July 10, 1923. 1,461,405

J. S. SOLOMON

SPARK PLUG

Filed Dec. 16, 1920

Fig. 1.

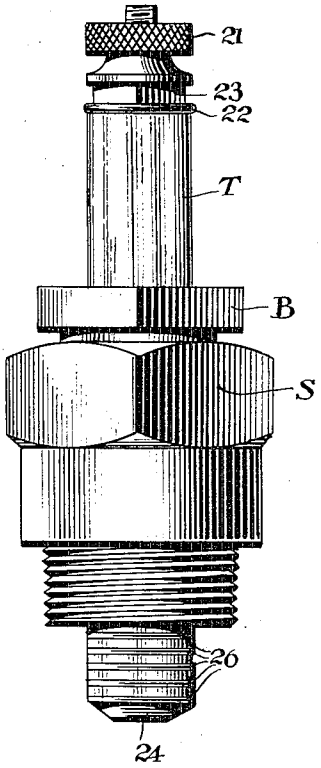


Fig. 2.

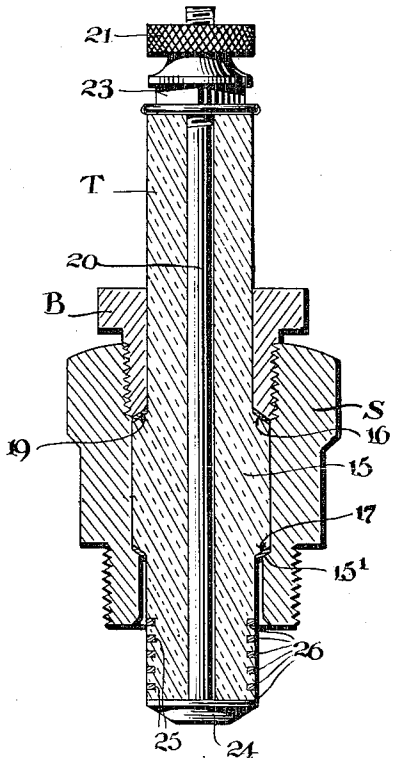
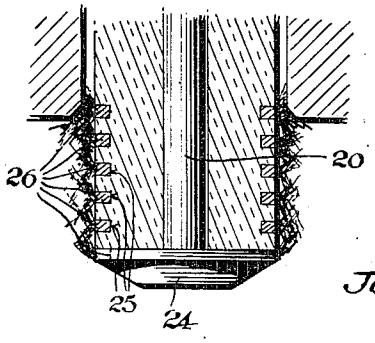


Fig. 3.



WITNESSES

R. E. Rousseau

E. L. Ames

INVENTOR

Joseph S. Solomon,

BY Munn & Co.

ATTORNEYS

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UNITED STATES PATENT OFFICE.

JOSEPH SIMON SOLOMON, OF EVANSVILLE, INDIANA.

SPARK PLUG.

Application filed December 16, 1920. Serial No. 431,134.

To all whom it may concern:

Be it known that I, JOSEPH SIMON SOLOMON, a citizen of the United States, and a resident of Evansville, in the county of Vanderburgh and State of Indiana, have invented certain new and useful Improvements in Spark Plugs, of which the following is a specification.

My invention relates to spark plugs and a purpose of my invention is the provision of a spark plug comprising a plurality of electrodes permanently adjusted and arranged to provide a succession of spark gaps which function to intensify the spark in the aggregate and to prevent fouling of the plug.

I will describe one form of spark plug embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view showing in side elevation one form of spark plug embodying my invention.

Figure 2 is a vertical longitudinal sectional view of the spark plug shown in Figure 1.

Figure 3 is an enlarged detail view showing in vertical section the lower end of the spark plug in applied position within the head of an internal combustion engine.

Referring specifically to the drawings, my invention in its present embodiment consists of a standard form of sleeve S adapted to threadedly fit within the usual spark plug opening formed in the head of a cylinder, such sleeve being interiorly provided with an annular shoulder 15 against which rests the lower edge of a circular projection 16 formed intermediate the ends of an insulating tube T which extends through the sleeve in the manner shown in Figure 1. A gasket 17 is interposed between the lower edge of the projection 16 and the shoulder 15′. The normal diameter of the tube T is less than the internal diameter of the sleeve S, and after locking the tube in engaging position with respect to the shoulder 15, I provide the usual bushing B threadedly fitted within the upper end of the sleeve S and engageable with the upper edge of the projection 16, a gasket 19 being interposed between the two.

The tube T receives a stem 20, the upper end of the latter being provided with a binding nut 21, a washer 22 and a nut 23 interposed between the two and all coacting to sustain the stem in proper position within the tube and to provide the usual binding post for connecting the conductor to the spark plug. The lower end of the stem 20 is formed with a main electrode 24 which is of substantially disc formation and of substantially the same diameter as the end of the tube T. That portion of the tube T projecting beyond the lower end of the sleeve S is formed with a plurality of circular grooves 25 spaced apart at regular intervals from each other and from the main electrode 24. Within each groove is fitted a subsidiary electrode 26, I having shown in the present instance five grooves and five subsidiary electrodes, although it is to be understood that any number of grooves and electrodes may be provided. The arrangement of the electrodes 26 with respect to each other and to the main electrode 24 is such that an annular spark gap is provided between the electrodes, each gap being of uniform width throughout its circumference so as to provide a uniform resistance between the electrodes. As shown in Figures 2 and 3, the uppermost electrode 26 is disposed adjacent the head of the cylinder so that the two coact to provide another air gap across which the spark is adapted to jump.

From the foregoing arrangement of electrodes, it will be clear that a circuit is established which may be chased as follows: from the stem 20 downwardly to and through the main electrode 24, through the several subsidiary electrodes 26 and finally through the sleeve S to ground. From this circuit it will be seen that the current is caused to successively jump the gaps between the electrodes 24 and 26 of the sleeve S, and that the current in jumping these gaps generates a plurality of circular sparks which increase in intensity from the lowermost gap to the uppermost gap.

In the manufacture of the spark plug, the several subsidiary electrodes 26 are spaced a predetermined distance from each other, and after this adjustment has been once made it is always maintained irrespective of the rough usage to which the plug may be subsequently subjected. Because of the circular sparks occurring between any two adjacent electrodes, it will be manifest that the accumulation of carbon between the electrodes is prevented, and that should carbon accumulate between the uppermost electrode 26 and the lower end of

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the sleeve S, this short circuiting of this particular electrode will not prevent the operation of the other electrodes.

Although I have herein shown and described only one form of spark plug embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

What I claim is:

1. A spark plug comprising a metallic sleeve, having an annular shoulder extending inwardly from the inner wall thereof at an appreciable distance from the lower end, a tube of insulating material embraced by the portion of the sleeve located above the said shoulder and having the lower portion thereof spaced from the confronting portion of the inner wall of the metallic sleeve in such manner as to provide an annular air gap extending for an appreciable distance from the lower end of the metallic sleeve, said tube being of sufficient length to depend below the lower end of the sleeve, a stem extending through the tube, means at the upper end of the stem for sustaining the stem within the tube, a main electrode secured to the lower end of the stem, and a plurality of auxiliary electrodes seated within the periphery of the depending end of the tube, the auxiliary electrodes being spaced apart from one another and from the main electrodes by integral portions of the insulating tube, with the uppermost auxiliary electrode arranged in spaced relation to the lower end of said sleeve to provide a spark gap and with the peripheral face of each auxiliary electrode flush with the peripheral faces of the adjacent portions of the insulating tube.

2. A spark plug comprising a metallic sleeve, a tube of insulating material extending through the bore of the sleeve and having its lower end projected beyond the lower end of the sleeve, said tube being formed with the lower end portion thereof smaller diametrically than the inner diameter of the lower portion of the sleeve and being spaced from the latter to provide an annular air gap extending for an appreciable distance from the lower end of the metallic sleeve, a stem extending through the tube, means at the upper end of the stem for sustaining the latter within the tube, a main electrode secured to the lower end of the stem, and a plurality of auxiliary electrodes seated within the periphery of the projecting end of the tube and being spaced from one another by integral portions of the insulating tube, the uppermost auxiliary electrode being spaced from the lower end of the metallic sleeve to provide a spark gap therebetween, and the peripheral faces of the auxiliary electrodes being flush with the peripheral faces of the spacing portions of the insulating tube.

JOSEPH SIMON SOLOMON.