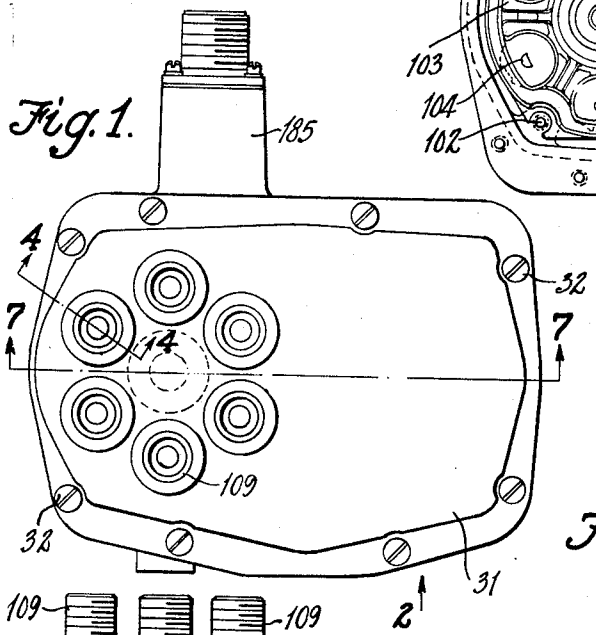
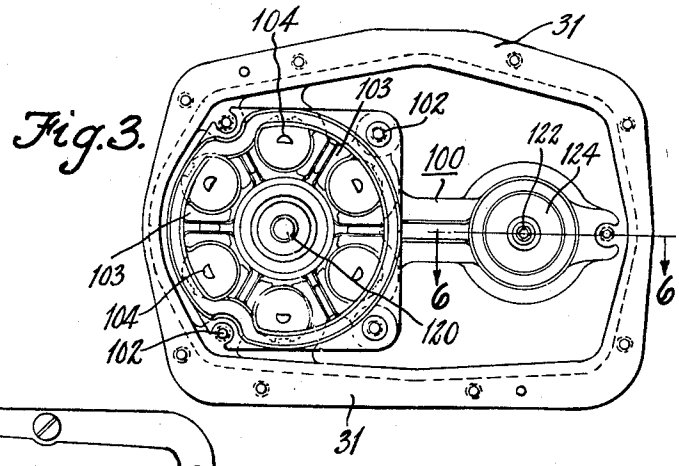
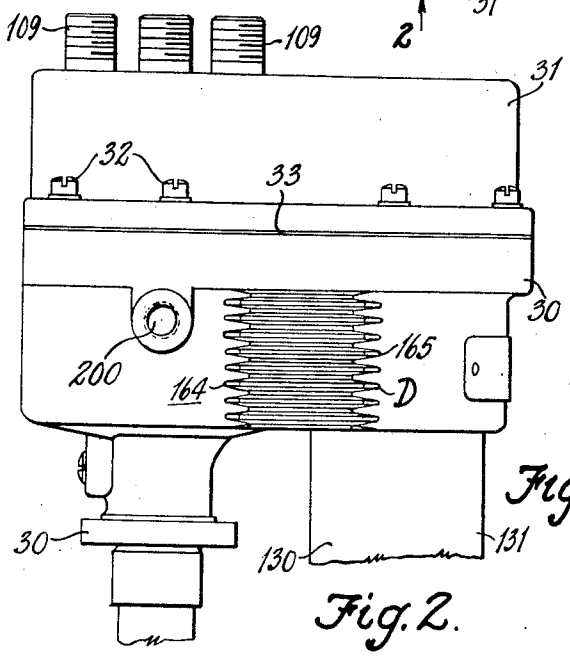
Feb. 19, 1957 M. G. BALES 2,782,247

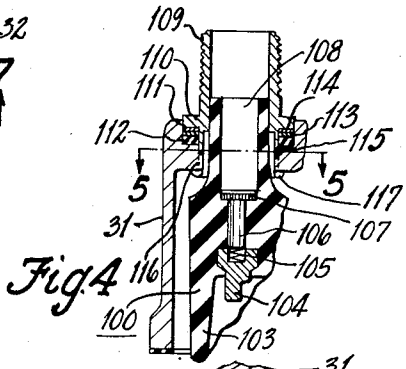
IGNITION DISTRIBUTOR AND COIL UNIT

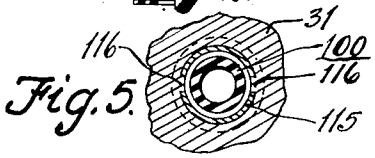
Original Filed Aug. 17, 1950 3 Sheets-Sheet 1

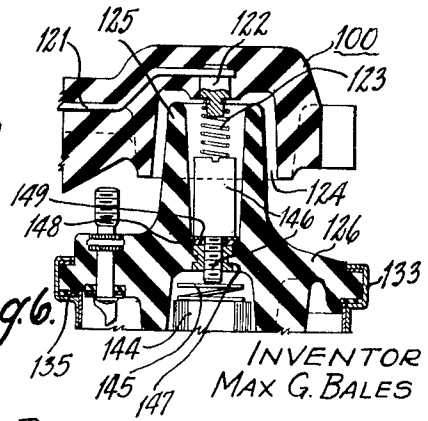












INVENTOR
MAX G. BALES

BY Willitts Hartman & Fehr
ATTORNEYS

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IGNITION DISTRIBUTOR AND COIL UNIT

Original Filed Aug. 17, 1950 3 Sheets-Sheet 2

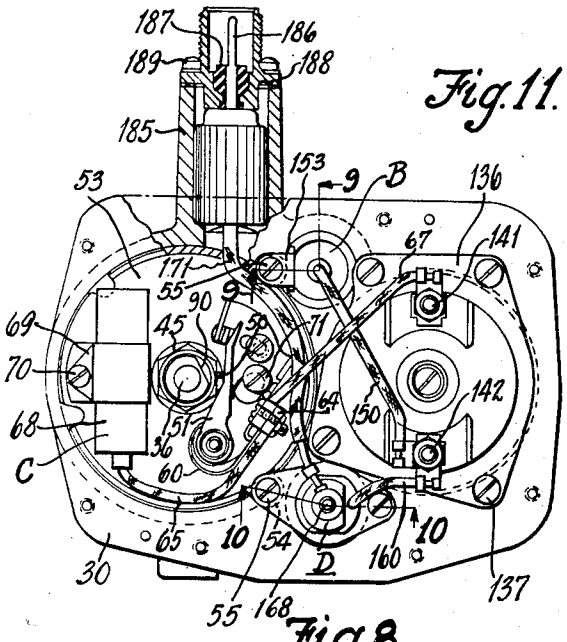


Fig. 11.

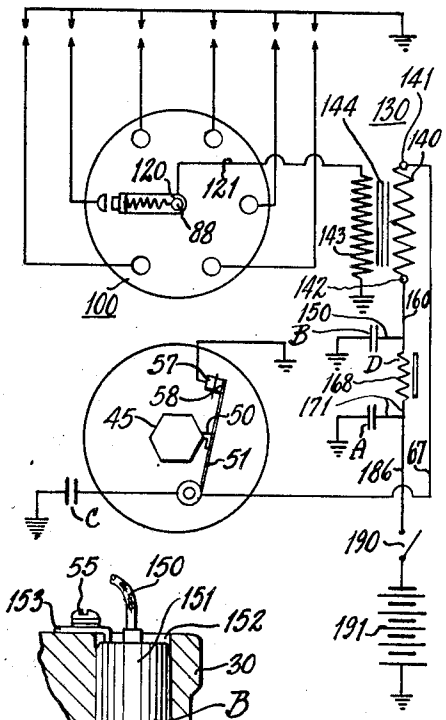


Fig. 8.

Fig. 9.

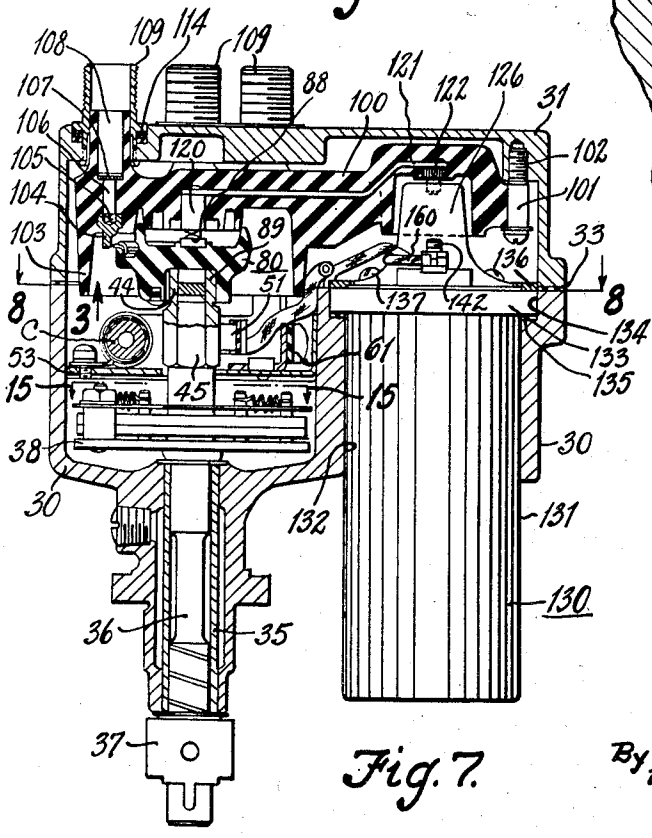


Fig. 7.

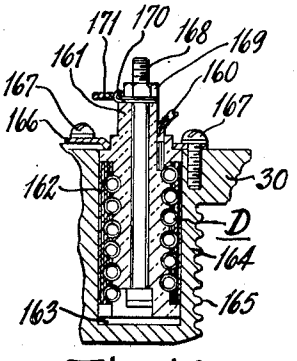


Fig. 10.

INVENTOR
MAX G. BALES
By Willcox Hardman & Fehr
ATTORNEYS

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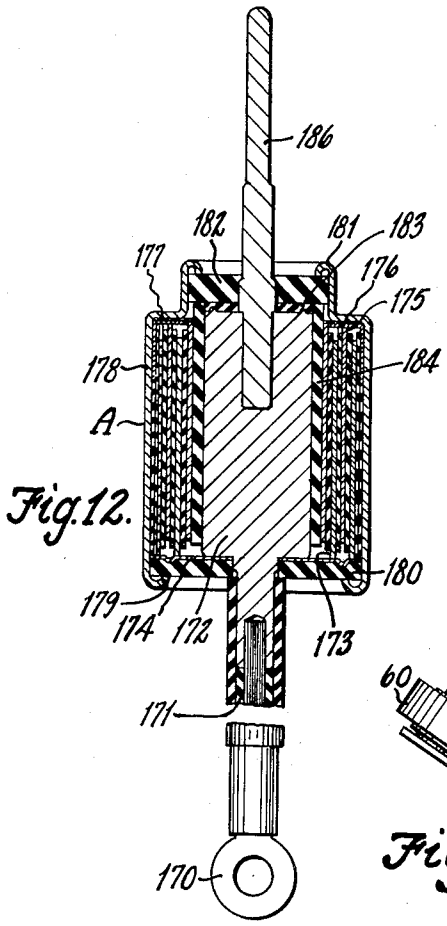


Fig.12.

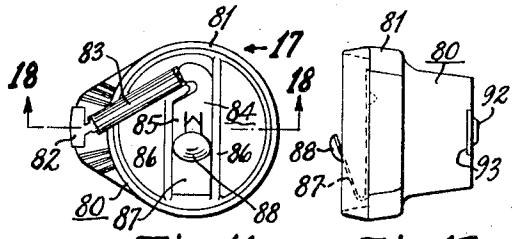


Fig.16

Fig.17.

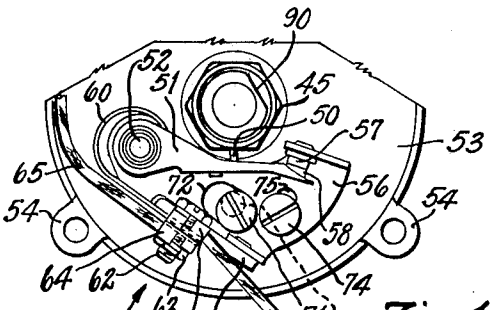


Fig.13.

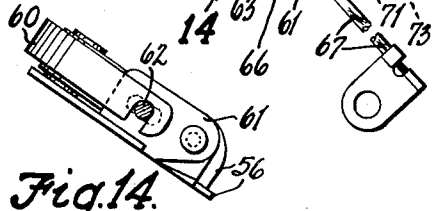


Fig.14.

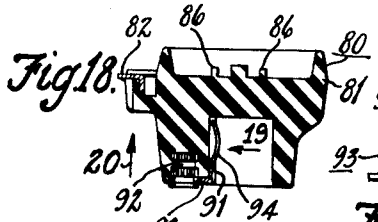


Fig.18.



Fig.19.

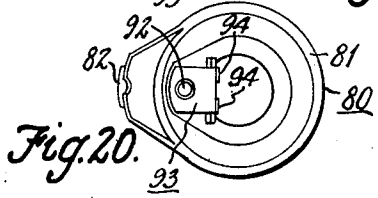


Fig.20.

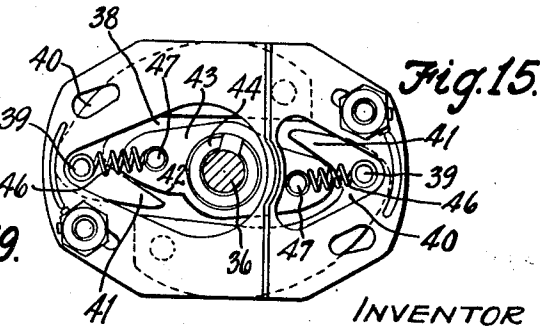


Fig.15.

INVENTOR
MAX G. BALES
By White, Hardman & Fehr
ATTORNEYS

United States Patent Office

2,782,247

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IGNITION DISTRIBUTOR AND COIL UNIT

Max G. Bales, Anderson, Ind., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Original application August 17, 1950, Serial No. 179,970, now Patent No. 2,662,105, dated December 8, 1953. Divided and this application March 17, 1953, Serial No. 342,924

4 Claims. (Cl. 123—148)

This invention relates to ignition apparatus and internal combustion engines. This application is a division of original application, Serial No. 179,970, filed August 17, 1950, now Patent 2,662,105. An object of the present invention is to provide a unitary structure comprising an ignition timer, an ignition distributor and an ignition coil all in a housing which provides for the exclusion of dirt and moisture which provides for connection with an air-circulating system in which there includes in addition to the timer distributor and coil devices for suppressing disturbances to radio apparatus mounted on the vehicle.

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 plan view of an ignition unit embodying the invention.

Fig. 2 is a side view looking in the direction of arrow 2 of Fig. 1.

Fig. 3 is a view in the direction of arrow 3 of Fig. 7.

Fig. 4 is an enlarged scale fragmentary sectional view on line 4—4 of Fig. 1.

Fig. 5 is a sectional view on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary sectional view on an enlarged scale and is taken on line 6—6 of Fig. 3.

Fig. 7 is a sectional view on line 7—7 of Fig. 1.

Fig. 8 is a view on line 8—8 of Fig. 7 showing the timer housing and the plan view of the ignition timer and the ignition coil.

Figs. 9 and 10 are sectional views on line 9—9 and 10—10 of Fig. 8.

Fig. 11 is a wiring diagram.

Fig. 12 is an enlarged longitudinal sectional view of condenser A shown in Fig. 8.

Fig. 13 is a fragmentary plan view of a portion of a circuit breaker plate and the circuit breaker supported thereby.

Fig. 14 is a view in the direction of arrow 14 of Fig. 13.

Fig. 15 is an enlargement of a sectional view on line 15—15 of Fig. 7.

Fig. 16 is a plan view of the distributor rotor on a larger scale than Fig. 7.

Fig. 17 is a view in the direction of arrow 17 of Fig. 16.

Fig. 18 is a sectional view on line 18—18 of Fig. 16.

Fig. 19 is a view of a rotor retainer member and is taken in the direction of arrow 19 of Fig. 18.

Fig. 20 is a bottom view of the rotor looking in the direction of arrow 20 of Fig. 18.

The structure includes a timer housing 30 and a cover 31 which are secured by screws 32 (Fig. 2) with a sealing gasket 33 between them. The housing 30 provides a bearing 35 for a shaft 36 connectible with an engine driven member by a coupling, one portion being member 37 attached to shaft 36.

Shaft 36 drives a plate 38 carrying studs 39 and supporting weights 40 pivoted on the stud and having arms 41 for engaging cam surfaces 42 of a plate 43 attached to a tubular shaft 44 which provides the ignition timer cam 45 (Fig. 7 and Fig. 8). Springs 46 connected with studs 39 and studs 47 carried by plate 43 oppose movement of weights 40 away from shaft 44 as the speed of shaft 37 increases. As these weights move out shaft 44 is moved clockwise relative to shaft 36 whose direction of movement is clockwise. Therefore, the timing of the ignition is advanced with an increase of speed.

Cam 45 has lobes which engage with a rubbing block 50 attached to a lever 51 pivotally mounted on a stud 52 which is attached to its circuit breaker supporting plate 53, having ears 54 which receive screws 55 (Fig. 8) by which the plate 53 is attached to the housing. A leaf spring 60 is connected at one end with the lever 51 and at the other with a non-conducting junction block 61 by means of a screw 62 which receives a nut 63. The tightening of the nut 63 on the screw 62 causes the leaf spring 60 to be clamped between terminal clips 64 and 66 of wires 65 and 67 respectively. Wire 65 is connected with one coil of a condenser C, the other coil of which connects to ground through connection with the case 68 of the condenser which by a clip 69 and a screw 70 is fastened to the plate 53 (Fig. 8). The function of spring 60 is to urge the contacts 58 toward contact 57 and to maintain the rubbing block 50 in engagement with the cam 45 when the latter is functioning to open and close the contacts. A plate 56 can be adjusted around the stud 52 in order to change the distance between the rubbing block and the axis of cam 45 in order to change the amount of contact separation so that as the rubbing block 50 wears the contacts can be caused to separate to a predetermined extent. This adjustment is effected by rotation of a screw driver slotted disc 71 received by a slot 72 in plate 56 having an eccentric shank 73 journaled in plate 53. Plate 56 is retained in adjustment by tightening of a screw 74 passing through an armature slot 75 in plate 56 and threaded into the plate 53.

Referring to Figs. 16 to 20 a distributor rotor 80 which is of the type shown in the copending application of Brooks H. Short et al., Ser. No. 81,432, filed March 15, 1949, now Pat. No. 2,593,205, issued April 15, 1952, comprising a block 81 supporting a distributing segment 82, a suppressor resistance 83 and a spring 84 having a flat portion 85 received between ribs 86 of the block 81 and making electrical connection with the resistance 83 which is electrically connected with the segment 82. The spring 84 has a flexible arm 87 providing a contact button 88. The rotor 80 (Fig. 7) is received by an extension 89 of the tubular shaft 44 which is provided with a flat 90 (Fig. 8) which engages a flat 91 defining a wall of the socket 92 which receives the extension 89. The rotor block 81 which is made of molded plastic carries an insert 92 to which a resilient metal clip 93 is attached, said clip having resilient arms 94 which press against the flat 90 of shaft 44 thus frictionally retaining the rotor 80 upon said shaft.

The cover 31 supports a distributor cap 100 attached thereto by screws one of which is screw 101 (Fig. 7). These screws are received by tapped holes 102 in cover 31. Cap 100 of molded plastic includes an inverted cup-shaped portion 103 which receives the rotor 80 and which supports a plurality of metal posts 104 in a circular row and cooperating with the distributor segment 82 of the rotor to receive sparking impulses which jump the gap between the segment and the post at the proper time in the firing sequence. As shown in Fig. 4 each post 104 receives a spring 105 bearing against a rod 106 integral with a disc 107 about which the material of the cap 100 is molded. The disc 107 is at the bottom of a socket 108 adapted

to receive a plug connector on the end of a spark plug cable, said cable being housed in a flexible armor, not shown, said armor being connected by coupling nuts with a threaded sleeve **109** attached to the cover **31**. The sleeve **109** has a flange **110** received by a recess **111** provided by the covering **31**, said recess receiving a resilient washer **112** of rubber-like material, a dished seal spring washer **113** and a plain washer **114**. The sleeve **109** has a tubular shank **115** received within a hole in the cover **31** and concentric with the recess **111**. The shank **115** in Fig. 5 has diametrically opposite notches which receive diametrically opposite tangs **116** of the cover **31** thereby preventing rotation of the sleeve **109** relative to the cover **31**. The shank **115** is deformed at **117** to secure the sleeve **109** to the cover **31**, said deformation of the shank **115** causing the flange **110** of sleeve **109** to be drawn into the recess **111**, whereby the resilient washer **112** is compressed and is caused to fit snugly against the cover **31** and the shank **115** to seal the joint.

Cap **100** supports a center contact **120** which engages the button **88** of rotor **80** and causes, when the parts are assembled as shown in Fig. 7, the resilient arm **87** to be bent down or to the right in Fig. 17 to locate the button **88** at the axis of the rotor. The contact **120** is connected by a strip **121** embedded in the cap **100** which is connected with an insert stud **122** to which a coil spring **123** is attached. Coil spring **123** is located in a recess **124** which receives the socket port **125** of the top or cover member **126** of an ignition coil **130** which is constructed substantially as shown in the patent to Herman L. Hartzell No. 2,512,796, issued June 27, 1950. The case **131** of the coil **130** extends through a bore **132** provided by housing **30** and it is connected with the top **126** by a metal band **133** which is received by a socket or recess **134** provided by housing **30** and rests upon a sealing gasket **135** against which it is urged by a plate **136** (Fig. 8) attached to housing **30** by screws **137**. As disclosed in Patent No. 2,512,796, coil **130** has a primary winding **140** (Fig. 11) connected with terminals **141** and **142** and a secondary winding **143** the inner end of which is grounded and the outer end of which is connected with the coil center terminal **144** which as shown in Fig. 6 is connected by resilient member **145** with a screw **146** threaded through an insert **147** and serving to clamp a rubberlike sealing washer **148** and a steel flat washer **149** against the bottom of the socket **125**. Spring **123** is confined against the head of the screw **146**. In this way, the secondary winding **143** is connected with the strip **121** which in turn is connected with the center contact **120** and the rotor button **88** as shown diagrammatically in Fig. 11. Coil terminal **141** is connected with wire **67** which is connected with the circuit breaker lever **51**. Coil terminal **142** is connected by wire **150** with one foil of a condenser B contained in a metal case **151** (Fig. 9) and having its other coil connected to ground through the case **151** which is received in a socket or pocket **152** provided by housing **30** and which is secured therein by a clip **153** which one of the screws **155** secures to the housing.

Terminal **142** is connected by a wire **160** with one end of a resistance D which is in the form of a helical coil helically wound around a non-conducting support **161** and surrounded by glass cloth insulation **162**, said unit being received in a socket or pocket **163** provided by the housing **30**, said pocket being surrounded in part by a wall **164** having heat dissipating fins **165** (Fig. 2). The resistance unit D is retained by a clip **166** secured to housing **30** by screws **167**, the other end of the resistance is attached to a head of a screw **168** receiving a nut **169** which clamps a terminal clip **170** attached to a wire **171**.

As shown in Fig. 12 wire **171** is connected with the center core **172** of a condenser A having a foil winding **173** electrically connected with core **172** by a washer **174** and having a foil winding **175** the margin of which engages a metal washer **176** engaging a spring washer **177** engaging the condenser case **178**. One flange **179** of the case is shaped by spinning to retain a non-conducting disc **180** against the metal washer **174**. Case **178** has a flange **181** which is formed against a non-conducting disc **182** thereby forcing it against a disc **183** and the end of a non-conducting tube **184** upon which the coil foils are wrapped. The case **178** to which foil **175** is electrically connected fits within a socket or tubular extension **185** (Fig. 8) of the housing **30**. A conducting rod or plug **186** attached to the core **172** extends through a rubber grommet **187** attached to a coupling **188** attached by screws **189** to the extension **185**. The coupling is threaded to receive the nut for connecting with the coupling a flexible metal armor enclosing a cable, the end of which is attached to a socket, not shown, which receives the plug **186** for making an electrical connection to an ignition switch **190** (Fig. 11) connected with the current source such as to the battery **191**.

From Fig. 11 it is apparent that the condensers A and B and the resistance D provide a pi filter for suppressing disturbances which would otherwise interfere with operation of neighboring radio apparatus. Since the screw **168** (Fig. 10) is made of magnetizable material coil D operates as a choke coil.

The ignition unit comprises two sub-assemblies, one being the subassembly of housing **30**, coil **130**, the ignition timer and the distributor rotor and the driving mechanism therefor together with condensers A, B and C and the resistance unit or choke coil D. All of the wiring connections between the circuit breaker, the coil, the condenser, the resistance unit and the primary terminal provided by the plug **186** (Fig. 8). The other subassembly comprises the cover **31** and the distributor cap **100**. The assembling of the cover **131** with the housing **30** establishes the connections between the high tension terminal of the coil and the central button **88** of the distributor rotor.

The assembling of the various parts of the first subassembly is very simple since the housing **30** provides sockets or wells into which various parts are moved, for instance, the housing **30**, provides a well or timer cup into which the assembly of shaft **36** and parts supported thereby with the exception of the rotor **80** is passed. The breaker plate **53** with the circuit breaker and condenser C supported thereby is placed in the distributor cup. The rotor **80** is placed upon the end of shaft **44**. The coil **130** is pressed into the well provided by the bore **132** of housing **30**. The condenser B is placed in the well **152** provided by the housing **30** (Fig. 9). The resistance unit D is placed in the well **163** provided by housing **30**. Before the coupling **188** is attached to the extension **185** (Fig. 8) the assembly of condenser A together with wire **171** is passed into the extension **185** and condenser A is retained by the coupling **188** which serves as one of the elements to attach an armored cable to the ignition unit. The replacement of any of the parts of the first subassembly is very easy since all that is required is to loosen screws and disconnect wires.

The housing **30** is provided with two tapped holes one of which is shown at **200** in Fig. 2. Threaded pipes can be screwed into these holes for making connection with an air-circulating system used for ventilating the unit.

The unit provides for the exclusion of dirt, foreign matter and moisture from the interior thereof, since all of the openings are sealed.

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.

What is claimed is as follows:

1. In an ignition system for an internal combustion engine including an ignition coil and an ignition distributor the combination with a housing having an opening to support an ignition coil provided with a primary winding and a second opening having a bore to receive a condenser unit housed in a condenser housing, said unit including a core, a coil of a foil winding electrically connected with the core, a second foil winding grounded to the housing of the condenser, and a conducting rod

attached to the core and extending beyond the bore in first mentioned housing; a coupling for retaining the unit with the bore; a yieldable grommet of rubberlike material located between the rod and coupling for insulating the rod from the coupling, said rod being adapted to engage portions of a metal socket when said socket is attached to said coupling for electrically connecting the core with a current source through a conducting member having one end electrically connected with the core and having the other end connected with the primary winding of the ignition coil.

2. In an ignition system for an internal combustion engine including an ignition coil and an ignition distributor the combiation with a metallic housing having a plurality of openings and a well comprising; an ignition coil provided with a primary winding terminal supported within one of the openings, a choke coil detachably suported in the well, a condenser unit having a housing supported in another opening, said unit including; a metallic core, a foil winding electrically connected with the core and a second foil winding grounded to the condenser housing, a means for securing the condenser unit within said metallic housing including; a detachable coupling for retaining the unit within the said other opening, a body of rubber-like material carried by the coupling, and a conductor element having one end electrically connected to one end of the core and having the other end projecting centrally through said rubber-like body; a conducting member for connecting the other end of the choke coil with the primary terminal with the ignition coil.

3. In an ignition system for an internal combustion engine including an ignition coil and an ignition distributor the combination comprising; an ignition coil including; a casing having an open end, a cover having a body of insulation for closing the open end of the casing, said body having a boss defining a socket on the outer surface of the body, a tapped metal insert embedded in the bottom of the socket arranged coaxially with the socket, a rubberlike washer and a metallic washer located in the bottom of the socket, a conducting member having a shoulder and a reduced threaded portion threadedly engaging said conducting member in the insert for causing the shoulder portion of said conducting member to compress the washers against the bottom of the socket to provide a moisture seal between the conducting member and the cover, said reduced threaded portion being adapted to extend through the insert when threaded therein; and a metallic

resilient member for electrically connecting the conducting member with a conducting part within the housing, a cap of insulating material having a recess for receiving the boss of the body, said cap including; a metallic conducting strip embedded in the cap adapted to connect the conducting part within the casing with a conducting part outside the casing, said strip having one end exposed and arranged coaxially within and extending below the bottom of the recess of the cap, a conductor spring carried by the exposed portion of the strip with the recess, whereby said cap when placed over said cover so that the recess therein receives the boss on said cover causing the spring in said cap to engage yieldingly the conducting member for electrically connecting the same with the conducting strip.

4. In an ignition system for an internal combustion engine including an ignition coil and an ignition distributor, of a distributor head subassembly for use with said system comprising in combination; a metallic cup-shaped cover having a plurality of openings in its bottom wall arranged in a circular row; a non-conducting body carried within said cover having a pair of spaced inverted recesses, one of which is adapted to receive a rotor while the other is adapted to receive a projection having a socket in which the high tension terminal of an ignition coil is supported, said cap having formed therewith a plurality of bosses defining sockets arranged coaxially with the axis of said one recess, each boss extending through a respective opening in said cover and having metallic inserts therein for connection respectively with spark plug cables and having portions exposed at the sockets and a conducting member embedded in the cap having its opposite ends exposed at the central portion of the recesses; and resilient means disposed at each end of said embedded conducting member for electrically connecting said rotor and the terminal of said coil.

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