

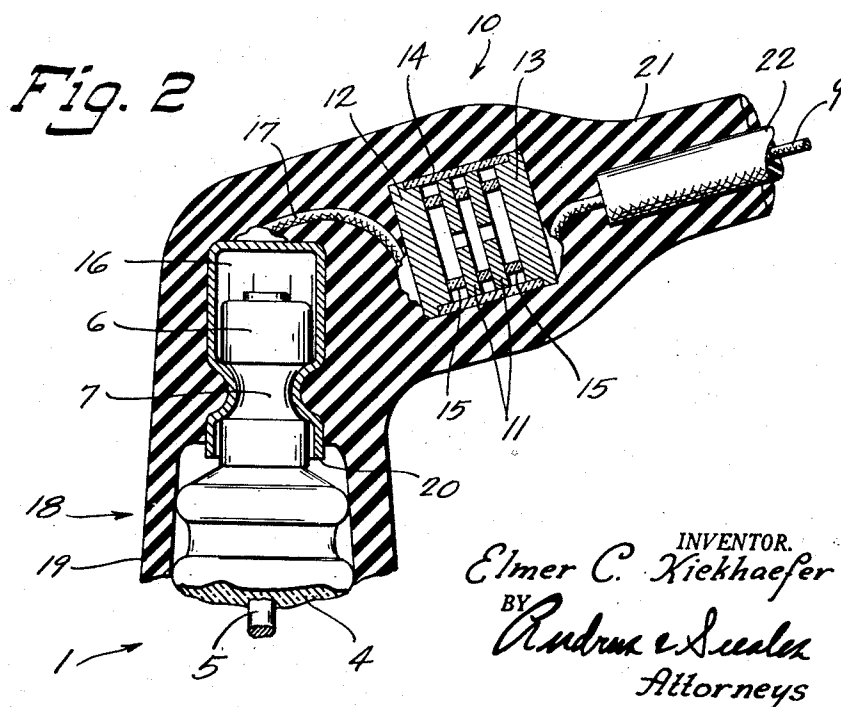
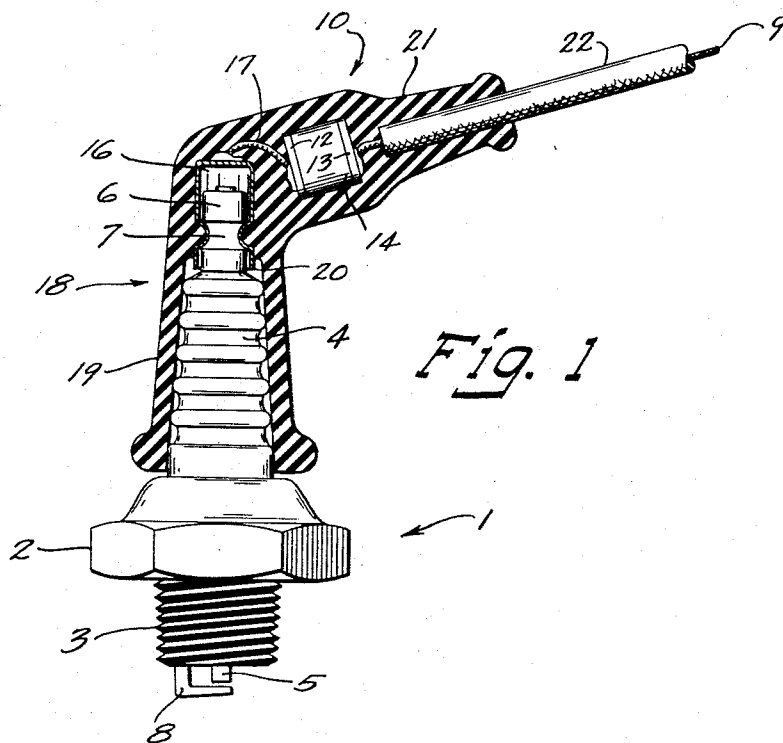
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SEALED CONDENSER AND SHIELD FOR SPARK PLUGS

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SEALED CONDENSER AND SHIELD FOR
SPARK PLUGS

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3 Claims. (Cl. 315-227)

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This invention relates to ignition systems and particularly to the provision and placement of a small condenser in the ignition circuit of the spark plug of internal-combustion engines.

The invention provides a sealed, small capacity-gap condenser immediate to the spark plug resiliently carried and supported by the spark plug in a rubber casing which serves as a water-tight covering for the spark plug.

An object of the invention is to dispose the condenser in the electric circuit as close to the spark plug as possible for optimum spark discharge and fuel ignition and at the same time to isolate the condenser from the vibration and heat of the engine.

A further object is to protect the condenser against the vibration of the engine and against damage by rough handling or breakdown by the vibration of the engine.

A further object is to prevent the vibration of the engine from ultimately causing breakdown of the sealing means closing the condenser to the air.

Another object is to protect the condenser unit against fouling as by corrosion of the metal parts or contamination of the ceramic parts of the condenser.

Another object is to assure the full electrical connection of the condenser in the circuit with the spark plug and eliminate unnecessary terminal fastenings.

These and other objects and advantages will be more fully set forth in the following description of a preferred embodiment of the invention as illustrated in the accompanying drawing.

In the drawing:

Figure 1 is an elevational view of the engine spark plug and the sealed condenser unit connected in series with the end of the lead wire and showing the spark plug terminal connector and rubber casing in section; and

Fig. 2 is an enlarged view of the terminal connector and the condenser in transverse section to show the construction of the condenser.

The engine spark plug 1, shown in the drawings, includes the metal hexagonal base 2 having a threaded lower end 3 for securing in the usual cylinder head or block of an engine, not shown.

The ceramic insulator 4 carried by base 2 extends a substantial height from base 2 and encloses the electrical conductor rod 5. The upper terminal 6 of rod 5 above insulator 4 and at the upper end of the spark plug includes an annular groove 7 for receiving a detachable connection to a source of high potential current,

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The lower end of rod 5 projects centrally from the insulator in base 2 at the lower end of the spark plug. The projecting metal electrode 8 secured to base 2 extends to a point beneath or adjacent to the lower end of rod 5 and is accurately spaced therefrom. The ends of member 8 and rod 5 comprise the electrodes or points of the spark plug across which the spark passes for ignition of the combustible mixture in the engine cylinder, not shown. The electrical potential is supplied to the points of the spark plug by suitable generating means, not shown, through the metal structure of the engine block to electrode 8, referred to as the "ground" and by means of the lead wire 9 to electrode 5 as hereinafter described.

Insulator 4 serves to prevent dissipation of the electrical potential between base 1 and rod 5 by shortcircuiting.

The condenser unit 10 is connected in series with the spark plug and is preferably of a capacity providing an improved spark characteristic.

Condenser unit 10 comprises a series of metal discs 11 having central openings therethrough and the metal end plates 12 and 13. The ceramic cylinder 14 encloses discs 11 and is closed and sealed at opposite ends by plates 12 and 13. The ceramic members 15 are disposed intermediate discs 11 and plates 12 and 13 to maintain the same in predetermined spaced relation within cylinder 14.

Cylinder 14 is exhausted of air and is filled with an inert gas which forms the dielectric of the condenser. In operation, the electrical potential is passed through the condenser in the form of a series of spark-gaps bridging the spaces between the discs and plates.

The end of lead wire 9 is secured as by soldering to plate 12 of condenser 10 for electrical connection therewith. Plate 13 of condenser 10 and the terminal clip 16 are connected by the wire 17 which may similarly be soldered thereto.

The lead wire 9 is preferably formed by a large number of woven strands of wire providing the necessary conductance and at the same time affording flexibility of the lead wire so as to allow for the usual installation and maintenance. Wire 17 is similarly constructed so as to allow limited relative movement of clip 16 and condenser unit 10 according to the invention.

The single piece molded fitting 18 is formed of an elastic dielectric material such as neoprene which is preferably impervious to water and oil. Fitting 18 includes the lower sleeve 19 which is adapted to fit over insulator 4 and upper end of

spark plug 1. Clip 16 is disposed at the inner end of the sleeve opening and includes a series of flexible members 20 adapted to fit over terminal 6 and engage groove 7 of the terminal. The upper body 21 of fitting 18 encloses condenser unit 10 and embraces the end portion of the insulating covering 22 of lead wire 9.

Clip 16, wire 17 and condenser unit 10 are embedded in body 21 of fitting 18 at the time of molding of the latter to form a unitary structure at the end of lead wire 9 which can be grasped firmly to be fitted over the spark plug. Sleeve 19 provides the desired protection of the plug from moisture and oil which otherwise allows the electrical potential to bridge insulator 4 and reduce the intensity of the spark discharge at the points. Clip 16 in addition to providing the electrical connection described, also serves to secure sleeve 19 over the spark plug.

Condenser unit 10 is fully embedded in material forming the body 21 of fitting 18 and is protected thereby against rough handling and the like which might otherwise damage the condenser. The condenser is fully enclosed against the atmosphere and is particularly sealed off from the sleeve opening by the portion of fitting 18 between the condenser unit 10 and clip 16. Gases which tend to leak through insulator 4 around rod 5 from the combustion chamber are allowed escape only into sleeve 19 and into the atmosphere from the lower end of the sleeve.

The upper end of fitting 18 is molded over the end of lead wire 9 secured to plate 12 and embraces a substantial portion of the covering 22 which encloses lead wire 9. A bond is established between fitting 18 and covering 22 which receives the stresses between these parts and relieves the condenser from any forces which might otherwise damage the same.

The flexibility of lead wire 9 and wire 17 and the elasticity of the material of fitting 18 allows condenser unit 10 to "float" in the surrounding body 21 of the fitting. Condenser unit 10 is thus insulated from vibration, particularly of the engine in operation, and the terminal connections made with plates 12 and 13 are relieved of such stresses as would either sever such connections or open the ends of the condenser.

The upper body 21 of fitting 18 may extend angularly of sleeve 19 and the spark plug as desired or in a straight line with the sleeve 19 to accommodate the particular engine design.

Various embodiments of the invention may be employed within the scope of the following claims.

I claim:

1. The combination in a device of the class de-

scribed, which comprises a terminal fitting, a small-capacity sealed condenser unit, a flexible electrical conductor connecting said fitting and one terminal plate of said condenser, a lead wire connected to the other terminal plate of said condenser, an insulator covering said lead wire, and a solid elastic dielectric material embracing said terminal fitting and the end of said insulator covering and embedding said condenser and conductor therebetween and including a sleeve extending from the open end of said terminal and adapted to receive and cover the upper end of an engine spark plug and to support said condenser, said elastic dielectric material being of resilient material to protect said condenser against damage and breakdown by rough handling and engine vibration.

2. A device of the class described comprising a small capacity condenser having a sealed gaseous dielectric and adapted to be connected in series with an engine spark plug, a spark plug shield of molded elastic dielectric material adapted to be fitted over the spark plug to protect the same against moisture and carrying said condenser embedded therein adjacent the upper end of the spark plug whereby said condenser is resiliently supported and protected against breakdown and damage as by the vibration of the spark plug with engine operation.

3. In a molded elastic shield fitting for a spark plug, a sleeve having an opening for receiving the upper end of the spark plug, a terminal connector at the inner end of said opening for connection with the terminal of the spark plug, a condenser embedded within said shield fitting and spaced from said terminal connector, and flexible conductor means electrically connecting said condenser and said fitting, said shield supporting said condenser independently of said terminal connector and spark plug with respect to normal engine vibration and being adapted to protect said condenser against damage and breakdown by rough handling and engine vibration.

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