United States Patent

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[54] **IGNITION DISTRIBUTOR HAVING A RADIO FREQUENCY INTERFERENCE SHIELD**
3 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **200/19,** 123/148 P, 200/27, 200/168 G, 310/70
[51] **Int. Cl.** **H01h 19/00,** H02h 9/02
[50] **Field of Search** ..... 310/70, 153; 123/148 P; 200/19—32, 168

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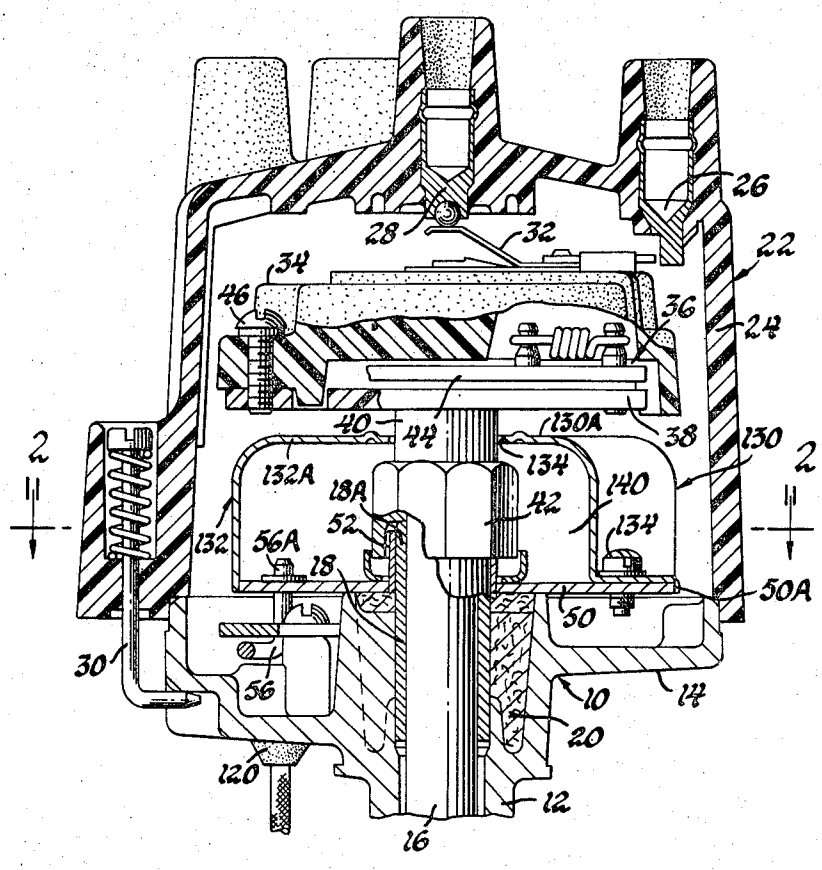
ABSTRACT: A radio frequency interference shield of an ignition distributor of the type having a fixed base and an adjustable breaker plate which is shifted by a vacuum unit relative to the base. The distributor is of the type wherein the centrifugal advance mechanism is disposed above the breaker can and located within a rotor assembly for the distributor. A radio frequency interference shield is provided which comprises a generally cup-shaped metallic housing that is attached to the breaker plate of the distributor. The cup-shaped housing is formed of two complementary interfitting metallic parts which are attached to the breaker plate and which have matching semicircular openings that together form a circular opening disposed about a rotatable part of the distributor that drives the rotor. The two housing parts are secured to the breaker plate by screws and with the breaker plate form a closed housing except for the opening that receives a rotatable part of the distributor and an opening for adjusting the breaker contact set of the distributor. The compartment defined by the breaker plate and the two housing shield parts enclose the distributor breaker contacts, a capacitor, and the capacitor lead wire connecting the capacitor to one of the breaker contacts.



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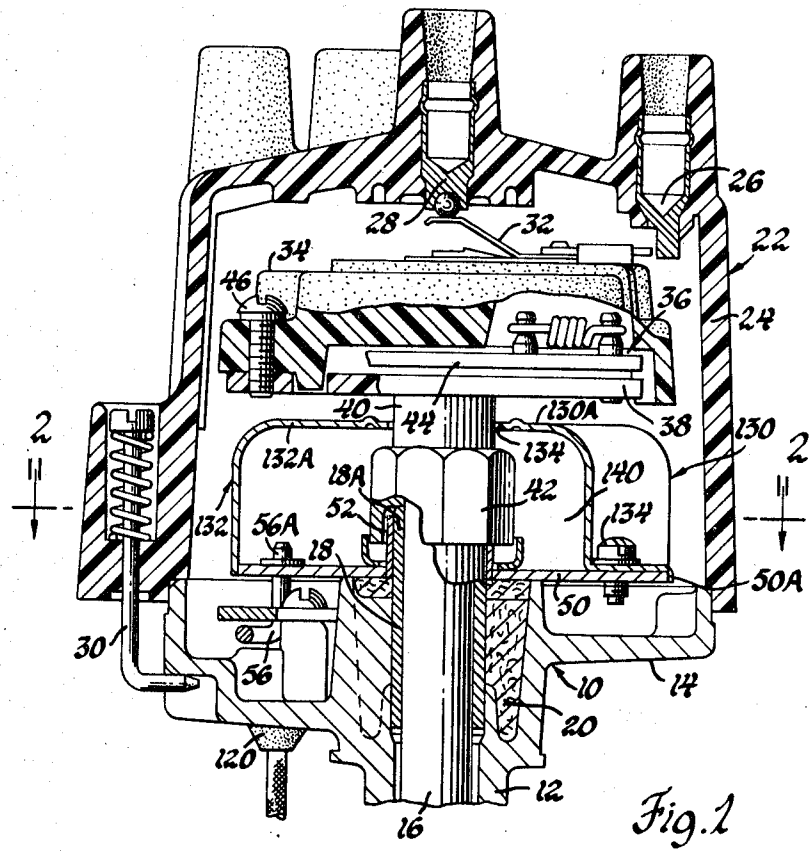

Fig. 1

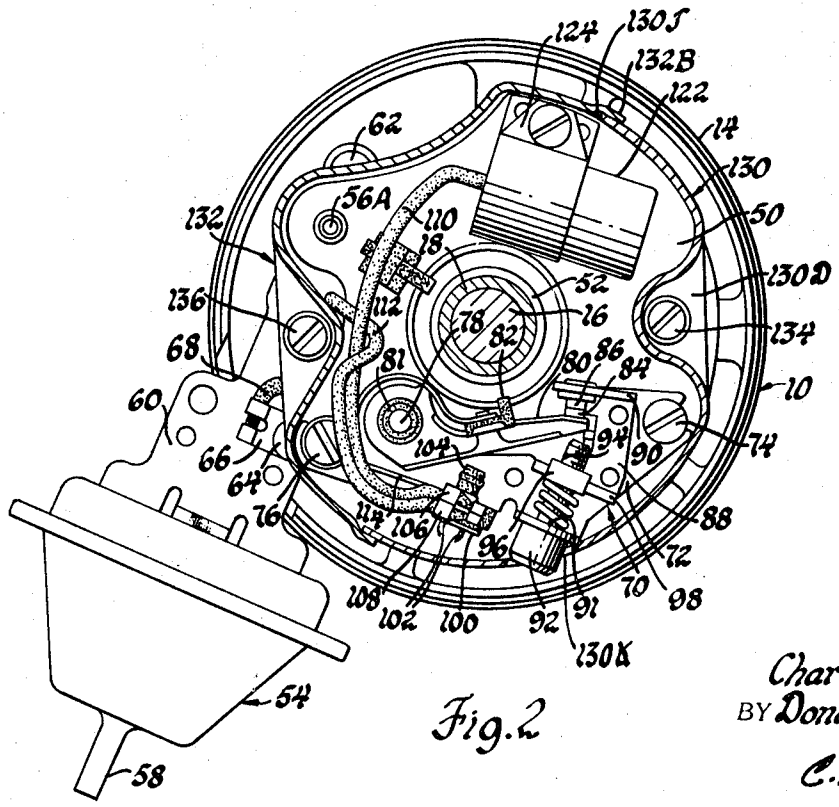

Fig. 2

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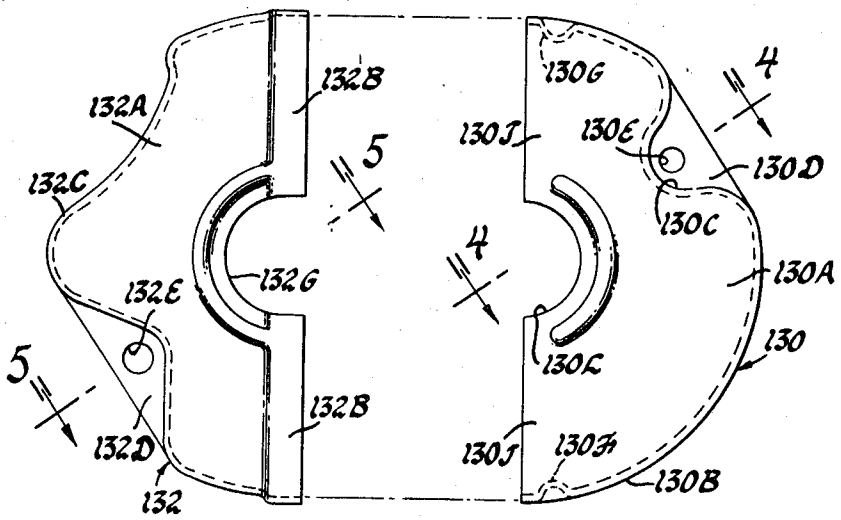

Fig. 3

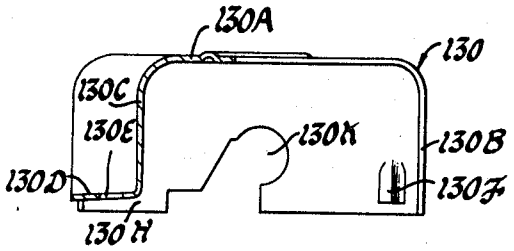

Fig. 4

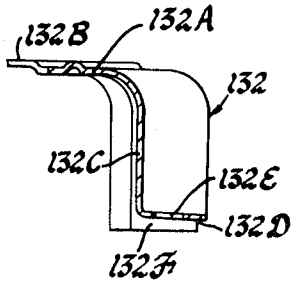

Fig. 5

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IGNITION DISTRIBUTOR HAVING A RADIO FREQUENCY INTERFERENCE SHIELD

This invention relates to ignition distributors for internal combustion engines and more particularly to an ignition distributor that has a shield for preventing signals developed by the ignition apparatus from interfering with proper operation of communications equipment on a motor vehicle such as a radio.

The ignition system for the internal combustion engine of a motor vehicle is known to be a source of electrical radiation which may interfere with the satisfactory operation of communications equipment such as radios located on a motor vehicle. The amount of interference to some extent depends upon the distance between the antenna of the radio receiver and the source of radio interference. The problem may become particularly troublesome where the radio antenna is embedded in the windshield and where the distributor for the internal combustion engine is located at the rear of the engine and therefore closely adjacent the windshield mounted antenna. A proposed solution to this problem which has been suggested by those skilled in the art is to provide a grounded metallic shield which is disposed between the interfering signal source and the antenna of the radio. The shield has taken various configurations but has followed the central idea of disposing a grounded metallic shield about the entire distributor cap in order to reduce the radiation of signals generated by the ignition apparatus. Typical examples of radio frequency interference shields which enclose the entire distributor cap are disclosed in the U.S. Pats. to Arthur No. 2,347,019 and to Hallett No. 2,465,447.

Where a radio frequency interference shield is provided that entirely encloses the distributor cap, such as those shown in the above-mentioned patents, the shield must be provided with a plurality of openings to accommodate the spark plug wires connecting the distributor cap and the spark plugs. In addition, the shield is of a rather bulky and large part since it must enclose the entire distributor cap and must be supported by the base of the distributor.

Moreover, some provision must be made for preventing the interfering signals from escaping through the openings in the shield through which the spark plug wires pass.

In contrast to known radio frequency interference shields which entirely enclose the distributor cap and which are attached to the base of the distributor the present invention contemplates providing a shield which is located closely adjacent the source of interfering signals and which is located within the distributor cap. In carrying this object forward an ignition distributor which has a rotatable breaker plate that supports the breaker contacts and a capacitor is fitted with a metallic shield which is attached to the breaker plate. The shield and breaker plate define a compartment of relatively small volume that encloses the breaker contacts, the capacitor, and the capacitor lead wire of the ignition distributor.

It accordingly is one of the objects of this invention to provide a shield for preventing the radiation of signals developed by ignition apparatus from interfering with radio receiving equipment wherein the shield is located within the distributor cap of an ignition distributor and attached to a rotatable breaker plate of the distributor and further wherein the breaker plate and shield form a housing which contains the breaker contacts, the capacitor and the capacitor lead wire of a distributor.

It will be appreciated that by using the shield of this invention the shield does not need to be provided with a plurality of openings accommodating the spark plug wires and the shield is located closely adjacent to the apparatus generating the interfering signals with a result that improved radio frequency suppression is provided.

Another object of this invention is to provide a radio frequency interference shield for an ignition distributor wherein a cup-shaped housing comprised of two interfitting metallic parts is secured to the breaker plate of the distributor to provide an enclosed compartment that contains the breaker points, the capacitor and the capacitor lead of the distributor. By providing a two part shield it is possible to remove the shield to service the distributor, for example, to replace the breaker contact set without the necessity of removing the distributor shaft from the distributor base.

A further object of this invention is to provide a radio frequency interference shield for an ignition distributor which is comprised of two complementary interfitting metallic shield parts which are secured to the breaker plate of an ignition distributor by fastener means such as screws and wherein portions of said shield parts engage the outer peripheral edge of the breaker plate to prevent rotation of the shield parts during operation of the distributor.

Still another object of this invention is to provide a radio frequency interference shield for an ignition distributor wherein the shield comprises a pair of metallic parts which are fixed to the breaker plate of a distributor which have complementary engaging surfaces and wherein the shield and breaker plate form an enclosed compartment containing the distributor breaker contacts and capacitor and further wherein an opening is provided in the shield for the reception of a tool that engages means for adjusting the breaker contact set.

IN THE DRAWINGS

FIG. 1 is a sectional view of an ignition distributor that is fitted with the radio frequency interference shield of this invention.

FIG. 2 is a sectional view taken along line 2–2 of FIG. 1 with the distributor cap removed.

FIG. 3 is a plan view of two complementary metallic shields that form the radio frequency interference shield of this invention.

FIG. 4 is a sectional view taken along line 4–4 of FIG. 3.

FIG. 5 is a sectional view taken along line 5–5 of FIG. 3.

Referring now to the drawings and more particularly to FIG. 1, the reference numeral 10 generally designates a base of an ignition distributor. This base 10 is formed of metal material and has an annular elongated section 12 and radially extending support section designated by reference numeral 14. The annular section 12 extends axially and contains a shaft 16 which is driven by the cam shaft of an internal combustion engine. The base portion 12 has an elongated portion not illustrated which fits within the internal combustion engine and which also supports an internal lower bearing not illustrated for rotatably supporting the lower end of shaft 16. The lower end of the shaft is connected to a gear (not shown) for driving the shaft.

The upper end of the shaft 16 is rotatably journaled in a bearing designated by reference numeral 18 which is supported by the base 10. Disposed within radially spaced chambers or pockets located about the bearing 18 is a lubricating compound generally designated by reference numeral 20. The bearing 18 has a portion 18A which projects above the section 14 of the base of the distributor and which forms a journal for the breaker plate of the distributor in a manner to be more fully described hereinafter.

The portion 14 of the base of the distributor supports a distributor cap which is generally designated by reference numeral 22. The distributor cap 22 is conventional and is formed of a molded insulating material 24 which carries a plurality of circumferentially spaced conductive inserts 26 which respectively receive the terminals of conductors connected with the spark plugs of an internal combustion engine. The distributor cap 22 also includes the conventional center terminal 28 which is connected with the secondary of an ignition coil. The distributor cap 22 is attached to the portion 14 of the base of the distributor by a pair of spring biased clamp arms 30, one of which is illustrated in FIG. 1.

The center electrode 28 an the circumferentially spaced inserts 26 are periodically connected by a conductor means 32. The conductor means 32 is supported by a rotor 34 which is

formed of insulating material and which contains a centrifugal advance mechanism generally by reference numeral **36**. The centrifugal advance mechanism includes a weight plate **38** connected to an annular part **40** which in turn is connected a breaker cam **42** which operates the breaker contacts of the distributor. The centrifugal advance mechanism **36** further includes flyweights **44** which are engaged by a cam plate not illustrated that is rigidly connected to the top end of the shaft **16**. The shaft **16** passes through the cam **42** and the annular part **40** and is connected with the cam plate in a manner illustrated in the Hartzell et al., U.S. Pat. No. 2,872,537. As explained in that patent movement of the flyweights **4** adjusts the cam **42** relative to the shaft **16** to shift the cam as a function of engine speed. The rotor part **34** which is formed of insulating material is fixed to the weights plate **38** by a pair of screws, one of which is illustrated in FIG. **1** and designated by reference numeral **46**.

The ignition distributor of this invention includes a conventional breaker plate generally designated by reference numeral **50**. A cylindrical bearing member **52** is secured to the breaker plate **50** and fits around the top end **18A** of the bearing **18**. The bearing **52** is secured to an inner wall of a central opening formed in the breaker plate **50**. The breaker plate **50** can rotate about the top end **18A** of the bearing **18** since the top end **18A** of the bearing forms a journal for rotatable movement of the breaker plate **50**.

The breaker plate **50** is rotatably adjusted by a conventional vacuum unit generally designated by reference number **54** and containing a diaphragm which is not illustrated but which is connected to the rod **56** shown in FIG. **1**. The rod **56** has an upstanding portion **56A** which fits within an opening formed in the breaker plate **50**. The tubular connector **58** of the vacuum unit is connected with the intake manifold of an internal combustion engine as is well known to those skilled in the art, and the breaker plate **50** is rotated relative to the base **12** of the distributor during operation of the internal combustion engine.

The vacuum unit **54** has a support section **60** which is secured to the base section **14** of the distributor by screws **62** and **64**. The screw **64** also secures a terminal clip **66** to the vacuum unit which is connected with a conductor **68**. The opposite end of the conductor **68** is welded or otherwise secured to the underside of breaker plate **50** and the screw **64** therefore connects the breaker plate **50** to the metallic portion **60** of the vacuum unit and therefore electrically connects the breaker plate **50** to ground. This is because the base **12** of the distributor contacts the block of the internal combustion engine and therefore is at electrical ground in a motor vehicle electrical system.

The breaker plate **50** supports a conventional breaker contact set which is generally designated by reference numeral **70**. The breaker contact set **70** comprises a support plate **72** which is fixed to the breaker plate **70** by means of screws **74** and **76** which pass through openings formed in the support plate **72** and which are threaded into the breaker plate **50**. The support plate **72** carries post **78** which pivotally supports a breaker arm designated by reference numeral **80**. The breaker arm **80** is electrically insulated from the post by insulation **81**. The breaker arm **80** carries a rubbing block **82** which is engaged by the cam **42** during rotation of the shaft **16** and carries the movable contact **84** of the breaker contact set. The fixed contact **86** of the breaker contact set is supported by a support **88** having an upstanding flange **90** which supports the fixed contact **86**. Support **88** has an opening disposed about the post **78** and with this arrangement the support **88** can be adjusted relative to the fixed support **72** by pivotal movement around post **78**. This adjustment is accomplished by an adjusting screw generally designated by reference numeral **91** having a head **92** formed with a hexagonal recess for receiving an adjusting tool and having a threaded end **94** fitted within a part **96** which is fixed to another upstanding flange **98** of the support **88**. Access to the adjusting screw **91** can be provided by providing an opening (not illustrated) formed in the side of the distributor cap which is opened or closed by a slidable door as disclosed in the Pat. Hartzell et al., U.S. Pat No. 2,872,537.The contact set that has been described may be of the type shown in Norris et al., U.S. Pat. No. 2,965,726 granted on Dec. 20, 1960.

The support **88** has another upstanding flange **100** which has an opening that receives a plastic fastener designated by reference numeral **102**. The fastener **102** has a cylindrical axially extending portion **104** which receives terminals **106** and **108** connected respectively with wire conductors **110** and **112**. The terminals **106** and **108** have open-ended slots which are disposed about the cylindrical portion **104** and the terminals are held in engagement with each other by a flat spring **114** which also serves to bias the breaker arm **80** toward the cam **42**. The conductor **112** passes through a grommet **120** located within an opening in the base of the distributor and is connected with the primary of an ignition coil as is well know to those skilled in the art. The conductor **110** is connected with a capacitor **122**, one side of which is grounded to the breaker plate **50** by a clamp **124**. The means for connecting the terminal clips **106** and **108** may be similar to that disclosed in the Julian U.S. Pat. No. 3,162,732 granted on Dec. 22, 1964.

The ignition apparatus that as thus far been described in conventional and the radio frequency interference shield for preventing the radiation of signals which would otherwise interfere with proper operation of a radio receiver on a motor vehicle will now be described. The radio interference shield as previously pointed out is disposed within the distributor cap **24** as opposed to prior art arrangements where the interference shield would be disposed entirely about the distributor cap **24** and secured to the base **14**.

The radio interference shield of this invention comprises a pair of metallic parts **130** and **132** which are preferably formed of a tin-plated steel approximately .023 inches thick and which when secured to the breaker plate **50** form a generally cup-shaped housing having an opening **134** located closely adjacent to part **40** of the weight plate assembly of the distributor. The parts **130** and **132** are shown in detail in FIG. **3** and in the sectional views of FIGS. **4** and **5**. The shield part **130** has the top wall **130A** connected with an axially extending wall **130B**. The wall **130B** is indented over an area designated by reference numeral **130C** and the part **130** has a flange **130D** which forms a support flange for the shield part **130**. The flange **130D** is formed with an opening **130E** which receives a screw **134** that is threaded into the breaker plate **50** and which serves to secure the metal shield **130** to the breaker plate **50**. The wall **130B** of the shield **130** is struck-in at **130F** and **130G** to provide ledges which engage the top surface of the breaker plate **50** when the shield **130** is attached to the breaker plate **50**. The lower edge **130H** of the part **130** engages the outer peripheral edge **50A** of the breaker plate **50** when the shield **130** is assembled to the breaker plate. This prevents the shield **130** from rotating relative to the breaker plate **50** when it is attached to the breaker plate. The flange **130D** has no projecting edge to engage the edge of the breaker plate and is secured directly to the top edge of the breaker plate **50** when the part **130** is secured to the breaker plate. The shield **130** has edges or borders **130J** which fit within complementary borders formed on the part **132** when the part **132** is secured to the breaker plate. The shield part **130** has an opening **130K** illustrated in FIG. **4** which is aligned with the head **92** of the adjusting screw **90** to permit adjustment of the breaker contact set when the shield is in place on the breaker plate.

Referring now more particularly to FIGS. **3** and **5** the shield part **132** is illustrated which is complementary to the part **130** and which interfits with the part **130** when the part **132** is secured to the breaker plate **50**. The part **132** has a top wall **132A** formed with edges or borders **132B** which extend or are bent to be slightly above the top wall **132A** as is illustrated in FIG. **5**. When the parts **130** and **132** are assembled to the breaker plate **50** the edges **132B** overlap the edges **130J** of the

shield **130** to provide an enclosure for the breaker contact set and the capacitor. Moreover, the top of the edges **130J** engage the lower surfaces of the edges **132B** of the shield part **132**. It is seen that the shield part **132** has an axially extending wall **132C** which merges into a flange section **132D**. The section **132D** engages the top surface of the breaker plate **50** and has an opening **132E** which receives a screw **136** for securing the shield **132** to the breaker plate **50**. The screw **136** is threaded into an opening formed in the breaker plate **50**. The lower edge **132F** of the shield **132** engages the outer peripheral edge **50A** of the breaker plate **50** over the periphery of the shield **132** except for the section **132D** which lies flat against the top surface of the breaker plate **50**.

It can be seen in FIG. **3** that the complementary shield parts **130** and **132** have semicircular openings **130L** and **132G** which together form the circular opening **134** illustrated in FIG. **1** which receives the part **40** of the weight plate assembly of the distributor. This opening **134** is sized such that it has a slightly larger diameter than the annular part **40** when the shield parts **130** and **132** are secured to the breaker plate **50** with the edges **132B** overlying and engaging the edges **130J**.

As previously pointed out the shield parts **130** and **132** are secured to the breaker plate **50** by the screws or fasteners **134** and **136** and certain portions of the lower edge of the shield parts engage the outer peripheral edge **50A** of the breaker plate to prevent rotation of these parts. It will be appreciated that the axially extending walls of the shield parts follow the outer contour of the outer periphery **50A** of the breaker plate **50** and that the shield parts and the breaker plate form a substantially closed compartment which is designated by reference numeral **140**. It will further be appreciated that the walls defining the compartment **140** enclose the breaker contact set including the breaker contacts **84** and **86**, the capacitor **122**, and the capacitor lead **110** connecting the capacitor to the moveable breaker contact **84**. This provides an efficient shield for preventing the radiation of signals which might otherwise interfere with proper reception by a radio receiver on a motor vehicle. These signals have a frequency of approximately 1,000 kilocycles and are at times radiated by the conductor **110** which operates as a small transmitting antenna. This conductor **110** is completely enclosed by the breaker plate **50** and the cup-shaped housing provided by the shield parts **130** and **132** and these parts are located closely adjacent to conductor **110**, the capacitor **122** and the breaker contacts as opposed to prior art arrangements where the shield is located about the distributor cap and therefore at a substantial distance from the source of signals that interfere with radio reception.

It has been found that by providing a shield that is located within the distributor cap an improved radio interference suppression is provided as compared to prior art arrangements where the shield is located on the exterior of the distributor cap **24**.

The two part or two piece shield is provided in order that the shield may be removed without removing the shaft **16** from the base **10** when it is desired to service the distributor, as for example, when it is desired to replace the contact set **72**. It is pointed out that the shield part **130** forms an axial support for the shield part **132** when the parts are assembled to the breaker plate **50** since the edges **132B** rest on the top of edges **130J**. The shield parts **130** and **132** are at electrical ground since they contact metallic breaker plate **50** which is grounded by wire **68**.

The capacitor lead **110** passes over the top of breaker arm spring **114** and is positioned closely adjacent the top wall **132A** of shield **132**.

As previously pointed out the shield and breaker plate form an enclosure of relatively small volume so that the plate and shield parts are located closely adjacent the source of interference. In this regard, and in a preferred embodiment of this invention, the distance between the top wall of breaker plate **50** and the inner surface of shield top walls **130A** and **132A** is approximately .95 inches. The diameter of the shield parts across the overlapping edges **132B** and **130J** is approximately 3.3 inches. The relative dimensions of the other parts of the distributor will be evident from an inspection of the drawings since the parts have the same full scale.

What we claim is:

1. A shielded ignition distributor for an internal combustion engine comprising, a base, said base having a laterally extending support section, a distributor cap comprised of insulation material secured to said support section of said base extending axially therefrom, said distributor cap having a center electrode and a plurality of circumferentially spaced electrodes which are adapted to be connected with wires leading to spark plugs of an internal combustion engine, shaft means rotatably supported by said base extending into said cap, a metallic breaker plate supported by said base and adjustable relative thereto, a breaker cam driven by said shaft, rotor means driven by said shaft including conductive means operative to connect the center electrode and said circumferentially spaced electrodes of said cap, breaker contacts supported from one wall of said breaker plate operated by said breaker cam, a capacitor supported from said one wall of said breaker plate including a capacitor lead wire connected to one of said breaker contacts, and a generally cup-shaped metallic radio interference shield supported by said breaker plate and defining with said breaker plate a substantially closed metallic housing containing said breaker contacts, said capacitor, said capacitor lead wire and said breaker cam, said metallic housing comprising first and second complementary metallic shield parts removably secured to said breaker plate by removable fastener means, said shield parts having overlapping edges which engage each other and having semicircular openings defining a central opening that receives said shaft means for driving said rotor of said distributor, said shield located within said distributor cap and having an outer wall spaced from the inner wall of said cap.

2. The ignition distributor according to claim **1** where said first and second metallic shield parts each have lower edges engaging the peripheral edge of said breaker plate, and wherein said first shield part has inwardly struck portions engaging the top surface of said breaker plate and wherein an edge of the second shield part overlaps a complementary edge of the first shield part and further wherein said shield parts are secured to said breaker plate by screws threaded into said breaker plate.

3. A shielded breaker plate and breaker contact assembly for an ignition distributor comprising, a laterally extending metallic breaker plate having an opening for receiving a distributor shaft, breaker contact means supported from one wall of said breaker plate, a capacitor supported from said one wall of said breaker plate, a capacitor lead wire connected to one breaker contact of said breaker contact means, and a generally cup-shaped metallic shield secured to said breaker plate having a central opening aligned with the opening in said breaker plate, said metallic shield comprised of first and second shield parts having overlapping engaging edges and having semicircular complementary openings defining said central opening in said shield, said first and second shield parts each having lower edges engaging the peripheral edge of said breaker plate and at least one of said shield parts having an inwardly struck portion engaging said one wall of said breaker plate, and removable fastener means for respectively removably securing said shield parts to said breaker plate, said shield and breaker plate defining a metallic enclosure containing said breaker contact means, said capacitor and said capacitor lead wire, said enclosure serving to reduce radiation of radio interference signals developed within said enclosure during use of said assembly.