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SPARK PLUG

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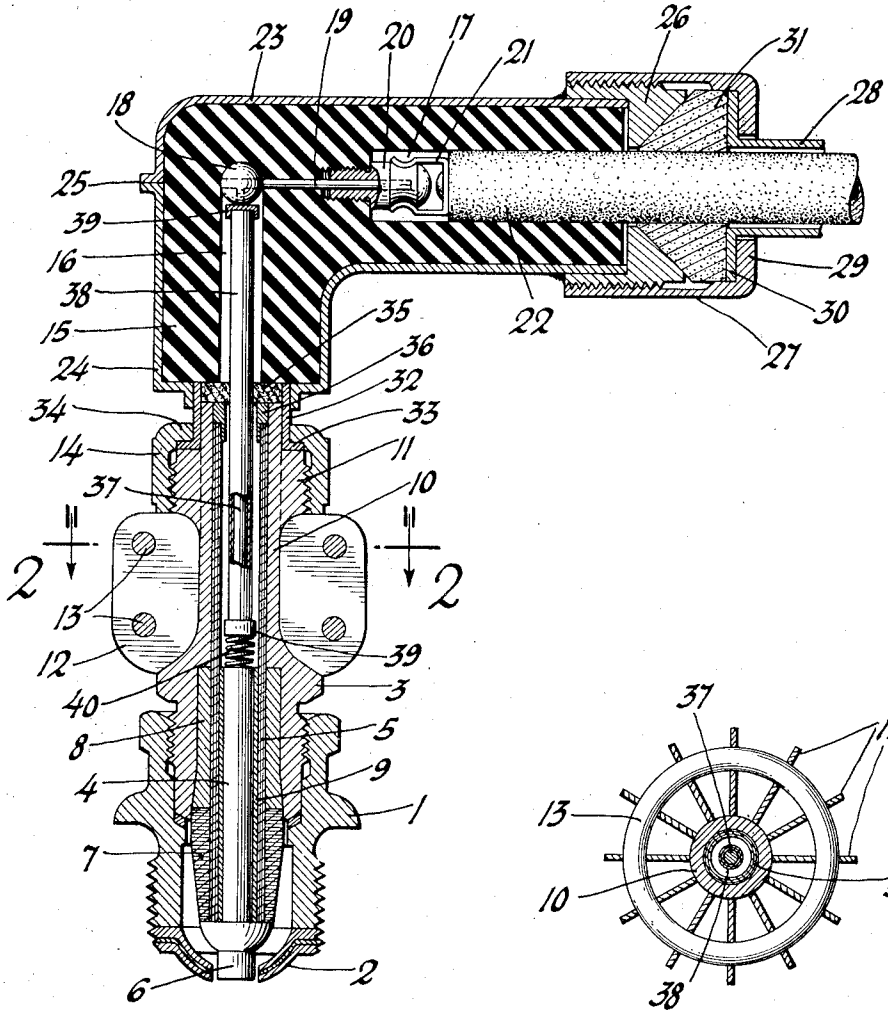


Fig. 1

Fig. 2

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SPARK PLUG

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6 Claims. (Cl. 123—169)

This invention relates to ignition systems for internal combustion engines and more particularly to the shielding of the ignition system to avoid interference to radio reception. Where the engine is operated in the vicinity of radio apparatus it is customary to enclose such parts as the high tension leads in a metal sheathing which is grounded on the spark plug assembly. Both the grounded outer shell of the plug and the cable sheathing must be amply insulated from the ignition circuit, particularly at points where the necessary detachable connections are provided in the circuit.

It is to this type of construction that my invention relates and one of the objects thereof is to provide a simplified and more economical construction and arrangement of parts to reduce manufacturing costs and provide more effective shielding.

Another object is to provide a structure by which the heat is properly transferred from the shell into the engine cooling system and dissipated to the air surrounding the exposed parts of the assembly in order that the upper portion of the plug and the shielded cable will be maintained below a temperature which would be harmful to the parts and result in quick deterioration of the materials used.

Other objects and advantages will become apparent from the following specification having reference to the accompanying drawing wherein Figure 1 is a vertical sectional view of a spark plug assembly and shielded cable and Figure 2 is a transverse section upon a plane indicated by the line 2—2, Figure 1, showing the cooling fins at the upper end of the plug.

Referring to the drawing, the numeral 1 indicates the outer shell of the plug, the skirt of which is screw threaded for connection with the engine cylinder head. As is usual, the heat absorbed by the plug assembly upon engine operation passes from the shell through the screw threaded connection into the water or air cooled cylinder head. Carried on the lower end of the shell skirt is the grounded electrode 2, here shown as comprising a ring electrically welded to the skirt and having inwardly extending fingers. This ring is of a laminated type consisting of outer layers of a suitable nickel alloy and an inner layer of copper or the like. The outer layers are thus formed of a material which has a long life and they protect the inner layer which is a good heat conductor in order that the temperature of the electrodes will be maintained fairly low.

The upper end of the shell is internally threaded to receive the central assembly, which includes the tubular member 3 and the center spindle or electrode 4 properly insulated from each other. The electrode 4 is of comparatively short length while the tubular member 3 extends for a considerable distance above the upper end of the electrode. A mica cigarette or other insulating tube 5 extends throughout the bore of the tubular member 3 and surrounds the center electrode throughout its length to the enlarged sparking head 6, which cooperates with the grounded electrode 2 to provide the spark gap. Additional insulation 7, preferably in the form of compacted mica washers, surrounds that portion of the electrode 4 beyond the lower end of the tubular member 3. In its lower end the tubular member 3 is provided with a counterbore which receives a ductile collar 8 which is deformed in a suitable manner to bind the parts together. One way of deforming the collar is to heat a weakened zone of the tubular member and compress the metal thereof by pressure applied longitudinally of the member which provides an inward bulge and radially constricts the ductile sleeve 8 to grip the mica cigarette and center electrode.

The center electrode is preferably provided with an outer sleeve or coating 9 of copper or the like to provide a path for the quick flow of heat from the lower end of the electrode and into the tubular member 3, and from it to the shell 1 and to the engine. That portion of the member 3 projecting immediately above the upper end of the electrode 4 is preferably reduced in diameter as at 10 to provide a restricted neck above which is an enlarged head 11 at the upper end of the tubular member. This construction is intended to restrict the heat flow path upwardly and in order that the upwardly flowing heat will be readily dissipated it is proposed to provide the neck 10 with radiating fins. This can best be done by separately forming the fins 12 to fit within the annular trough provided by the neck 10. To anchor the fins in place use may be made of a ring or rings 13 passing through openings in the several fins, as best seen in Figure 2. To apply the fins over the head 11 all of the fins are moved to one side of the anchor rings 13 which affords sufficient clearance to permit them to be slipped downwardly over the head and into the annular trough. They are then arranged in properly spaced relation on the rings and secured to the neck as by welding.

Detachably connected to the head 11, by means of a nut 14, is the shielded housing for providing an electrical connection between the cable

and the electrode. In the drawing this is shown as an elbow fitting and includes a body 15 of insulating material, such as bakelite, having therein a vertical bore 16 adapted for alinement with the upper portion of the bore in the member 3 and a second bore 17 extending at an angle to the bore 16 and intersecting the same. At the point of intersection of the two bores there is positioned a spherical or ball contact element 18 to which is fastened one end of a conductor wire 19 extending through a reduced portion of the bore 17 and terminating in an enlarged head 20 socketed to detachably receive the spring prongs 21 fastened on the end of the insulated wire of the supply cable 22; which is enclosed within the enlarged portion of the bore 17. The insulation on the cable 22, which is usually of flexible rubber, is thus removed a considerable distance from the hot end of the plug and is saved from rapid deterioration by heat communicated thereto.

The bakelite body 15 is molded in one piece and it is surrounded by sheet metal stampings 23 and 24, which for convenience are formed into sections and electrically welded as at 25. Instead of the stamped cover, the body 15 may be electroplated. At the end of the leg projecting away from the plug there is secured to the sheet metal cover, by welding or brazing, a collar 26 providing the end wall of the elbow fitting and carrying exterior screw threads for engaging with the nut 27 by which the metallic cable shield 28 is secured and grounded. The end wall of the nut is turned inwardly at 29 to engage the outturned flange 30 of the cable sheathing and between the flange 30 and a conical seat in the collar 26 is a ring 31 of rubber or other flexible packing material which can be compressed upon the tightening of the nut 27 to tightly grip and bind on the outside of the cable 22. To remove the cable from the elbow the nut 27 is unthreaded and slipped back on the sheathing which releases the pressure on the packing 31 and allows the cable to be pulled outwardly to disconnect the spring prongs 21 with the head 20.

The other leg of the elbow fitting terminates in a metal sleeve 32 either integral with or secured by welding or brazing to the cover. This sleeve closely fits a reduced upper portion of the tubular member 3 and carries in its lower end an outturned flange 33 fitting under the internal flange 34 at the upper end of the nut 14. The nut, therefore, is rotatably mounted on the elbow and removably secures the same to the member 3 by means of its screw threaded connection with the head 11. For the purpose of excluding moisture at the connection between the spark plug and shielded cover, use may be made of an asbestos gasket 35 inside the sleeve 32 and between the bottom of the insulating body and the top of said member. Immediately below the gasket and cooperating with the member 3 to provide a seat for the gasket is a ring 36 pressed into the bore of said member and provided with a dependent skirt to enclose the upper end of the mica cigarette 5 and hold it in place.

To connect the contact ball 18 with the electrode 4 there is positioned in the alined bores of the tubular member 3 and insulating body 5 a conductor spindle 37 enveloped within a wrapping 38 of insulating material such as mica or porcelain. Contact cups 39 are provided at opposite ends of the spindle 37 and a coil spring 40 bears against one of the cups to complete the circuit. The spring 40 serves several purposes, including the cushioning of shock on the spindle 37, the compensation of heat expansion and misalinement of parts, as well as inaccuracies in manufacture. By this construction the spindle 37 has no positive connection to either the cover or the spark plug and may be readily replaced in the event of breakage.

I claim:

1. In an engine ignition system, a shielded cable and a tubular spark plug shell extension, a metallic housing connecting the cable shield and tubular extension, said housing including a body of insulating material and a pair of sheet metal stampings joined together along mating edges and enclosing said body, and means at opposite ends of the stampings for removably securing thereto, respectively, the cable shield and the spark plug extension; said body of insulating material having a bore in line with said tubular spark plug extension, and means extending through said bore and into said tubular extension for supplying current to the central electrode of the spark plug.

2. In an engine ignition system, a shielded cable and a tubular spark plug shell extension, a metallic housing connecting the cable shield and tubular extension, said housing including a body of insulating material and a pair of sheet metal stampings joined together along mating edges and enclosing said body, means at opposite ends of the stampings for removably securing thereto, respectively, the cable shield and the spark plug extension, and alining the hollow portions of the extension and body; said body of insulating material having a bore in line with said tubular spark plug extension, an electrode the outer end of which lies within said tubular spark plug extension, and a replaceable conductor receivable within said tubular spark plug extension and said bore.

3. In a spark plug, a threaded shell having a grounded electrode at its inner end, and the outer end of which shell is internally threaded; a tubular member having a threaded portion engaging said internally threaded shell part, and which member extends beyond the outer end of said shell; an electrode within said tubular member and extending part way only along the length thereof; an insulating tube within said tubular member and surrounding said electrode and extending to the outer end of said tubular member; a metallic housing detachably secured to the outer end of said tubular member; an insulator enclosed within said housing and having a bore disposed in line with said tubular member; a supply conductor extending into said housing and insulating member and having a terminal at the outer end of said bore; and a conductor spindle loose within said tubular member and said bore and extending between said terminal and the outer end of said electrode, and the ends of which spindle contact the said last mentioned parts.

4. In a spark plug, a threaded shell having a grounded electrode at its inner end, and the outer end of which shell is internally threaded; a tubular member having a threaded portion engaging said internally threaded shell part, and which member extends beyond the outer end of said shell and is reduced in diameter so as to provide a thin wall portion beyond said outer end; an electrode within said tubular member and extending part way only along the length thereof; an insulating tube within said tubular member and surrounding said electrode and extending to the outer end of said tubular mem-

ber; a metallic housing detachably secured to the outer end of said tubular member; an insulator enclosed within said housing and having a bore disposed in line with said tubular member; a supply conductor extending into said housing and insulating member and having a terminal at the outer end of said bore; and a conductor spindle loose within said tubular member and said bore and extending between said terminal and the outer end of said electrode, and the ends of which spindle contact the said last mentioned parts.

5. In a spark plug, a threaded shell having a grounded electrode at its inner end, and the outer end of which shell is internally threaded; a tubular member having a threaded portion engaging said internally threaded shell part, and which member extends beyond the outer end of said shell; an electrode within said tubular member and extending part way only along the length thereof; an insulating tube within said tubular member and surrounding said electrode and extending to the outer end of said tubular member; a metallic housing detachably secured to the outer end of said tubular member; an insulator enclosed within said housing and having a bore disposed in line with said tubular member; a supply conductor extending into said housing and insulating member and having a terminal at the outer end of said bore; a conductor spindle arranged within said tubular member and said bore and spaced apart from the walls of said parts so as to fit loosely therein, and which spindle extends between said terminal and the outer end of said electrode; and a spring acting upon said conductor spindle to force the outer end thereof against said terminal, and which spring abuts against the upper end of said electrode.

6. In a spark plug, a threaded shell having a grounded electrode at its inner end, and the outer end of which shell is internally threaded; a tubular member having a threaded portion engaging said internally threaded shell part, and which member extends beyond the outer end of said shell; an electrode within said tubular member and extending part way only along the length thereof; an insulating tube within said tubular member and surrounding said electrode and extending to the outer end of said tubular member; a metallic housing detachably secured to the outer end of said tubular member; an insulator enclosed with in said housing and having a bore disposed in line with said tubular member; a supply conductor extending into said housing and insulating member and having a terminal at the outer end of said bore; a conductor spindle extending between and the ends of which are electrically connected with said terminal and with the outer end of said electrode; and a tubular insulating member surrounding and extending throughout the length of said spindle; said spindle with its insulating covering being spaced apart from the interior of said tubular member and from the wall of said bore so as to fit loosely within said parts.

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