Feb. 6, 1951 E. A. McDONALD 2,540,453

ADJUSTABLE ELECTRODE SPARK PLUG

Filed May 20, 1949

Fig. 1

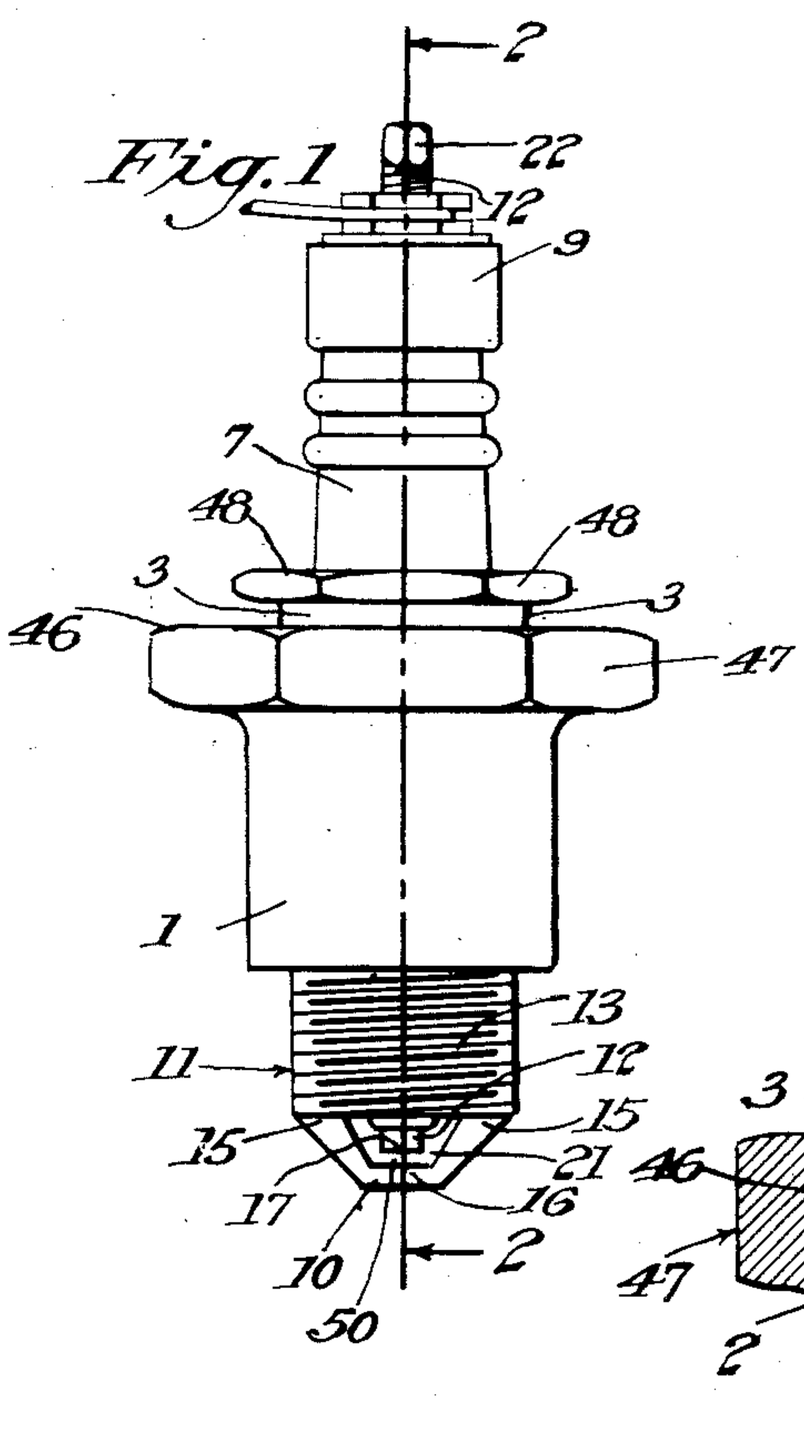


Fig. 2

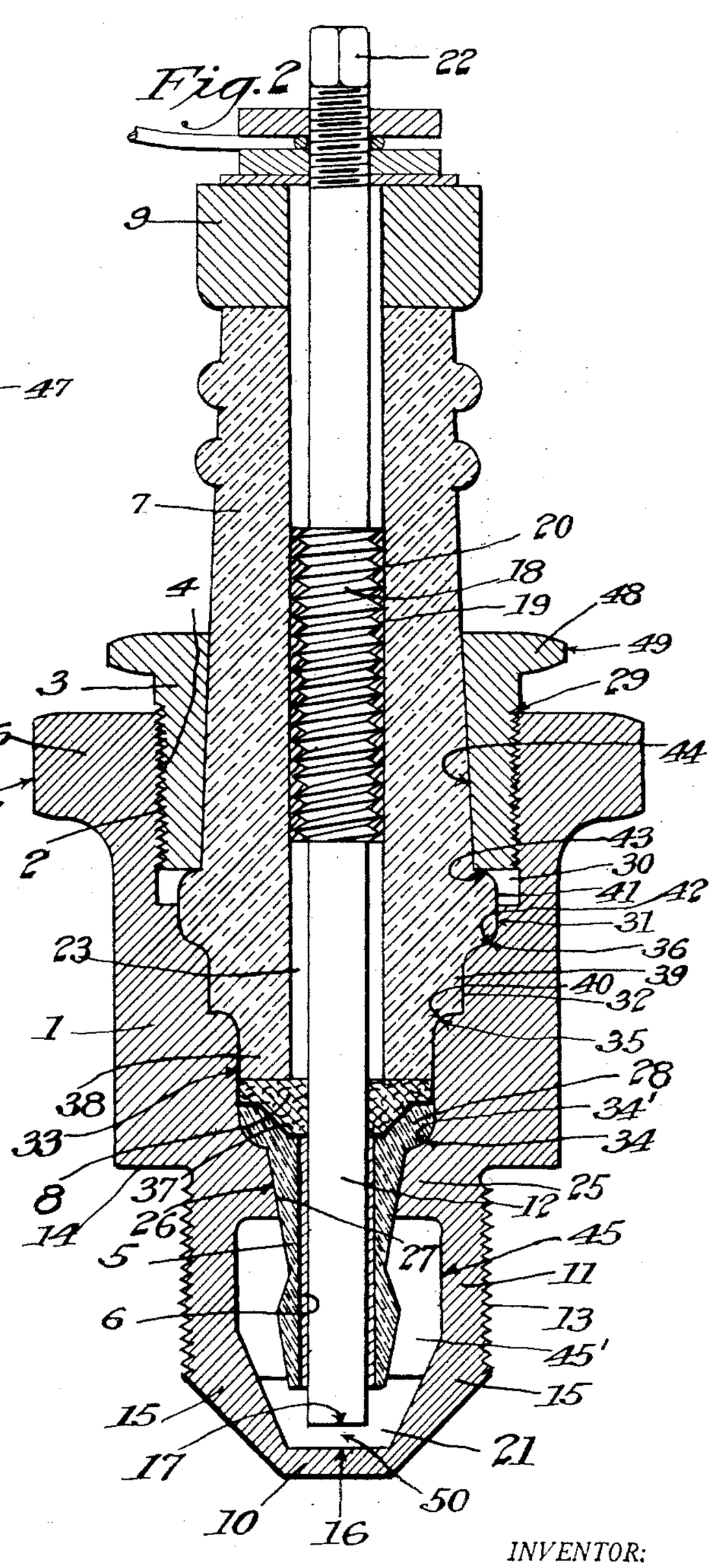
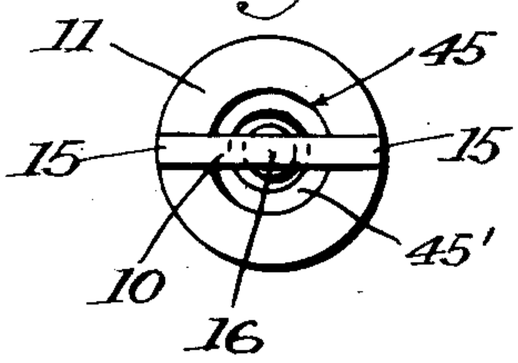


Fig. 3



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ADJUSTABLE ELECTRODE SPARK PLUG

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1 Claim. (Cl. 123—169)

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This invention relates to spark plugs for internal combustion engines, and the general object of the invention is to provide a spark plug with improved means whereby one of its electrodes may be adjusted with relation to its other electrode for maintaining the spark gap between the electrodes at its normal width, as the electrodes are burned by the sparking thereof and said gap is thereby widened.

A more particular object of the invention is to provide a spark plug of the character stated, in which one of its electrodes is in the form of a bolt and may upon turning the same be adjusted longitudinally toward or away from the other electrode to maintain the spark gap between the electrodes at its normal width.

Other objects and advantages will appear hereinafter as this specification progresses.

The invention is illustrated in the annexed drawing, which forms a part of this specification and in which:

Fig. 1 is a side elevation of a spark plug embodying my invention.

Fig. 2 is a vertical longitudinal section of said spark plug taken on line 2—2 of Fig. 1.

Fig. 3 is an inner end view of the spark plug.

Referring more particularly to the drawing, in which the same reference numerals designate the same parts in all of the figures, my spark plug includes generally a hollow metal tubular body 1 formed with an internal thread 2 in the upper end thereof; a locking sleeve 3, formed with an external thread 4 fitted in the upper end of said body 1 with its thread 4 interengaged with said body thread 2; a porcelain bearing member 5 lined with a metal bushing 6, fitted in the lower end of the metal body 1; an elongated porcelain insulating sleeve 7 extending with the body 1 through the locking sleeve 3; an insulating fire-resisting washer gasket 8 interposed between the upper end of the bearing member 5 and the lower end of the porcelain sleeve 7; a metal cap 9 fitted on the upper end of said porcelain sleeve; a stationary negative electrode 10 formed on the lower reduced end section 11 of the metal body 1; and a longitudinally adjustable positive electrode 12 in the form of a rod extending through the metal cap 9, porcelain sleeve 7, gasket 8 and bearing 5; there being an external thread 13 on the reduced end portion 11 of the metal body 1, which reduced end portion is threaded in a threaded opening in the head of a cylinder of an internal combustion engine with the annular external shoulder 14 at the upper end of the reduced end portion 11 engageable with the upper surface of said engine head.

The stationary negative electrode 10 is in the form of a narrow bridge extending diametrically across the lower end of the reduced end portion 11 of the tubular metal body 1 with the ends 15

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of said electrode integral with said lower end of said reduced end portion, and with said electrode extending downwardly and inwardly from its ends to its intermediate spark point 16, which is spaced below the lower end of the reduced end portion 11 and directly below and in alignment with the lower spark point 17 of the positive electrode 12. Said electrode 12 is formed with a thread 18 intermediate its ends, which thread interengages an internal thread 19 formed in a metal sleeve 20 cast axially in the elongated porcelain sleeve 7 whereby the electrode 12 upon turning the same may be adjusted longitudinally to adjust its lower spark end 17 closer to or farther away from the spark point 16 of the negative electrode 10.

The bridge construction of the negative electrode 10 provides an opening 21 extending transversely through the same between the ends thereof, in which opening are located the spark point 16 of electrode 10 and the spark point 17 of the electrode 12, through which opening 21 the spark produced between the spark points 16 and 17 of the electrodes 10 and 12 flares into the engine cylinder to ignite the gas therein. The upper end 22 of the positive electrode 12 extends upwardly above the upper end of the plug and is square to receive a wrench for turning the electrode for the purpose hereinafter fully described. The bore 23 in the lower portion of the elongated porcelain sleeve 7 below the lower end of the threaded sleeve 20 is of greater diameter than the diameter of the external thread 18 on the electrode 12, so that said thread may pass through said bore, whereby said electrode may be introduced into or removed from the plug through said bore 23 in the lower portion of the elongated sleeve 7.

The metal tubular body 1 is formed nearer its lower end with a transverse horizontal partition 25, which is provided with an inverted conical opening 26 through which opening a corresponding conical external portion 27 of the electrode porcelain bearing member 5 extends, and in which opening said conical portion of said bearing is tightly fitted. Said bearing is formed at its upper end with an external annular flange 28. The bore 29 of the tubular metal body 1 is largest in diameter in the upper end portion of said body, as indicated at 30, and in the cylindrical wall of said largest portion of the bore is cut the internal thread 2 to receive the external thread 4 of the locking sleeve 3. From the lower end of said largest portion 30 of the bore 29, said bore is formed with progressively smaller bore sections 31, 32 and 33 extending downwardly in short lengths with the lowermost bore section 33 extending down to the partition 25, there being a concaved annular seat 34 between the lower end of the wall

of said lowermost bore section 33 and the upper side of said partition 25, and there being a convex annular seat 35 between the bore sections 33 and 32, and a concaved annular seat 36 between the bore sections 32 and 31. The lower side of the external annular flange 28 at the upper end of the bearing 5 is convex as at 34' to fit in the annular concave seat 34. The upper end of the bearing 5 is formed with an inverted conical depression 37 in which the lower side of the asbestos washer 8 is adapted to be compressed in the manner hereinafter described. The porcelain elongated sleeve 7 is formed with a reduced lower cylindrical end portion 38 which fits in the lower bore section 33 of the metal body 1 and rests at its lower end upon the upper side of the asbestos washer 8. The porcelain elongated sleeve 7 is formed, immediately above its reduced lower end portion 38, with a short cylindrical portion 39 of larger diameter than said reduced lower end portion 38, which cylindrical portion 39 fits in the bore section 32 of the metal body 1, there being a concaved annular shoulder 40 formed on the porcelain sleeve 7 between the reduced lower end portion 38 and the cylindrical portion 39 of said sleeve, which annular shoulder rests upon the convex annular seat 35 in the metal body 1. The porcelain elongated sleeve 7 is formed immediately above its cylindrical portion 39 with an external short enlarged cylindrical portion 41 of larger diameter than the cylindrical portion 39, the lower part of which cylindrical portion 41 fits in the short bore section 31, there being a convex annular shoulder 42 between said cylindrical portions 39 and 41, which shoulder rests upon the annular concaved seat 36 in the metal body 1, and there being an annular concaved shoulder 43 between the upper end of said cylindrical portion 41 and the base of an elongated conical portion 44 of the elongated porcelain sleeve 7, which conical portion extends upwardly above the metal body 1 through the threaded sleeve 3 in the upper end of said body. The bore 29 of the metal body 1 has its lower portion 45 formed in the reduced lower end portion 11 of said metal body, which lower bore portion 45 extends downwardly from the portion 25 through the lower end of said reduced lower end portion 11, forming an air chamber 45' into which the lower portion of the electrode bearing 5 extends, and which facilitates the sparking of the spark points 16 and 17.

The upper end of the metal body 1 is formed with an external flange 46, which flange is formed with an external hexagonal surface 47 to be engaged by a wrench for turning said body 1 to screw the lower reduced threaded end 11 of said body into a threaded opening in the head of a gas engine cylinder.

The threaded lock sleeve 3 is formed at its upper end with an external flange 48, the outer surface 49 of which is hexagonal to receive a wrench for turning and threading said sleeve into the threaded upper end portion 30 of the bore 29 of the metal body 1, so that the lower inner end of said sleeve 3 will engage the concaved annular shoulder 43 on the elongated porcelain sleeve 7 and hold said porcelain sleeve securely in position in said metal body 1, with the lower end of the reduced lower end portion 38 of sleeve 7 against the asbestos washer 8 and the annular shoulders 40 and 42 of said sleeve 7 against their seats 35 and 36, respectively, in the metal body 1.

The operation of my invention is as follows:

When the spark point 17 at the lower end of the electrode 12 is burned down to such extent that the gap 50 between the spark points 16 and 17 is too great for effective sparking, a wrench is applied to the upper square end 22 of the electrode 12, and upon turning said electrode with said wrench the engagement of the electrode thread 18 with the sleeve thread 19 will cause the electrode 12 to move down in the plug until the spark point 17 is moved back to such distance from the spark point 16 as to provide the gap 50 of proper width between the spark points 16 and 17, thus enabling use of the electrode 12 and the spark plug for a considerably greater length of time than is possible otherwise.

I claim:

A spark plug including a hollow metal body, means for mounting said body with one end thereof projecting into a gas engine cylinder, a fixed electrode on said projecting end of said metal body forming a fixed spark point, said metal body being formed with a transverse partition in the lower part thereof, providing an air chamber below said partition in the lower end of said metal body, said partition being provided with an opening therein, said metal body being formed with a bore extending upwardy from said partition and with a larger bore above said first bore, an insulating bearing member formed with an external flange on its upper end, which bearing member extends downwardly through said opening in said partition with said external flange resting upon the upper side of said partition within said first bore, a fire-resisting washer gasket resting upon the upper end of said bearing member, an elongated insulating sleeve formed with a reduced lower end portion and with a short external enlarged portion above said reduced end portion and said elongated insulating sleeve resting in said hollow metal body, with its reduced lower end portion resting upon said gasket and fitted within said first bore, and with its short external enlarged portion fitted within said upper and larger bore, said metal body being formed in its upper end portion with an enlarged threaded bore, a threaded sleeve fitted in threaded engagement with said threaded bore and engaging at its lower end said short external enlarged portion of said elongated insulating sleeve, for securing said sleeve in said metal body with said gasket compressed between the lower end of said sleeve and the upper end of said bearing member, an internal thread in the bore of said elongated sleeve, a rod forming an electrode extending through the bore of said sleeve and forming at its lower end an adjustable spark point, an external thread on said rod for engaging said internal thread in said insulating sleeve for adjusting said rod longitudinally and thereby adusting said adjustable spark point with relation to said fixed spark point.

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The following references are of record in the file of this patent:

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