Sept. 4, 1923. 1,467,137

E. T. CURRAN

SPARK PLUG

Filed April 20, 1921

Fig. 4

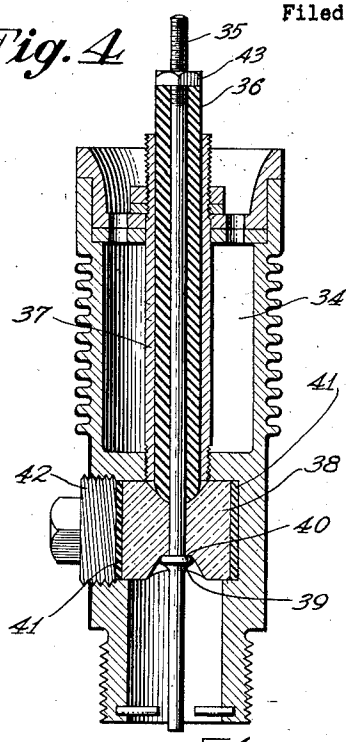


Fig. 2

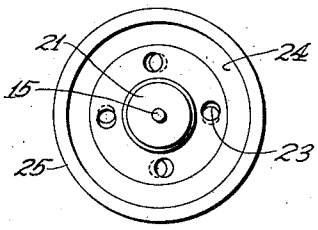


Fig. 3

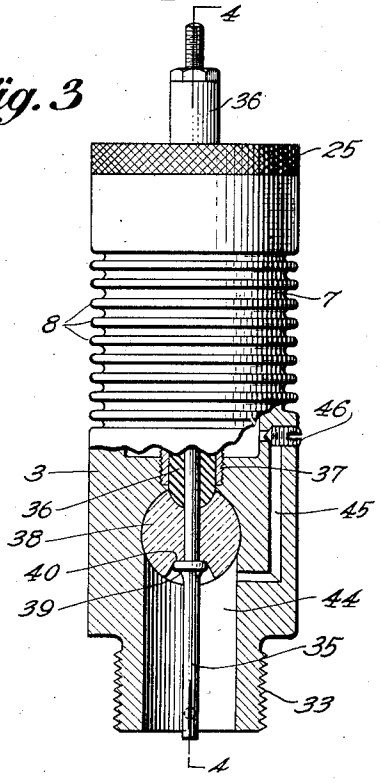
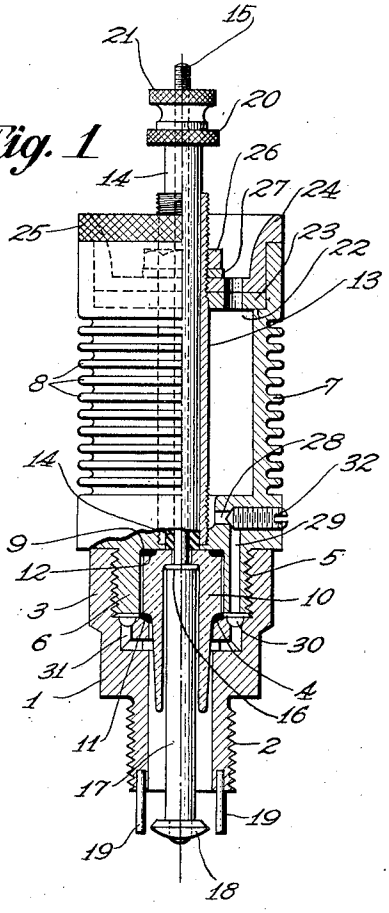


Fig. 1



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UNITED STATES PATENT OFFICE.

EDWARD T. CURRAN, OF DETROIT, MICHIGAN.

SPARK PLUG.

Application filed April 20, 1921. Serial No. 462,990.

To all whom it may concern:

Be it known that I, EDWARD T. CURRAN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Spark Plug, of which the following is a specification.

This invention is a spark plug and is intended to overcome the grounding of such plugs through the accumulation of soot or carbon deposits within the plug.

It is well known that after a spark plug has been used for a comparatively short time and particularly in an engine employing a rich mixture, that soot or carbon deposits within the plug short circuit the same and render it inoperative.

It has also long been known that the presence of water or steam within an engine cylinder will greatly minimize the carbon deposits by effecting a burning or combustion of such deposits, and it has been proven that if proper amounts of water or steam can be supplied within the cylinder such carbon deposits may be entirely avoided.

In the past numerous methods and mechanisms have been employed for the introduction of water into the cylinder, but the most practical way of doing this at the present time is to lead steam from the top of the radiator into the intake manifold of the engine. Some mechanics, however, prefer to introduce water from time to time through the pet cocks and other mechanics employ kerosene in the same manner.

When a spark plug accumulates a deposit of carbon or soot, it will not cease to function until the electrode, which supplies the current becomes grounded, but in the meantime, such deposit of carbon becomes heated through the burning of the gases in the cylinder to a point of incandescence and causes back firing and loss of power. The introduction of steam or water at intervals into the cylinder will, in a measure, keep the cylinder and piston head free from carbon, if such water or vapor be admitted in just the proper quantities. However, it is found in practice that while a cylinder and piston head may be kept reasonably free from carbon deposits that it is more difficult to keep the chamber within the plug free from such deposits, unless the steam is caused to circulate within the chamber in the plug and this is difficult to accomplish when the steam or water is fed directly into the cylinder.

With these considerations in mind, the object of the present invention is to provide a spark plug provided with a reservoir adapted to contain water which may be fed continuously or at intervals through the plug into the cylinder. Such construction will not only efficiently supply water to the cylinder, but will also serve to keep down the heat in the plug and by so doing minimize unequal expansion and contraction which in the plugs now in use, frequently occasions the breaking of the porcelain or mica insulation forming a part thereof.

Another advantage in forming the water feeding means as a part of the plug, is the elimination of twice necessitating piping installations in order to lead the steam from the radiator or water from a tank on the car. By simply screwing the plug of the present invention in the cylinder head of any car, all the advantages of water feed to the motor may be obtained without undue expense of the services of a skilled mechanic.

Features of the invention, other than those specified, will be apparent from the hereinafter detailed description and claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate different practical embodiments but the constructions therein shown are to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 illustrates a plug embodying the present invention in its preferred form.

Figure 2 is a top plan view of the plug shown in Figure 1.

Figure 3 illustrates a slightly modified form of plug, partly in section and partly in elevation, and,

Figure 4 is a section on the line 4—4 of Figure 3.

Referring to the drawings, and more particularly to the plug shown in Figures 1 and 2, 1 designates a shell provided at its lower end with a reduced exteriorly threaded portion 2 adapted to be screwed into a spark plug hole of the engine, by means of a wrench applied to the polygonal upper portion 3 of such shell. The shell 1 is tubular and it is provided interiorly with a

shoulder 4 intermediate its end, above which said shell is of enlarged interior diameter and is threaded at 5 to receive the reduced shank 6 of a container or reservoir 7. The shank 6 of the reservoir 7 is adapted to be screwed into the upper end of the shell 1 for the purpose of firmly and rigidly mounting the reservoir upon the shell.

The reservoir 7 is made hollow whereby it is adapted to contain water and its exterior is preferably provided with ribs 8 which serve to radiate the heat from the plug and maintain the plug relatively cool.

The shank 6 is made tubular and is provided interiorly of its base with a shoulder 9 opposed to the shoulder 4 of the shell, so that when these parts are secured together, the insulating member 10 of porcelain, mica or other suitable material may be clamped between the parts after the manner shown in Figure 1. Gaskets 11 and 12 are preferably employed in this connection to produce tight joints. Threaded into the base of the reservoir 7 is a tubular stem 13 within which is positioned a concentric tubular insulating bushing 14, which houses a portion of an electrode 15. The electrode 15 extends from a point above the top of the bushing 14 downwardly through said bushing and into the interior of the porcelain 10, wherein it is enlarged to rest against a gasket 16 seated on a shoulder within the porcelain. The enlarged portion 17 extends downwardly to a point slightly beyond the base of the plug and is preferably provided with a head or enlarged portion 18 positioned between fixed electrodes 19 mounted on the part 2 of the shell. The electrode 15 is clamped in position by screwing the nut 20 on to the upper end thereof and this nut 20 serves to tightly clamp the bushing 14 in place and serve as a seat for a binding nut 21 by means of which an ignition lead may be secured to the plug.

The upper portion of the reservoir 7 is provided with an interior shoulder 22 on which rests a perforated disc 23. A rotatable cap 24 seats on the disc 23 and is provided with a knurled surface 25 by means of which this cap may be manually rotated. The base of the cap is also perforated and by rotating said cap, the perforations thereof may be moved into and out of registration with the perforations of the discs 23 for the purpose of either sealing the top of the reservoir or unsealing the same. The top of the cap is preferably cup or funnel shape, so that when the perforations of the cap and disc are in alinement, water may be poured into the cup-shaped cap and thus fed into the interior of the reservoir. When the reservoir has been filled, the cap is rotated slightly to bring the perforations out of alinement and seal the reservoir.

The cap 24 is held in place by a nut 26 which is threaded on to the upper end of the tubular member 13 and bears against the washer 27 which seats in the base of the cap, all as clearly shown in Figure 1.

The water introduced in the manner described into the reservoir 7 is adapted to be fed either constantly or at desired intervals into the engine cylinder by means of passages from the interior of the reservoir to the interior of the chamber within the plug. To this end, the passage 28 leads to a passage 29, which extends downwardly through the threaded shank 6 and communicates with an annular channel 30 formed in the shoulder 4. From the channel 30, a plurality of passages 31 lead to the interior of the shell, so that water may flow through the channels and passages from the interior of the reservoir into the engine cylinder.

In order that this flow of water may be controlled, a set screw 32, shaped at its inner end after the manner of a needle valve, is threaded into the base of the reservoir in alinement with the channel 28 and may be regulated to control the flow in a manner which will be clearly understood.

While the regulation of the set screw 32 may be varied as particular car operators may desire, I recommend under ordinary running conditions that the screw be seated in such manner as to substantially seal the passages against the flow of water and that such screw be unseated from time to time to allow the entrance of water into the cylinder as the operator may deem desirable. However, no matter how tight this seat may be, there is apt to be a slight seepage so that at all times there will be minute quantities of water entering the plug. As the plug becomes more or less hot during the running of the engine, this leakage will be formed into steam so that steam will be continually present within the plug and the depositing of carbon therein will be precluded. However, when the screw is unseated at intervals to allow a greater amount of water to flow into the cylinder, sufficient steam will be generated to free the entire cylinder and piston head from carbon deposits. While the foregoing manner of manipulating the set screw is that recommended, I do not wish to limit the invention to this specific operation, as it may be varied without departing from the invention.

An important feature which is present, however, irrespective of the particular method of feeding the water is the fact that the water or steam is fed into the cylinder through the plug, and, accordingly, the plug will be kept clear at all times.

I have found in practice that another advantage of the invention inherent in the use of water in the plug is that the body of water in the reservoir serves to keep the plug relatively cool and by so doing precludes un-

equal expansion and contraction between the parts which would be apt to result in fracturing the insulating material. In practice, the plug keeps relatively cool at all times and the water in the reservoir is accordingly maintained in a liquid state and is not converted into steam as would be the case if the temperature of the plug were allowed to rise above the boiling point of the water.

In Figures 3 and 4 of the drawings, a slightly modified form of construction is illustrated. In this form of the invention, the reservoir is provided at its lower end with a reduced exteriorly threaded shank 33, which is adapted to be screwed directly into the cylinder head. The upper portion of the reservoir is formed with a chamber 34 adapted to contain water and the top of this chamber is closed by a perforated disc and capable of the same character as described with reference to Figure 1. The electrode 35 is housed within a bushing 36 which extends through a tubular member 37 in the same manner as hereinbefore described and said tubular member is threaded into the base of the reservoir at the bottom of the chamber 34.

The electrode 35 extends upwardly through an insulating member 38 and is provided with a shoulder 39, which comes to a seat in a recess 40 formed in the insulating member 38. In the construction shown, however, the insulating member is inserted from the side of the plug, and while it may partake of various shapes, it is shown as substantially cylindrical. The plug is provided with a complementarily shaped bore extending inwardly from one side thereof and a cylindrical insulating member is adapted to be inserted into this bore and clamped between gaskets 41 by a screw plug 42. In assembling the parts, the insulating member 38 is inserted before the bushing 36 and electrode 35 are brought into position and after this is accomplished a nut 43 is screwed on to the upper end of the electrode 35 to clamp the bushing 36 in position and screw the electrode in place. The lower end of the plug is provided with a chamber 44 which communicates with the interior of the cylinder and water from the reservoir chamber 34 is fed into the chamber 44 through the duct or passage 45 which is controlled by a set screw 46 in the same manner as the set screw 32 controls the flow of water in the construction of Figure 1.

The two plug construction hereinbefore described operates in substantially the same manner and both have been illustrated merely to show that the invention is not restricted to specific details of construction, but that it is as broadly novel as is commensurate with the appended claims.

It will be understood that the invention is not limited to the illustrative structure herein described, but is as broadly novel as is commensurate with the appended claims. Moreover, the mode of operation herein described embodies a novel principle which I propose to protect by filing a method application thereon.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A spark plug embodying a hollow casing, an insulating element extending longitudinally through said casing and positioned substantially coaxial thereof to form an annular chamber adapted to contain water, a sleeve surrounding that portion of the insulating element which extends through the chamber to preclude the water within said chamber from contacting with the insulating element, and means for regulating the flow of water from the chamber into the interior of the engine cylinder with which the plug is associated.

2. A spark plug provided in the upper portion thereof with a reservoir adapted to contain liquid to be introduced into an associated cylinder through the plug, means for controlling the introduction of such liquid, a central electrode having an insulating member extending through the reservoir, and a metallic sleeve embracing that portion of the insulating member which extends through the reservoir for the purpose of protecting the same from contact with the liquid in the reservoir.

3. A spark plug embodying a reservoir adapted to contain liquid, means for controlling the flow of such liquid through the plug into an associated cylinder, an electrode positioned substantially coaxial of the plug, an insulating member enclosing that portion of the electrode which passes through the reservoir, and means embracing the portion of the insulating member which passes through the reservoir to preclude contact of the liquid in the reservoir with said insulating member.

4. A spark plug provided with a reservoir adapted to contain liquid to be introduced through the spark plug into an associated cylinder and a porcelain core passing through the reservoir and protected from contact with the liquid contained in the reservoir.

In testimony whereof, I have signed the foregoing specification.

EDWARD T. CURRAN.