Oct. 3, 1933. L. F. HAHN 1,929,203

SHIELDED SPARK PLUG

Original Filed Oct. 3, 1929

Fig. 1.

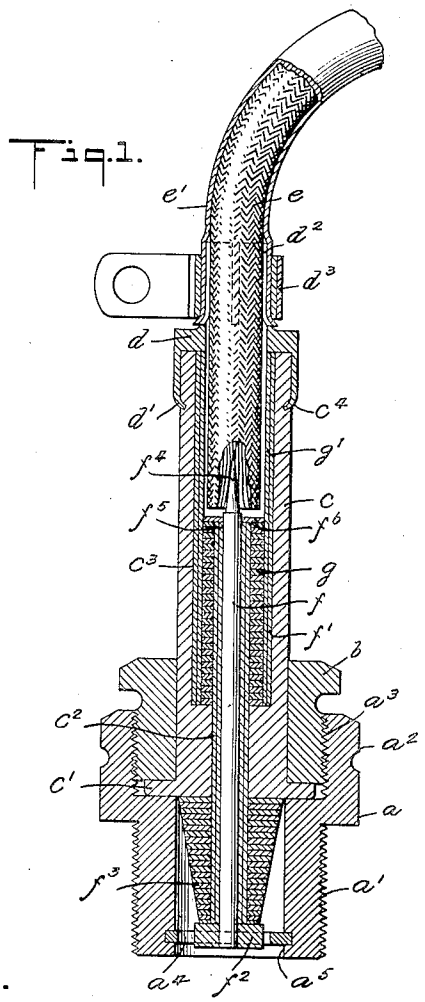
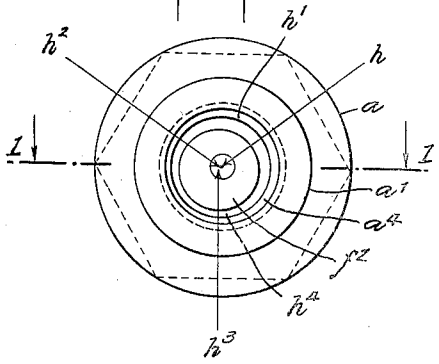


Fig. 2.



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Patented Oct. 3, 1933

1,929,203

UNITED STATES PATENT OFFICE

1,929,203

SHIELDED SPARK PLUG

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Original application October 3, 1929, Serial No. 396,950. Divided and this application October 27, 1932. Serial No. 639,764

10 Claims. (Cl. 123—169)

The present invention relates to spark plugs and embodies, more specifically, an improved spark plug of the type generally known as a shielded spark plug constructed to prevent electrical disturbances set up by the ignition system from affecting radio communication adjacent the engine.

The present disclosure constitutes a division of my co-pending application for shielded spark plug, Serial No. 396,950 filed October 3, 1929.

The primary object of the invention is to provide a simple form of spark plug and particularly to provide for simplification of spark plugs of the shielded type.

Among the other objects of the invention is to provide a construction of spark plug, the parts of which can be readily and easily manufactured and assembled in a few separable units, which will permit a ready inspection of the electrodes, which will provide for a long fat spark, which will provide for an easy resetting of the location of the active portion of spark gap, which will insure a moisture proof condition of the electric current carrying parts, which will defeat any possibility of dirt or powder collecting on the exterior of the plug from short circuiting the electric current passing through the plug, and which will provide for such cooling as will prevent preignition and at the same time insure the retention of sufficient heat to prevent fouling.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawing and in part will be more fully set forth in the following particular description of one form of mechanism embodying the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawing:

Fig. 1 is a view in section, taken on line 1—1 of Fig. 2 and looking in the direction of the arrows; and

Fig. 2 is a bottom view of the spark plug shown in Fig. 1.

Referring to the above drawing, a designates a spark plug shell which is threaded at a^1 to engage the cylinder head of an engine. An enlargd portion a^2 is internally threaded at a^3 and receives an annular compression nut b. An annular electrode a^4 is mounted within the sheel a^1, its opening eccentric with respect to the axis thereof, and is secured in position by a turned over portion a^5 of the shell a^1.

A metallic shield or jacket c, preferably made of brass, or other good heat conducting material, is formed with a flanged portion c^1 which is secured between the compression nut b and a restricted portion of the shell a^1.

An axial passage c^2 is formed adjacent the flange c^1 and is enlarged at c^3 to receive the elements to be described hereinafter. A circumferential groove c^4 is formed adjacent the top of the shield and receives the extremity d^1 of a cap d, which extremity is preferably rolled into the groove c^4. The cap d is formed with a split or sleeve head d^2 which carries a clamping device d^3 to compress the split portions of the head about a wire or electric head e which is part of an ignition system, as well as to secure the metallic covering or shielding e^1 of the wire e. It will be understood that all of the elements belonging to the high tension ignition system are shielded to prevent the infiltration of dust, dirt, moisture or water, including the ignition wires which are covered with a metallic braiding or the like.

A spindle f carries a desired number of layers of mica f^1 and is received within the axial passage c^2. The lower extremity of the spindle carries a flat cylindrical head f^2 which constitutes an eccentric central electrode which lies in the plane of the annular electrode a^4. Mica discs f^3 are mounted between the head f^2 and the flanged portion c^1 of the shield. The upper extremity of the spindle f is formed a conical point f^4 at the base of which is a shoulder f^5. Additional sheets of mica g^1 and mica discs g are mounted within the shield c to provide the desired insulation and a metal washer f^6 is placed over the end of the spindle f. The portion of the shield adjacent the flange c^1 is placed under a high compression and the diameter thereof reduced to secure the spindle and mica therewithin. Prior to such compression, the washer f^6 and the spindle head f^2 are placed under compression to secure the mica discs f^3 in a desired manner, as well as the mica discs g and the shoulder f^5 is in such position. In this manner, it will be seen that the elements of the core are effectively secured in position and form a single unit adapted to be mounted in the shell a.

The replaceable unit or core assembly, constituting the jacket, the spindle, and the parts secured therewithin, is secured to the shell by means of the compression nut b in the base of which the unit is snugly received with a slight freedom of rotary movement, as clearly shown in Fig. 1. It will be seen that no gasket is

used, and the proper cooling of the inner portions of the plug is thus facilitated, by reason of the good heat conducting path offered by the metal to contact. The metallic covering e^1 of the ignition wire e is cut back as shown, the wire e being forced downwardly through the cap until the strands thereof are engaged and spread by the point f^4. At the same time the metallic covering c^1 is arranged over the outside of the cap as shown, at which time the clamp d^3 effectively secures not only the metallic covering to the cap, but the wire within the cap. In this manner the shielding of the plug and the connecting ignition wire is complete and unbroken, and by reason of the rolled engagement of the portion d^1 of the cap d with the groove c^4, a watertight connection is also secured.

With reference to Fig. 2 which is a bottom view of the spark plug shown in Fig. 1, the geometrical center of the spark plug is the center line of the spindle f and is indicated by the reference character h. The opening h^1 in the annular electrode a^4 is circular in form and has its center h^2 offset from the geometrical center h as shown. The central electrode f^2, which lies in the plane of the annular electrode a^4, is also circular in form and has its center h^3 likewise offset from the geometrical center h. In Fig. 2 the central electrode is shown in the position to give the desired initial spark gap setting h^4. It will be noted that the two electrodes approach each other somewhat closely over a considerable portion of the circumference and this fact, coupled with the fact that the annular electrode and the central electrode may be made as thick as desirable, permits the formation of a fat spark with a minimum of burning away of the electrodes. When the spark gap becomes appreciably changed by reason of such burning, the plug can be removed, the compression nut loosened and the core assembly rotated until the desired spark gap is again obtained, this adjustment being made possible by reason of the displacement of the centers of the two electrodes. It will, of course, be evident that the central and annular electrodes must be made of high arcing resistance material and that they may or may not be integral with the spindle and the shell respectively. The jacket c is preferably made of brass or other good heat conducting material.

I claim:

1. In a new, unworn spark plug, the combination of a metallic tubular shell of heat conducting material and provided with a bore, an annular electrode of high arcing resistance material fitted in the bore and having its opening of fixed circular form disposed eccentric relative to the axis of the shell bore, a spindle having its axis coinciding with the axis of the bore and having one end intruded into the opening in the annular electrode, means of cylindrical form for mounting the spindle in the shell for turning the spindle about the axis of the shell and for insulating it from the shell, the intruded end of the spindle provided with a disc-like flat cylindrical head constituting a coacting electrode with its peripheral edge spaced outwardly from the spindle and disposed in the plane of the annular electrode, said head having its periphery disposed eccentrically with respect to both the axis of the bore and the axis of the spindle whereby there is formed an annular spark gap clearance which increases circumferentially from its point of minimum radial width to form a fat spark and said point shiftable by relative rotation of either the shell or the spindle or both about the axis of rotation of said cylindrical mounting means.

2. In a spark plug, the combination of a tubular shell provided with a bore, an annular electrode of a material different from the material of the shell projecting into the bore, the center of the circle defining the inner periphery of the electrode being offset from the axis of the bore, a spindle disposed in said axis, and projecting into the opening in the annular electrode, a cylindrical head of a material different from the spindle secured to the spindle, rotatable therewith and having the center of the circle defining its perimeter disposed eccentric relative to both the axis of the bore and spindle and to the center of the opening in the annular electrode, said head located in the opening in the annular electrode and coacting therewith to form an annular spark gap of substantially the same radial width but slightly increasing in radial width in both circumferential directions from the point of least radial width.

3. A spark plug provided with a ring having its inner perimeter forming the side of a flat outer cylinder and constituting an annular electrode, a flat cylindrical disc located in the opening in the annular electrode and disposed in its plane, the outer periphery of said disc constituting a coacting electrode and forming the side of a flat inner cylinder with the axis of said cylinders offset from each other, and the diameter of the inner cylinder being approximately three quarters of the diameter of the outer cylinder whereby the opposing cylindrical sides of the electrodes coact to form a long thin annular spark gap increasing slightly in radial thickness circumferentially in both directions from a point of minimum radial thickness.

4. In a device of the class described, the combination of a shell provided with a bore enlarged at its upper end to provide an upwardly facing seat, an annular electrode projecting into the bore of the shell adjacent its lower end, the center of the circle defining the inner periphery of said electrode being eccentric relative to the axis of the bore, a tubular replaceable unit adapted to engage the seat, and having its axis coinciding with the axis of the bore, a spindle extending along said axis projecting below said seat and provided at the projecting end with a head forming an electrode contained in the plane of the annular electrode, said head being cylindrical with the center of the circle defining its perimeter being located eccentric relative to said axis, means for centering and securing the spindle in the unit, and means for securing the unit as a whole in rotatably adjusted position in the shell.

5. A spark plug comprising a mounting shell an outer electrode carried thereby and having an annular opening eccentric with the axis of the plug, a member mounted in the shell for rotary movement about its axis, a central electrode secured to said member to turn therewith and provided with an extension comprising a disc-like spark head mounted eccentrically with respect to the axis of the plug and within the annular opening, the arrangement being such that the size of the spark gap may be adjusted by the rotation of the mounting member in its shell, and means to mount the central electrode adjustably in the annular electrode.

6. A spark plug in accordance with claim 5, wherein the outer electrode is in the form of a

separate annular ring secured to the shell of the plug.

7. In a spark plug, the combination of a tubular shell provided with means for mounting the same in an engine cylinder and provided with an axially extending bore, an annular electrode projecting into the bore of the plug, the center of the inner periphery of the electrode being eccentric relative to the axis of the shell, a spindle centered in the shell and projecting into the opening in the annular electrode, a disc-like head secured to the spindle disposed in the opening in the annular electrode and constituting a coacting electrode, said electrodes being each of high arcing resistance material.

8. A spark plug including a mounting shell and associated nut having a bore extending axially therethrough and said shell provided at its inner end with an annular electrode, a replaceable unit mounted in said bore for adjustable rotary movement about its axis and adapted to be secured in its adjusted position by said nut, said unit including a spindle disposed in said axis and rotatable with the unit about said axis, said spindle provided with a disk-like head constituting a coacting electrode disposed in the opening in the annular electrode, the centers of both electrodes being offset from each other and from the axis of rotation of said unit.

9. A spark plug including a mounting element and a replaceable insert, the mounting element provided with a bore forming a cylindrical bearing surface and having at one end an annular electrode, said insert provided with an external cylindrical bearing surface rotatably mounted in the bearing surface of the mounting element, a spindle carried by the insert and provided at one end with a disk-like member constituting a coacting electrode, the center of the periphery of which is offset from the axis of rotation of the insert, and said annular electrode having its center eccentric relative to said axis.

10. A spark plug including means forming an annular outer electrode and a coacting disk-like inner electrode, the centers of the electrodes being offset from each other and from the axis of the plug.

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