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SPARK PLUG FOR HIGH COMPRESSION ENGINES

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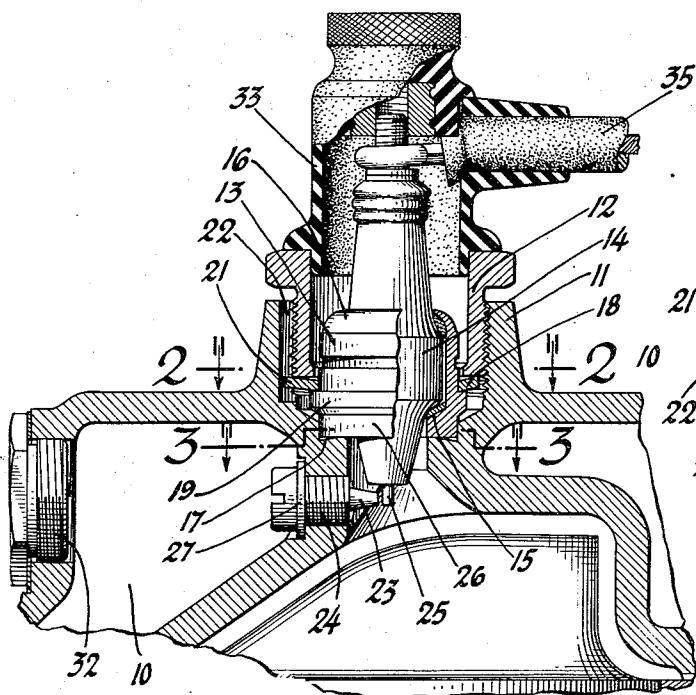


Fig. 1

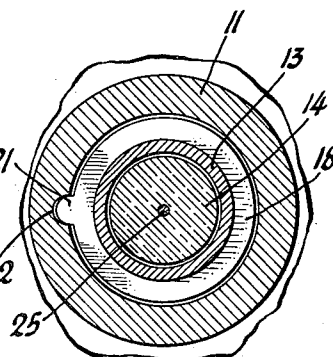


Fig. 2

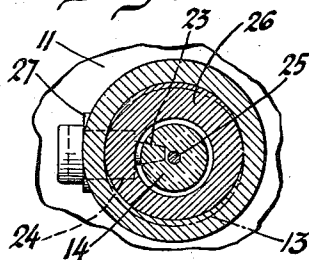


Fig. 3

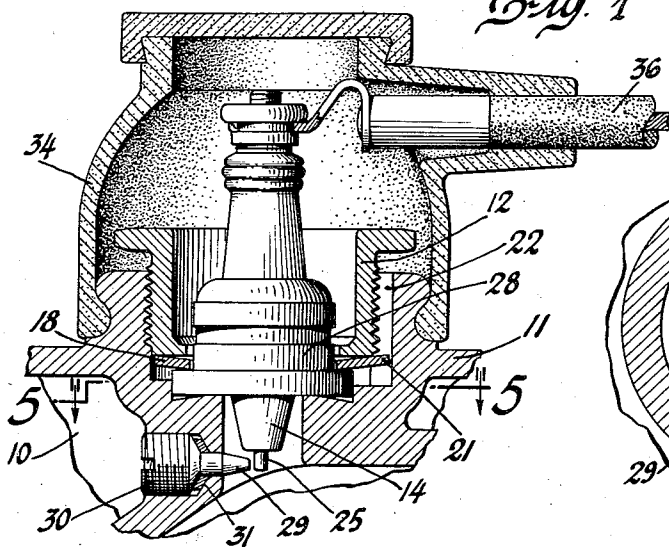


Fig. 4

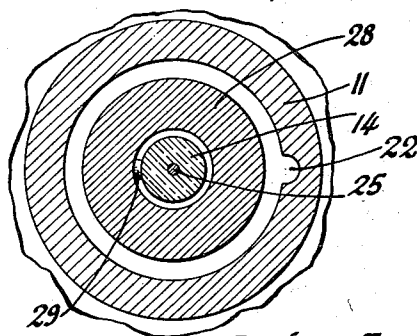


Fig. 5

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SPARK PLUG FOR HIGH COMPRESSION
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6 Claims. (Cl. 123-169)

My invention relates to spark plugs for internal combustion engines, and the object thereof is to provide a spark plug wherein the grounded electrode thereof is so arranged that it will be more effectively cooled than heretofore.

Another object of my invention is to provide certain features associated with the insulating member of the plug whereby the heating thereof when the plug is in use is greatly reduced; and a further object is to provide improved means for adjusting the spark gap between the grounded and insulated electrodes, and for insuring that the length of said gap after the insulating member has been removed for inspection and cleaning, shall be the same when the parts are reassembled that it was before the insulator was removed, thus maintaining an unchanged length of spark gap notwithstanding repeated removals and replacements of the insulating member.

With the above and other objects in view as will hereinafter appear my invention consists in the spark plug illustrated in its preferred form in the accompanying drawing, and hereinafter described and claimed; and in such modifications and variations thereof, within the scope of the concluding claims, as will be obvious to those skilled in the art to which my invention relates.

In the drawing:

Figure 1 is a view showing a section upon a vertical plane of a spark plug made in accordance with my invention, certain parts of an engine head being also shown.

Figure 2 is a view showing a section upon a horizontal plane indicated by the line 2-2, Figure 1, looking down.

Figure 3 is a similar view taken upon a plane indicated by the line 3-3, Figure 1.

Figure 4 is a view taken upon a vertical plane as in Figure 1, but showing my improved spark plug modified as to some of its features.

Figure 5 is a view showing a section on a horizontal plane indicated by the line 5-5, Figure 4, looking down.

Referring to the drawing, the cylinder head, which enters into the formation of a spark plug in accordance with my invention, has the usual inner and outer walls and an intervening space 10 which contains a cooling liquid, and said head may be either integral with an internal combustion engine cylinder or formed separate therefrom and secured thereto by the usual holding bolts. Said head has an internally threaded annular part 11 extending upward from the top wall thereof; and arranged within this part and held therein by an externally threaded bushing 12 is a hollow cylindrical shell or sleeve 13 within which the porcelain or equivalent material insulating member 14 of the plug is held between a lower internal supporting ledge 15 and an upper 60 inturned flange 16, as is usual in spark plugs

wherein the insulating member is permanently assembled within a hollow metallic shell or casing. A circular recess or seat 17 in the head supports the shell 13 the lower end of which fits closely within said seat, but within which seat the shell is angularly adjustable; a holding washer 18 being interposed between the lower end of the bushing 12 and an annular shoulder 19 adjacent the lower or inner end of the shell, to thereby hold the shell in place and force its lower end against the seat 17 as will be appreciated. The washer 18 has a projection 21 which extends into a groove 22 within the projecting part 11 so that the screwing of the holding nut or gland 12 into the projection to hold the shell against the seat 17 will not rotate the shell.

The grounded electrode is shown as in the form of a smaller projecting part 23 extending from an enlarged threaded part or base 24 which screws into a threaded electrode passage in a properly shaped portion of the inner wall of the head; and the insulated electrode 25 extends through a passage in the insulating member 14 as is usual.

The lower end 26 of the shell 13, see Figure 3, is preferably made eccentric to the upper part which holds the insulator, so that angular movement of the same will vary the length of the spark gap between the electrodes 23, 25. If before the shell is removed for cleaning the inner end of the insulator, or for any other purpose, the position of the shell is marked as by marking upon the same and washer 18 after removing the gland nut 12, then if in reassembling the parts the shell or sleeve is positioned as indicated by the marking, the length of the spark gap will obviously be the same as before the shell was removed.

A washer 27 is commonly placed beneath the head of the grounded electrode and by selecting washers of different thicknesses the position of the inner end thereof may be varied and an average length of spark gap thus provided, to be thereafter more definitely determined by the adjusting features provided by the eccentric lower end 26 of the shell and the seat 17 into which it extends.

In the form of my invention illustrated in Figures 4 and 5 the shell or sleeve 28 is concentric as regards all parts thereof, and the grounded electrode 29 has an enlarged threaded part 30 which is adjustable in a threaded passage in the inner wall of the head; and adjustment of the spark gap is secured by the use of washers 31 of different thicknesses, or by compressing such a washer more or less if the washer is of the type which may yield to a certain degree. In both forms a screw driver may be inserted through an opening in the outer wall of the head arranged in line with the grounded electrode, and opening is normally closed by a plug 32, to thereby adjust the grounded electrode.

Caps 33 and 34 of insulating material differing somewhat in form in the two embodiments of my invention illustrated and hereinbefore described are provided to protect the upper ends of the
 5 insulators, and the connections between supply cables 35 and 36 and the central electrodes, from the weather, as the plug herein disclosed is designed especially for use with outboard motor engines for boat propulsion; but these protecting
 10 caps are not claimed in this present application.

In both forms of my invention the enlarged outer threaded parts of the grounded electrodes provide a metal to metal contact between them and the inner head wall of large area, which
 15 facilitates a rapid flow of heat to the wall; and the fact that the cooling liquid is in direct contact with the head wall about the electrodes and with the outer ends of the electrodes themselves secures a rapid dissipation of heat from them, and
 20 prevents them from becoming overheated when the engine is in operation. The insulating member also is kept at a lower temperature than would otherwise be the case because of the metallic path provided by the lower end 26 of
 25 the shell 13, which fits closely within an annular recess in the comparatively cool top wall of the head, the parts being in direct metal to metal contact with one another; so that heat which would otherwise flow to the shell and insulator is
 30 for the most part diverted through the lower end of the shell and to the cool head wall, and excessive heating of the upper part of the shell and the insulator therein is avoided. This flow of heat
 35 to comparatively cool parts instead of to the upper part of the shell 13 and to the insulator 14 is further facilitated by contact between the washer 18 and the shoulder 19, and between the washer and gland nut 12, thus providing a second metallic
 40 path to the comparatively cool head and which to a degree is independent of the path provided by the lower end 26 of the shell as hereinbefore explained.

Having thus described and explained my invention I claim and desire to secure by Letters
 45 Patent:

1. In a spark plug and in combination with a cylinder head having an internal cooling liquid space, and an internally threaded annular part; a hollow shell; an insulator assembled within said
 50 shell and extending into a space containing a combustible mixture to be ignited; an insulated electrode extending through said insulator and into sparking relation with a grounded electrode; an externally threaded bushing within said annular
 55 part and spaced apart from the shell aforesaid; means located adjacent the inner end of said shell and through which said bushing acts to hold said shell in place with its inner end in direct contact with said head; and a grounded
 60 electrode arranged in sparking relation with the inner end of said insulated electrode, and a part of which grounded electrode is in direct contact with cooling liquid within said cooling liquid space.

2. In a spark plug and in combination with a cylinder head having an internal cooling liquid space, and an internally threaded annular part; a hollow shell; an insulator assembled within said
 65 shell and extending into a space containing a combustible mixture to be ignited; an insulated electrode extending through said insulator and into sparking relation with a grounded electrode;

an externally threaded bushing within said annular part and spaced apart from the shell aforesaid; an annular shoulder adjacent the lower end of said shell; a washer engaging said shoulder and with which the lower end of said bushing
 80 engages to hold said shell in place, with its inner end in direct contact with said head; and a grounded electrode arranged in sparking relation with the inner end of said insulated electrode, and a part of which grounded electrode is in
 85 direct contact with cooling liquid within said cooling liquid space.

3. In a spark plug and in combination with a cylinder head having an internal cooling liquid space, an internally threaded annular part, and a circular recess adjacent the lower end of said
 90 annular part; a hollow cylindrical shell the lower end of which fits within said recess; an insulator within said shell and extending through the lower open end thereof; an insulated electrode extending through said insulator and into sparking
 95 relation with a grounded electrode; an externally threaded bushing within said annular part; means located adjacent the inner end of said shell whereby said bushing acts to hold said shell in place, with its lower end within the recess
 100 aforesaid; and a grounded electrode assembled with the cylinder head and arranged in sparking relation with the inner end of said insulated electrode.

4. In a spark plug and in combination with a cylinder head having an internal cooling liquid space, an internally threaded annular part, and a circular recess within and below the lower end of said annular part; a hollow cylindrical shell
 110 having an eccentric lower end of circular form fitting within said recess; an insulator within said shell; an insulated electrode extending through said insulator and into sparking relation with a grounded electrode; an externally threaded
 115 bushing within said annular part and spaced apart from the shell aforesaid; means adjacent the inner end of said shell and engaged by the lower end of said bushing for holding said shell in place, with its eccentric lower end within the
 120 recess aforesaid; and a grounded electrode assembled with the cylinder head and arranged in sparking relation with the inner end of said insulated electrode.

5. A cylinder head having inner and outer
 125 walls, an intervening cooling liquid space, a threaded grounded electrode passage in said inner wall and leading into the interior of said head, and an opening in said outer wall arranged in line with said passage; and a threaded grounded
 130 electrode extending through the passage aforesaid and the outer end of which is in direct contact with cooling liquid within said cooling liquid space.

6. A cylinder head having inner and outer
 135 walls, an intervening cooling liquid space, a threaded grounded electrode passage in said inner wall and leading into the interior of said head, and an opening in said outer wall arranged in line with said passage; and a grounded electrode
 140 extending through said passage and having an enlarged outer threaded part in direct contact with cooling liquid within the cooling liquid space aforesaid, and a reduced inner part extending
 145 into sparking relation with an insulated electrode.

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