April 12, 1932. J. M. LEE 1,853,129

SPARK PLUG

Filed March 6, 1930

Fig. 1.

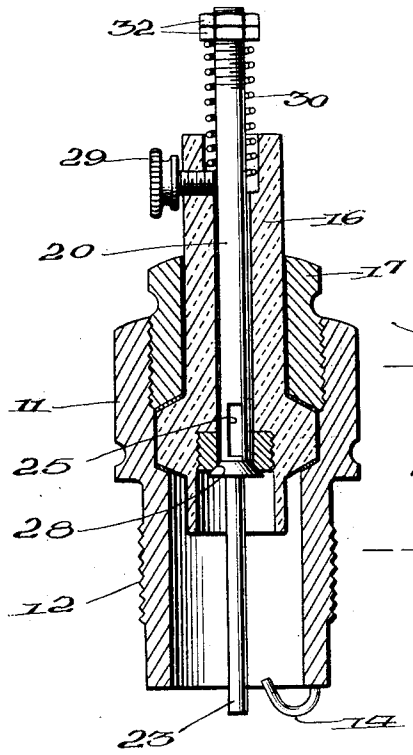


Fig. 2.

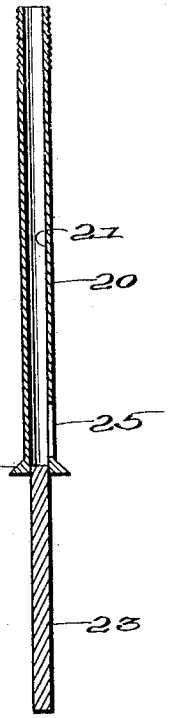


Fig. 4.

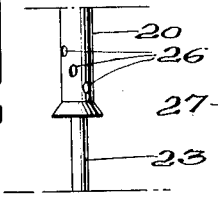
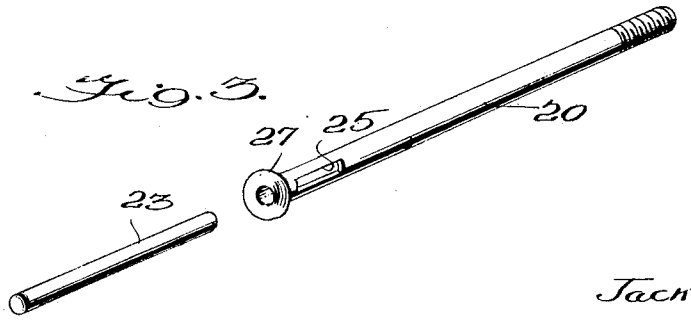


Fig. 3.



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UNITED STATES PATENT OFFICE

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SPARK PLUG

Application filed March 6, 1930. Serial No. 433,661.

The present invention relates to spark plugs, and especially to the type of plug provided with a central movable electrode arranged to supply air to the internal combustion engine cylinder in connection with which such spark plug is used.

The principal object of the invention is to provide such a plug that is constructed to vary the intake of air into the cylinder through the plug directly as the suction or negative pressure within the cylinder.

Accordingly, the invention includes a movable center electrode which operates not only as an air valve, but which, by the extent of its movement, permits a greater or less amount of air to pass through it per unit time depending entirely on the requirements of and conditions in the individual cylinder with which the plug is used.

A preferred embodiment of the invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view through a spark plug embodying the present invention;

Fig. 2 is an axial sectional view through the center electrode of Fig. 1;

Fig. 3 is a perspective view of the electrode of Fig. 2; and

Fig. 4 is a fragmentary elevation showing the lower end of the electrode provided with a different form of opening.

Referring in detail to the accompanying drawings, a spark plug sleeve or casing 11 is threaded at 12 for engagement with the usual threaded opening in the cylinder of an internal combustion engine. At the lower edge of the sleeve 11 is provided an inwardly extending fixed spark terminal 14.

A porcelain insulator 16 is held in the sleeve 11 by a nut 17, which bears against a shoulder formed on the porcelain and forces the porcelain to seat tightly on an internal shoulder of the sleeve 11, suitable gaskets being provided between the contacting surfaces, if desired, in the usual manner.

In accordance with the present invention, a movable central electrode is provided, which is hollow, and which is provided with an opening or openings in its lower end, which end is drawn into the cylinder of a cooperating internal combustion engine at the moment of fuel intake. The greater the difference in pressure between the interior of the cylinder and the outside atmosphere, the more the central electrode will be drawn into the cylinder, with the result that the greater will be the effective air passage opening into the cylinder from the hollow electrode due to the uncovering of a greater area of its elongated opening as the electrode is drawn further into the cylinder.

In the present example of the invention, a central electrode 20 is formed with a central internal passage 21 extending throughout its length. This passage 21 is open to the atmosphere at its upper end, and is closed at its lower end, as viewed in the drawings, by a spark terminal 23, a portion of which lies in proximity to the fixed spark terminal 14.

An opening 25 is formed in the side wall of the tubular electrode 20, near the bottom thereof, whose effective area is at least equivalent to the effective cross-sectional area of the internal passage 21 of the electrode. Or, as shown in Fig. 4, a plurality of small openings 26 may be arranged spirally in the lower end of the hollow electrode 20.

At the bottom, referring to the position as shown in the drawings, the electrode 20 is flared outwardly in conical shape, as at 27, this conical portion being adapted to close against a correspondingly shaped conical seat 28 in the lower part of the porcelain 16.

A terminal post 29 is removably fixed in the porcelain 16 near the top thereof, and against this post bears the lower end of a coil spring 30 which encircles the movable elec-

trode 20, and thrusts at its upper end against one of a pair of lock nuts 32 threaded on the upper end of said electrode and thus forces the conical portion of the electrode normally into seating contact with the seat 28.

The movable electrode 20 fits nicely within the porcelain 16 for sliding, axially reciprocating movement therein, and is drawn more or less into a cooperating internal combustion engine cylinder depending on the amount of decrease in pressure in said cylinder at the moment of fuel intake, thus exposing more or less of the electrode opening 25 to the interior of the cylinder and thereby varying the effective cross-sectional area of the electrode air passage in accordance with the pressure conditions of the individual cylinder. The limits of variation, in the present embodiment, are zero when the electrode is in seating contact with the porcelain, and the full cross-sectional area of the passage 21 when the electrode 20 has been drawn far enough into the cylinder to uncover the entire opening 25.

Various changes may be made in the detailed construction above described by way of illustration without departing from the invention as defined by the following claims.

What is claimed is:

1. A spark plug including a fixed electrode and a tubular movable electrode provided with an elongated side opening, means normally urging said movable electrode into position to cover said opening, and the effective area of said opening increasing with increase of distance moved by said electrode away from said position.

2. A spark plug including a fixed electrode, an insulator, and a tubular electrode movable in said insulator, said tubular electrode having an opening in one end the effective area of which is constant, and having a side wall opening in its other end normally covered by said insulator and uncovered by movement of said tubular electrode, and whose uncovered area varies directly with the amount of such movement.

3. A spark plug including a fixed electrode, an insulator, a tubular electrode movable axially in said insulator, said tubular electrode having an opening in one end whose full area is constantly exposed and effective, and having an elongated side wall opening near its other end extending in the direction of the length of said electrode, and means normally urging said electrode into such position with respect to said insulator that said insulator covers the entire area of said side wall opening, said opening being uncovered by movement of said insulator away from said position by an amount, up to its full effective area, corresponding to the amount of such movement, the area of said side wall opening being the full equivalent of the internal cross-sectional area of said tubular electrode and also of the area of the opening hereinabove first mentioned.

4. A spark plug including a fixed electrode and a tubular movable electrode having a series of spirally arranged openings in its lower end, means normally urging said movable electrode into position to cover said openings, the effective area of said openings increasing with increase of distance moved by said electrode away from said position.

In testimony whereof I affix my signature.

JACK M. LEE.