Fig. 12

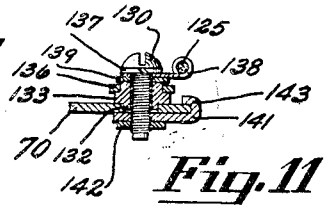


Fig. 11

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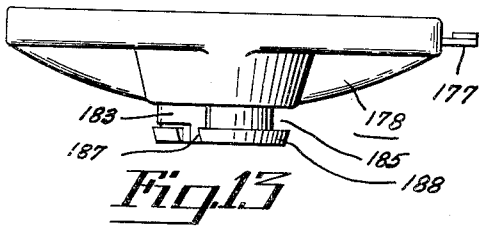


Fig. 13

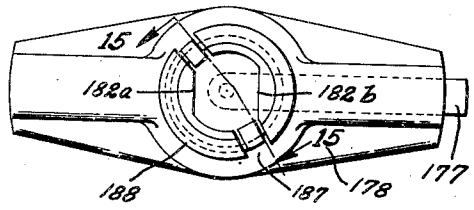


Fig. 14

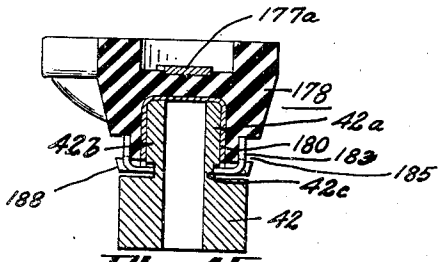


Fig. 15

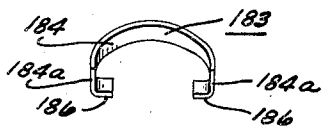


Fig. 16

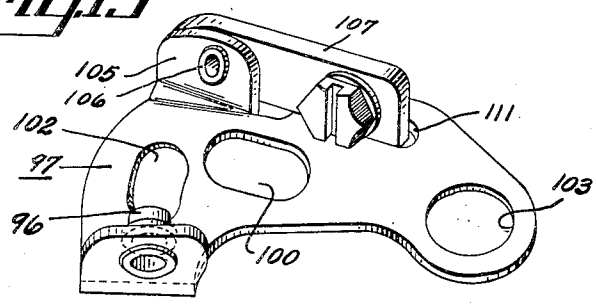


Fig. 17

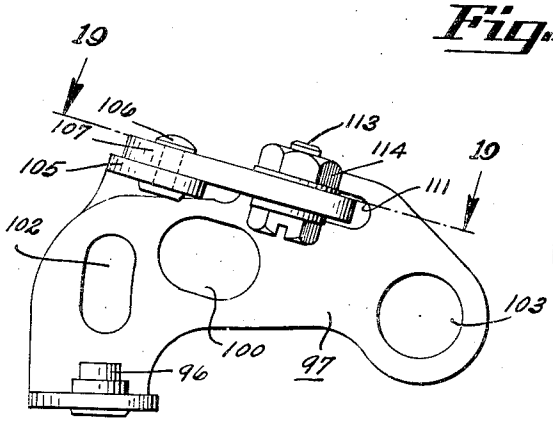


Fig. 18

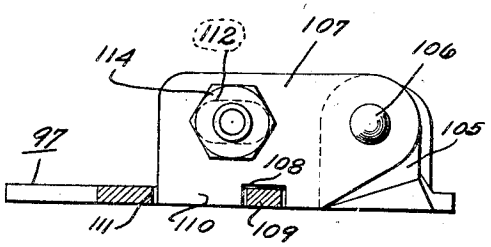


Fig. 19

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Patented Jan. 16, 1940 2,187,070

UNITED STATES PATENT OFFICE

2,187,070

IGNITION DISTRIBUTOR

James L. Arthur, Anderson, Ind., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application April 4, 1938, Serial No. 199,882

12 Claims. (Cl. 200—31)

This invention relates to ignition distributors for internal combustion engines.

One of the objects of the present invention is to provide an ignition distributor having an adjustable circuit breaker plate so mounted with respect to the cam which operates the circuit interrupter that concentricity between the breaker plate and cam will be maintained for all positions of adjustment of the breaker plate. In order to accomplish this object I provide an antifriction bearing for the cam shaft near the end of the shaft to which the cam is attached. The outer race of the bearing has a running fit within a centrally located recess in the distributor housing so that the outer race is journaled for rotation within a wall of the distributor housing. To the outer race of the antifriction bearing, I secure the adjustable circuit breaker plate. Therefore, the circuit breaker plate is maintained by the antifriction bearing in a concentric relation with respect to the ignition timer cam.

Another object of the present invention is to provide a water proof connection between the distributor posts or the distributor center contact and the high tension cables to which the posts and the center contact are respectively connected. In order to accomplish this object, the distributor cap is provided with metallic inserts which provide the distributor posts past which the rotor segment rotates and the center contact to which the rotor segment is connected. Each of these inserts carries a sharp pointed pin projecting outwardly from the upper surface of the cap. Each insert extends flush with a plane boss at right angles to the pointed pin. A sleeve or thimble of soft rubber is placed over each high tension cable, and the cable end with the thimble assembled thereon is forced sideways down over the pointed pin which pierces the thimble, the insulation of the cable and the cable itself which is made of twisted or stranded small wires. The thimble is provided with a plane surface which fits snugly against the plane boss with which the insert is flush. On the side of the thimble remote from the boss on the distributor cap, the thimble is provided with a boss which is substantially parallel with the boss of the thimble which bears against the boss of the distributor cap. This other boss of the thimble is adapted to be engaged by a surface of a distributor cap cover which can be attached to the cap by screws, the tightening of which causes the rubber thimble to be squeezed between the distributor cap and distributor cap cover thereby causing the thimble to be clamped tightly against the boss of the distributor cap, thereby preventing moisture from entering into the insert.

A still further object of the invention is to provide a quick detachable means for connecting the distributor rotor with the timer cam, said means having provisions for preventing accidental displacement of the rotor from the cam in a direction axially of the cam.

A still further object of the present invention is to provide for insulatingly supporting the end of the conducting leaf spring of the circuit breaker lever upon a metallic bracket upon which the stationary contact is mounted.

Another object of the present invention is to provide a pivotal connection between the adjustable contact bracket and an actuating member, said pivotal connection being adjustable to various positions within a limited range. A feature of this connection is that it includes a single screw by which the connection is assembled and by which it is secured to the breaker plate in adjusted position. In this connection it is still a further object to provide a construction in which the screw referred to is used to secure in position a metal clip on the end of a wire which provides a part of the ground connection of the primary circuit of the ignition distributor.

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

In the drawings:

Fig. 1 is a vertical, longitudinal sectional view of an ignition distributor embodying the present invention. This sectional view being taken on the line 1—1 of Fig. 4.

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 4.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a plan view partly in horizontal longitudinal section of the ignition distributor with the cap and rotor removed.

Fig. 5 is a fragmentary plan view of the timer cam on a larger scale than shown in Fig. 4.

Fig. 6 shows a plan view of a ball bearing received within a recess of a plate with which the bearing is to be assembled.

Fig. 7 is a view similar to Fig. 6, but showing the sub-plate and bearing in assembled relation.

Fig. 8 is a plan view of the cam circuit breaker plate assembled with the bearing and sub-plate of Fig. 7.

Fig. 9 is a plan view of the assembly of main circuit breaker plate and auxiliary circuit breaker plate.

Fig. 10 is a fragmentary sectional view on the line 10—10 of Fig. 4 showing a circuit breaker lever assembled on an auxiliary circuit breaker plate which is mounted upon the main circuit breaker plate which is secured to the outer race of the ball bearing by the sub-plate.

Fig. 11 is a fragmentary sectional view on the line 11—11 of Fig. 4.

Fig. 12 is an exploded view in perspective of various parts shown in Fig. 11.

Fig. 13 is a side elevation of the distributor rotor.

Fig. 14 is a bottom plan view of the rotor.

Fig. 15 is a sectional view on the line 15—15 of Fig. 14.

Fig. 16 is a perspective view of a resilient clip for securing the rotor to the cam.

Fig. 17 is a perspective view on an enlarged scale on one of the stationary contact brackets of the circuit breaker mechanism.

Fig. 18 is a plan view thereof; and

Fig. 19 is a sectional view on line 19—19 of Fig. 18.

Referring to Fig. 1, the ignition distributor comprises a cup shaped housing 20 having a tubular shank 21 adapted to be received within a recess of the frame of the engine with which the distributor is associated. The shank 21 carries a ball bearing 22 within which a tubular shaft 23 is journaled. Shaft 23 carries a coupling 24 by which a connection with an engine driven shaft may be made. The bearing 22 is protected from dirt and the escape of lubricant therefrom is prevented by seals 26 which are a part of the bearing assembly. The threaded recess 25 in the lower end of shank 21 receives a nut 25*a* which secures the bearing 22 within the recess.

The housing cup 20 supports the bottom wall 31 of a dish-shaped housing member 30. Wall 31 is provided centrally with a recess 32 which receives the outer race 33 of an anti-friction ball bearing 34, the inner race 35 of which fits over a shaft 36. The bearing race 35 is located between a shoulder 37 of the shaft 36 and a spacing sleeve 38 retained in position by a C washer 39 which fits into a groove 40 in the shaft 36. The C washer 39 is maintained in position by reason of the fact that said washer is received within a recess 41 provided in the shouldered surface of the timer cam 42 which fits over the upper end of the shaft 36, said upper end being divided by slots into resilient prongs 43 which can be wedged apart by conical wedge 44 so as to press tightly against the cylindrical surface of the central bore 45 of the cam 42. The conical wedge 44 is swivelly connected with a screw 46 which is threaded into the tapped hole 47 in the upper end of the shaft 36.

The lower end portion 36*a* of the shaft 36 is reduced in diameter and is provided with cylindrical bosses 50 which are received with a sliding fit within the cylindrical bore 51 of the shaft 23. The housing portions 20 and 30 are concentric. Hence, the bearings 22 and 34 are in alignment and the shafts 23 and 36 are substantially in alignment. The shaft 23 drives the shaft 36 through a device responsive to engine speed for varying the angular relation between the shafts for the purpose of varying the ignition timing in accordance with engine speed. This speed responsive device comprises a weight supporting plate 52 attached to the shouldered upper end of the shaft 23. Plate 52 provides pivot posts 53 each pivotally supporting a weight 54 having an arm 55 bearing against a lever or cam 56. There are two levers or cams 56 integrally connected by a hub 59 which is drivingly fitted over a knurled portion 57 of the shaft 36. A slot 58 is milled in shaft 36 opening into bore 51 of shaft 23 to permit access of lubrication of shaft 36 in bore 51. Motion of the weights outwardly to cause counterclockwise rotation of the cams 56 is restrained by springs 60 attached at one end of the pivot posts 53 and at the other end to studs 61 carried by the cams 56. The weight members 54 are retained in position by a plate 62 supported upon studs 63 carried by the weight plate 52. Nuts 64 are screwed upon threaded upper ends of the stud 63 to secure the plate 62 in position. Nut locking clips 64*a* are carried by stud 63 and posts 53 and have ears 64*b* which are bent against flats of the nuts 64 to prevent accidental loosening thereof.

The outer race 33 of the ball bearing 34 has a running fit within the recess 32 of housing member 30. The bearing race 34 therefore provides a journaled bearing for the adjustable circuit breaker plate 70 which is secured to the race 33 in a novel manner now to be described. A part of this securing means is a sub-plate 71 (see Figs. 6 and 7) having an opening 72 which is defined by arcuate portions 72*a* and 72*b* and straight portions 72*c* and 72*d*. The arcuate portion 72*a* is greater in diameter than the outside diameter of the race 33 so that race 33 may be entered within the portion 72*a*. Race 33 is provided with a groove 73 having a diameter only slightly less than the distance between the portion 72*c* and 72*d* of member 71. The portion 72*b* is an arc, the radius of which is equal to the radius of the bottom of the groove 73. Therefore, when parts 33 and 71 are assembled, as shown in Fig. 7, the bottom of groove 73 will be engaged by the portions 72*b*, 72*c* and 72*d*. When the parts are assembled as shown in Fig. 7, the annular flange 74 of sub-plate 71 will be substantially concentric with respect to the bearing 34. The plate 71 is notched at 74*a* to provide clearance.

Fig. 8 shows the main breaker plate 70 assembled with sub-plate 71 by means of screws 75 extending through holes in the plate 70 and screwed into holes 76 tapped in the plate 71. When plates 70 and 71 are thus assembled, tangs 77 struck out of the plate 70 extend closely along the outer cylinder wall of the bearing race 33 and thus prevent the sub-plate 71 from shifting out of its position relative to the bearing 34 shown in Fig. 7.

Plate 70 is provided centrally with a hole 80 which is concentric with the bearing 34 and which provides a journal for a flange 81 of an auxiliary plate 82. Plate 82 is therefore pivotally mounted upon the plate 70, the axis of the pivot being coaxial with the bearing 34. The adjustment of plate 82 upon plate 70 is effected by the turning of a disc 83 having an eccentric shank 84 journaled in the plate 70. The disc 83 is provided with a slot 85 adapted to receive the blade of a screw driver by which the disc 83 may be turned by turning the screw driver. The plate 82 is secured to the plate 70 in the desired position of adjustment by screws 86 which pass through arcuate slot 87 provided in plate 82 and which screw into tapped holes 88 provided by plate 70.

The plates 70 and 82 support similar circuit breaker mechanisms which will now be described.

Plate 70 supports a pivot stud 90 which receives the nonconducting journal bushing 91 of a circuit breaker lever 92 which is thus insulatingly mounted upon the plate 70. Lever 92 carries an L-shaped rubbing block 93 bearing against the cam 42. The rubbing block 93 is urged toward the cam 42 by a leaf spring 94 which serves as an electrical conductor in a manner to be described. Lever 92 carries a contact 95 engageable with a stationary contact 96 carried by a bracket 97 which is adjustable upon the plate 70, said bracket 97 being pivoted upon the breaker lever pivot stud 90. Bracket 97 is adjusted about the pivot 90 by the turning of a disc 98 having an eccentric shank 99 pivotally connected with the plate 70. The disc 98 is received by a slot 100 provided by the bracket 97 and located radially with respect to the pivot 90. The disc 98 is provided with a slot for receiving a screw driver blade, the turning of which effects the turning of the disc 98 and the adjustment of the bracket 97. The bracket 97 can be secured in the desired position of adjustment by tightening a screw 101 which extends through an arcuate slot 102 in the bracket 97 and which screws into a threaded hole 103 in the plate 70, see Fig. 9.

The operation of the circuit breaker is most obvious. The lobes of the cam 42 engage the rubbing block 93 in order to move the lever 92 to separate the contact 95 from the contact 96. When a cam lobe leaves the rubbing block 93 and spring 94 urges the contact 95 into engagement with the contact 96. A similar circuit breaker mechanism is mounted upon the auxiliary plate 82 and the parts of this similar circuit breaker are labeled with the same reference characters as those applied to the circuit breaker which has just been described, but with the affix *a*. Therefore, the circuit breaker mounted on auxiliary plate 82 will need no further description.

There is a feature of the contact bracket 97 which can best be understood by reference to Figs. 17, 18 and 19 which show one of the stationary contact brackets on an enlarged scale The bracket 97 has a hole 103 which receives a portion of the pivot post 90 around which the bracket 97 is pivoted. Bracket 97 is provided with an ear 105 to which a rivet 106 secures a nonconducting plate 107 having a notch 108 receiving a portion 109 of the bracket 97 and having a portion 110 which extends into an opening 111 provided by the bracket. In this way a single rivet 106 is all that is needed to secure the plate 107 to the bracket. Plate 107 is provided with an elongated hole 112 which receives a screw 113 which cooperates with a nut 114 to secure to the plate 107 an end of the circuit breaker lever spring 94. The screw 113 and the nut 114 also secure to the plate 107 the terminal clips on the end of conducting wires by which electrical connections are to be made with the circuit breaker lever springs 94 as shown in Fig. 4. One of these wires is the wire 120 which makes a connection between lever spring 94 and lever spring 94*a*. Another of these wires is the wire 121 which makes an electrical connection between the lever spring 94 and a terminal 122 which is insulatingly supported by the housing member 30. Terminal 122 is the insulated terminal of the primary circuit. The two circuit breaker levers 92 and 92*a* are electrically connected with terminal 122. The stationary contacts 96 and 96*a* are grounded through the supporting plates 70 and 82 which together are grounded by means of a flexible wire 125 attached by screw 126 to housing 30 and attached by screw 130 to the plate 70 in a novel manner which will now be described with reference to Figs. 11 and 12.

Referring now to Figs. 11 and 12, there is shown a fragment of the plate 70, which is provided with an arcuate slot 131. Slot 131 receives a shouldered portion 132 of a washer 133 having a shouldered portion 134 which is received by a hole 135 in an operating member 136. The screw 130 passes through a lock washer 137 then through a terminal clip 138 attached to wire 125 and then through a washer 139. Screw 130 passes through a plane hole in the washer 133 and then through a hole 140 tapped in a clip 141 which is reinforced by a plate 142 welded or otherwise secured to the clip 141. clip 141 is provided with tangs 143 which extend around the edge of the plate 70 so as to prevent turning the clip 141 when the screw 130 is turned. By loosening the screw 130 the assembly of parts can be shifted relative to the plate 70, the shouldered part 132 of the collar 133 sliding along the arcuate slot 131 of the plate 70. In this way the relation between the plate 70 and the operative member 136 can be adjusted. When the desired adjustment has been made, the screw 130 is tightened to secure the parts in assembled relation and in fixed relation with respect to the plate 70, yet to provide a pivotal connection between the plate 70 and the operating member 136 and, at the same time, to provide an electrical connection between the plate 70 and the wire clip 138 to which the wire 125 is attached.

Referring to Fig. 4 the operating member 136 is actuated by means which functions in response to variations in suction pressure in the engine intake pipe passage. The member 136 is attached to a flexible diaphragm 150, the periphery of which is clamped between the flanges of cup shaped members 151 and 152. Member 152 carries a tubular part 153 into which a pipe connector 154, threaded for making connections leading into the engine intake manifold, the part 153 housing a spring 155 which exerts pressure tending to maintain the diaphragms 150 in the position shown in Fig. 4. Movement of the member 136 is limited by a stop 156 extending into an opening 157 provided by member 136. Stop 156 is integral with a bracket 158 to which the cup shaped part 151 is attached. Bracket 158 is attached by screws 159 to the housing 30. It is apparent that variations in engine suction will effect movement of the diaphragm 150 thereby effecting movements of the breaker plates 70 and 82 which will locate the circuit breaker lever in correct position relative to the cam to effect proper timing of the engine ignition sparking into conformity to engine operating conditions.

During the movements of the circuit breaker plates 70 and 82 effected in accordance with variations in engine intake suction, the circuit breakers will remain always with the same distance from the axis of the cam. This is important, otherwise the spark timing might vary in accordance with the position of the breaker plate 70 and 82. While the variation would not be so very material in engines having relatively small number of cylinders, any slight variation in distance between the cam and circuit breaker levers due to slight eccentricity of movement of the circuit breaker plates relative to the cam might seriously effect ignition timing of engines embodying relatively large number of cylinders. The disclosed embodiment of the present inven-

tion is an ignition distributor having 12 cylinder engines. Hence, the cam 42 has 12 lobes 42x. As shown in Fig. 5 on an enlarged scale, a cam of this type has been very carefully dimensioned in order that the lobes will all be exactly alike and will be correctly spaced apart. While it is important that the cam conform to the prescribed dimensions with great accuracy, it is equally important that concentricity between the breaker plates and the axis of the cam be maintained, otherwise ignition timing will not be properly synchronized with the engine. The desired concentricity is provided in accordance with the present invention by securing the circuit breaker plates to the outer race of that ball bearing supporting the timer cam shaft and located nearest to the timer cam.

The cam shown in Fig. 5 provides for a closing period of circuit breaker contacts of 16° and an open period of 14° cam shaft rotation. To secure a greater closing period would mean a sharper rise on the cam lobes and greater wear or the cam and rubbing block of the breaker lever. In order to obtain a longer total closing period of the ignition primary circuit to allow the ignition coil to build up sufficiently for adequate ignition, two circuit breakers are so located that one closes and opens 5° respectively ahead of the closing and opening period of the other circuit breaker. This increases the total time of primary closing to 16°+5° or 21°.

To reduce sparking at the contacts of the circuit breaker, a condenser 160 is connected in parallel with the circuit breaker. The condenser has one foil connected with an insulated terminal wire 161 connected with the terminal 122. The other condenser foil is grounded on the metal container of the condenser which is attached by metal clip 162 and a screw 163 to the housing 30.

A distributor cap 170 fits upon the rim of the housing 30 as shown in Fig. 1 and is secured thereto by spring clips 171 hingedly connected at 172 with brackets 173 attached to the housing 30. The free ends of the clips 171 bear against lugs 174 provided by the cap 170. Cap 170 is provided with inserts 175 located in a circular row. The lower end of each insert provides a distributor post 176 past which swings a distributor segment 177 embedded in a nonconducting distributor rotor 178. The hub of the rotor 178 is provided with a recess 179 lined with a metallic liner insert 180 having flats which fit around the flats 42a and 42b provided by the cam 42 as shown in Figs. 1, 4 and 15. As shown in Fig. 14, the flats of the insert 180 are marked 182a and 182b, since these conform respectively with flats 42a and 42b of cam 42. In order to prevent accidental displacement of the rotor 178 away from the cam 42, there is provided a spring clip 183 shown in Fig. 16 which comprises an arcuate portion 184 received within a groove 185 provided by a rotor 178 and having tangs 186 which extend through notches 187 in the flange 188 of the rotor 178 and which extend into a groove 42c provided by the cam 42. The rotor 178 cannot be removed from the cam 42 until the clip 183 is removed therefrom. This can be done by springing apart the end portions 184a of the arm part 184 of the clip 183.

The distributor segment 177 has a bare portion 177a at the center of the distributor rotor 178 engaged by a conducting button 190 mounted on the end of a sleeve 191 guided by an insert 192 and urged downwardly by spring 193. The center insert 192 and each of the distributor posts inserts 175 terminate flush with a plane surface of a boss. The central boss is numbered 192a, and the bosses that are in the circular row are number 175a. The bosses 175a are all in the same plane which plane is parallel to the plane of the boss 192a. To the cap 170 is secured a cover 194 which is attached by screws 195. Cover 194 has a central recess, the upper surface of which is indicated by numeral 196. This recess 196 extends upwardly from a plane surface 197 which is spaced at a distance from the central part of the surface 196a which is substantially equal to the distance between the plane of the central boss 192a and the plane of bosses 175a, for a purpose to be described. The plane surface 197 merges into a flange 198. To each of the inserts 175 and 192 is secured a sharp pointed pin 199 for making an electrical connection with a high tension cable 200 comprising a flexible stranded conductor 201 encased in insulation 202. Each conductor 200 is squared off at the end and is inserted into a soft rubber sleeve or thimble 203 having on diametrically opposite sides thereof bosses 204 and 205 each provided with a shallow conical recess 206. Before the cover 194 is attached to the distributor cap 170, the thimbles and assembled ends of the cables 200 will each be pushed down over a pin 199, the conical recess 206 serving to guide or start the pin in the right direction so that it will pierce diametrically through the cable 200 and its point will make contact with the stranded wires 201. Then the cover 194 is secured in position; and the tightening of the screws 195 will cause each one of the thimbles 203 to be clamped between a plane boss provided by the distributor cap 170 and a surface provided by the cover 194. As the bosss 204 and 205 of the thimbles 203 are alike, it matters little which one of the bosses is pushed down over the pointed pin 199. The thimbles 203 which are associated with inserts 195 are squeezed between the boss 175a and the cover surface 197. At the same time, the centrally located thimble 203 is squeezed between the boss 192 and the cover surface 196. The thimbles 203, being alike, make it desirable that the distances between the cover surface 197 and the various bosses 175a be substantially equal and be equal to the distance between the central part of the cover surface 196a and the boss 192a. In this way all of the thimbles 203 will be clamped securely in position by tightening the screws 195 which secure the cover 194 to the clip 170. Thus each thimble 203 is tightly squeezed around a cable 200 and each thimble is also tightly forced against an insert of the distributor cap. Thus, a water tight connection between each of the cables and each of the inserts of the distributor cap is provided.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An ignition distributor for internal combustion engines comprising a housing, an antifriction bearing having its outer race rotatably journaled in the housing, a shaft carrying a timer cam and fixed within the inner race, a circuit breaker plate fixed to the outer race, a circuit breaker supported upon the plate and including a breaker arm operated upon by the cam, and means for adjusting the breaker plate, said plate rotating coaxially with respect to the cam by

reason of the attachment of the plate to the bearing outer race.

2. An ignition distributor according to claim 1 in which the breaker plate is provided with means centering it with respect to the bearing outer race, and in which the breaker plate is attached to the race in its centered position by a sub-plate attached to the breaker plate and fitting into a groove provided by the race.

3. An ignition distributor according to claim 1 in which the breaker plate is provided with a central opening through which the cam shaft extends and is provided with spaced tangs located in a circular row concentric with the opening in the plate said tangs embracing the bearing outer race to center the plate with respect to it, and in which the breaker plate is attached to the race in its centered position by a sub-plate attached to the breaker plate and fitting into a groove provided by the race.

4. An ignition distributor according to claim 1 in which the breaker plate is provided with a central opening through which the cam shaft extends and is provided with spaced tangs located in a circular row concentric with the opening in the plate said tangs embracing the bearing outer race to center the plate with respect to it, and in which the breaker plate is attached to the race in its centered position by a sub-plate having a central opening defined by surfaces which fit into a groove provided by the race and having an off-center opening large enough to receive the race, said off-center opening merging with the central opening whereby the sub-plate can be located around the race and then be moved so that said surfaces of the sub-plate are received by the groove in the race, and means for securing together the breaker plate and sub-plate in their centered positions relative to the race.

5. An ignition distributor according to claim 1 in which a main drive shaft, journaled in the housing at a point remote from said antifriction bearing, has a tubular portion which receives a portion of the timer cam shaft, and in which the two shafts are connected by means responsive to speed of rotation for varying the angular relation between them.

6. An ignition distributor according to claim 1 in which the means which adjusts the circuit breaker plate includes an arm adjustably secured to the plate by a plate clamping device which provides a pivotal connection between the plate and arm said device fitting into an arcuate slot concentric with the antifriction bearing, said device including two washers engaging opposite surfaces of the breaker plate and a screw for securing the washers in clamping position.

7. In an ignition distributor the combination of a distributor rotor, a timer cam supporting the rotor in a fixed angular position relative thereto, and a quick detachable means for preventing axial displacement of the rotor relative to the cam and comprising a resilient member having a part received by a groove in the rotor and a part received by a groove in the cam.

8. In an ignition distributor, the combination of a distributor cap and a distributor cap cover having substantially parallel, spaced surfaces, the surface of the cap being flush with an end surface of a metallic distributor insert embedded in the cap, a pointed pin projecting from the insert and into the space between the cap and cap cover, an insulated stranded wire conductor for making an electrical connection with the pin, a soft rubber thimble on an end of the wire, the pin piercing sidewise through the thimble and conductor including the stranded wire thereof, the thimble having diametrically opposite plane bosses one of which is pressed against the surface of the cap and overlying the insert end surface, and the other of which is pressed against the cap cover and means for securing the cap cover to the cap and for causing the thimble to be clamped between the cap and cap cover to squeeze the thimble against the insulated wire.

9. The combination defined by claim 8 in which diametrically opposite conical recesses are provided, respectively, in the bosses of the thimble, either one of the recesses being used to start the thimble properly over the pin, the point of the pin being applied to the apex of the conical recess.

10. The combination defined by claim 8 in which the cap cover has an annular flange surrounding a thimble engaging surface thereof, said flange extending downwardly against the insulated conductor and outside of the outer end of the thimble.

11. An ignition distributor comprising a housing, an antifriction bearing having its outer race journaled in the housing, a timer cam on a shaft, said shaft being carried by the inner race of the bearing, a circuit breaker operated by the cam, and a plate supporting the circuit breaker, said outer race providing a support for the cam shaft and also a concentric bearing for movement of the circuit breaker plate.

12. An ignition distributor comprising a housing, a double ball bearing supported by the housing, a timer cam on a shaft supported by the inner race of the bearing, a circuit breaker operated by the cam and a plate supporting the circuit breaker and attached to the bearing, said bearing serving as means for maintaining the circuit breaker plate in a definite relation to the cam in order to accurately maintain a definite amount of separation of the contacts of the circuit breaker.

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