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SPARK PLUG CLEANING DEVICE

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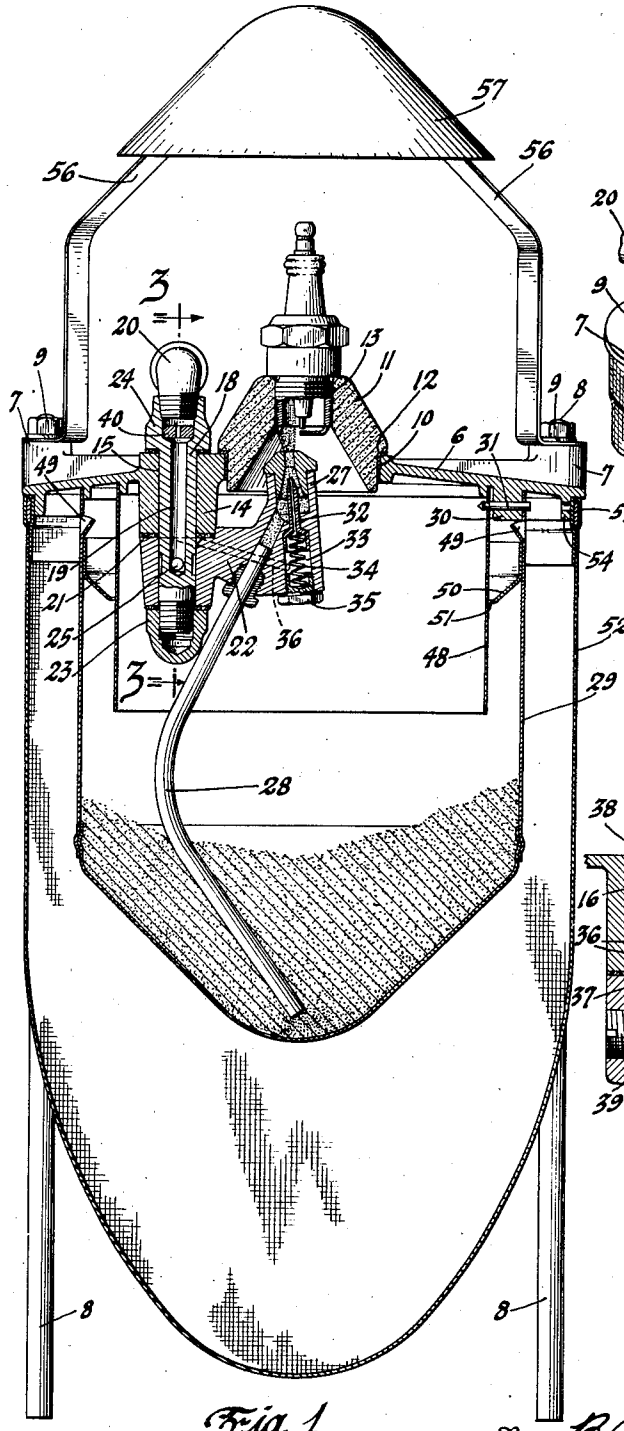


Fig. 1

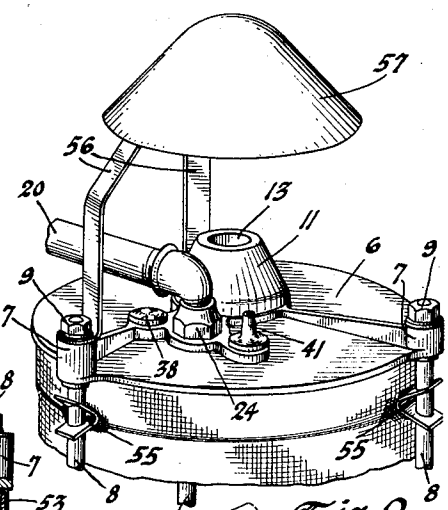


Fig. 2

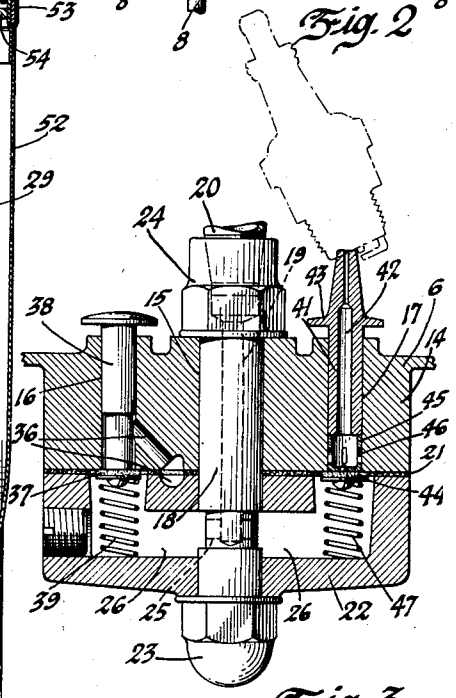


Fig. 3

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SPARK PLUG CLEANING DEVICE

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9 Claims. (Cl. 51—8)

Our invention relates to spark plug cleaning devices which operate upon the sand blast principle, and wherein a stream of air under pressure is employed to entrain sand or an equivalent abrasive and project the same against the inner end of a spark plug to be cleaned; whereby the soot, hard deposit of encrusted carbon due to an excess of oil which is not completely burned, or other substance which tends to short circuit the plug electrodes or otherwise interfere with its proper operation, is removed and the plug restored to a condition which will permit its further use.

The objects of our invention are to provide an improved spark plug cleaner for the purpose stated wherein the exposed inner end of the insulating member of the plug will be subjected to little or no injury by abrasive action of the sand or like abrasive; to provide such a device wherein a more effective separation of worn out particles of abrasive, and of dust due to disintegration thereof, will be secured than in similar devices heretofore in use, and the abrasive thus kept sharp and uncontaminated with particles which are not effective for cleaning purposes; to provide in such a cleaning device means for discharging a stream of air unmixed with abrasive against the part of the plug to be cleaned, either before cleaning the same by the abrasive material to remove oil and loose material and thus avoid contamination of the abrasive by material which may be blown away by an air jet, or after the cleaning operation performed by the jet of mixed air and abrasive to thereby remove residual particles of abrasive material from the interior of the plug; and to otherwise and as will hereinafter appear improve upon spark plug cleaning devices wherein the sand blast principle is made use of to effect the cleaning of the plug.

In cleaning carbon or like deposits from the inner exposed ends of spark plugs it is of the greatest importance to prevent the parts of the plug upon which the abrasive material impinges from being injured by the abrasive, this being particularly important in plugs wherein the insulating member is of porcelain, and wherein the inner extremity thereof is unglazed, or is provided with comparatively sharp ridges surrounding the inner insulated electrode. In sand blast cleaning devices of the type heretofore commonly used the jet of mixed air and abrasive has usually been discharged in a direction substantially parallel with the axis of the plug, and against the inner end of the insulator thereof, with consequent injury to such inner end by the abrasive material employed; whereas in our device the nozzle through which the stream is projected is arranged inclined relative to the axis of the plug so that the jet misses the extremity of the insulator and passes into the hollow part of the plug along and about parallel with the surface of the insulator to be cleaned, thus avoiding injury thereto. At the same time and because of such inclination the jet engages the interior of the steel shell of the plug, which because of its hardness will not be injured by the abrasive at an angle instead of flowing approximately parallel therewith; whereby a more effective scouring action upon the interior of the shell, which is the part most difficult to clean, will be secured.

The drawing accompanying and forming a part of this specification illustrates the preferred embodiment of our invention; although the same may be embodied in other forms, and we regard our invention as including such variations and modifications of the particular form thereof illustrated and described as come within the scope of the concluding claims, wherein the particular features which constitute our invention are particularly pointed out.

In the drawing:

Figure 1 is a view showing our invention in section upon a vertical centrally located plane.

Figure 2 is a view showing the upper end of our invention in perspective.

Figure 3 is a fragmentary view showing a section upon a vertical plane indicated by the line 3—3, Figure 1.

Referring now to the drawing, the numeral 6 designates an elevated head or support having spaced bosses 7 which receive the upper ends of legs 8 which support the device as a whole, the upper ends of these being shouldered and threaded to receive nuts 9 which hold the legs and support together; and this support has a central opening 10 circular in form and within which a conical plug supporting member 11 is freely rotatable. This plug support is made, preferably, of rubber of somewhat soft texture, and is ordinarily provided with an annular flanged ring 12 at its lower end so as to secure a metal to metal bearing between its lower end and the support 6 and provide an arrangement whereby the plug support may be freely rotated by the operator during the cleaning of a plug. This plug support is provided with a central hole 13 to receive the threaded end of a spark plug, as shown, and a number of plug supports will ordinarily be supplied with each

cleaning device all adapted to fit within the opening 10, but having different sized plug receiving holes 13, so that plugs the threaded portions of which are of different diameters may be cleaned. The underside of the plug support is recessed, conically, as shown, so that the sand blast nozzle occupies a position close to the lower end of the plug being cleaned and the jet of air and abrasive issuing therefrom is confined to the interior conical part of the plug support which, as stated, being of a comparatively soft rubber composition, is but little affected by the abrasive action of the jet.

The head 6 is provided with a boss or ridge 14 depending somewhat from the underside of the head so that a flat lower face may be conveniently machined thereupon and through which three vertical passages 15, 16, and 17 extend; and extending through the central one 15 of these passages is an air supply member 18 having an air passage 19 with which a pipe 20 leading from a suitable source of air under pressure communicates. Arranged below the ridge 14 with a gasket 21 between the two to secure air tightness is a combined air chamber and nozzle member 22; and the air supply member 18 is prolonged below the boss 14 and extends through a hole in the member 22 (see Figure 1) and is threaded and has a nut 23 at its lower end, and a shoulder 24 at its upper end, whereby the nozzle and air chamber member is held in engagement with the underside of the ridge 14, as will be understood. The air supply member 18 has holes 25, and an external annular recess, whereby air can flow from the passage 19 into an interior air chamber 26 of the member 22 whatever may be the angular position of the air supply member and conduit 20 through which air under pressure is supplied to the device.

The valve chamber and nozzle member 22 has a nozzle 27 the axis of which is arranged inclined relative to that of the plug being cleaned, as shown in Figure 1; and sand or other abrasive material is supplied to this jet through a supply pipe 28 extending to near the bottom of an abrasive material hopper 29 which is supported beneath the support 6 by lugs 30 and pins 31 extending through holes therein, three or more of such lugs being spaced about the underside of said support.

The valve chamber and nozzle member 22 has an air jet tube 32 arranged within the nozzle 27 and held in place in a passage 33 thereof by a spring 34 and threaded plug 35; and air is supplied from the chamber 26 in said member 22 to the passage 33 and to the nozzle through a passage 36 formed partly in the boss 14 and partly in the member 22 (the two parts registering with one another as shown in Figure 3), said passage being controlled by a valve 37 carried by a stem 38 which reciprocates in the passage 16 aforesaid in the boss 14, said valve seating upward against a seat on the underside of said boss and being kept normally closed by a spring 39. When the valve 37 is opened by depressing its stem 38 air under pressure flows from the chamber 26 through the passage 36 and to the nozzle 27, and abrasive material which reaches the nozzle through the pipe 28 is projected against the lower end of a plug to be cleaned as illustrated in Figure 1.

Arranged in the air supply passage and preferably within the upper end of the air supply member 18 so that access may be had thereto by removing the air supply pipe 20 is a restriction plug or disc 40 having a restricted passage therethrough. The purpose of this plug is to regulate and predetermine the pressure of air at the nozzle 27 relative to available sources of compressed air under different pressures. For example, if air under a pressure of 100 lbs. per square inch is available where the device is to be used a restriction plug having a predetermined size of orifice will insure the proper (also predetermined) pressure at the nozzle; whereas if the pressure available is greater a plug having a smaller orifice will be necessary, and if less one having a larger passage, in order that the air pressure at the nozzle may be that found to result in the most effective and efficient operation of the device. Several calibrated and marked restriction plugs will be furnished with each device, or will be available, so that a purchaser may use the particular one which, with the air supply available at his place of business, will result in the proper pressure at the nozzle of the device purchased by him.

Arranged in the passage 17 aforesaid is a plunger 41 having a central air passage 42, and the upper end of which plunger forms a nozzle through which air alone and unmixed with abrasive material may be discharged. This plunger has a flange 43 which may be pressed upon by the fingers to force said plunger down; and 44 is a valve seating upward against the underside of the boss 14 and having a hollow guide 45, with holes 46 therein. The valve is forced upward by a spring 47 wherefore, and upon the plunger 41 being depressed by hand, or by pressing a spark plug against its upper end, the valve 44 will be forced open and a jet of air unmixed with abrasive will be discharged against the plug. This may be done before cleaning the plug to remove liquid or loosely adherent matter, which otherwise would become mixed with the abrasive and contaminate it; or it may be done after the plug has been cleaned by the blast from the nozzle to remove residual abrasive material from the interior of the plug.

Surrounding the nozzle 27 and the air supplying means therefor and located within the upper part of the abrasive material receptacle 29 is a cylindrical baffle member 48 supported, preferably, by the same pins 31 which support the abrasive material receptacle; and which baffle intercepts the heavier particles of abrasive material and returns them to the receptacle 29. Lighter particles, however, resulting from disintegration of the abrasive material and such material as is removed from the plug, are carried upward about the baffle and escape from the receptacle 29 through openings 49 in its upper end; a ring member 50 supported inside the receptacle, and arranged with its inner edge close to the baffle wall so as to provide a narrow annular passage at 51, being preferably provided to control the flow of air and prevent eddy currents and surges therein when the device is in use.

Obviously the air which is discharged from the nozzle 27 flows through the passage 51 and out through the openings 49, and obviously this air carries with it a certain amount of dust; and in order to separate the dust from the air a dust intercepting and collecting bag 52, like those used with household and like vacuum cleaners, surrounds the receptacle 29. The upper end of this bag is folded inward over a ring 53 which fits closely about a flange 54 depending from the underside of the support 6; and supports 55 carried by the legs 8 press inward against the bag

and beneath the ring to support the bag from the head.

Extending upward from the head 6 are legs 56 fastened at their lower ends by certain of the nuts 9, and which support a hood 57 at their upper ends the purpose of which is to prevent the sand or equivalent abrasive from being blown into the surrounding atmosphere if the valve 37 is accidentally opened when there is no plug in the opening 13 of the plug supporting member 11.

Having thus described our invention and explained the operation thereof we claim and desire to secure by Letters Patent:

1. In a spark plug cleaning device, an elevated head, and legs whereby the same is supported, said head having a central opening adapted to receive a spark plug supporting member; an abrasive material receptacle supported from and located beneath said head, and having openings at its upper end; a combined air chamber and nozzle member located within said receptacle and beneath said head, and having a nozzle arranged to discharge a jet of air and an abrasive against a spark plug to be cleaned, and an internal air chamber; means for supplying air under pressure to said air chamber; a valve for controlling the flow of air from said air chamber through a suitable passage and to said nozzle; an abrasive material supply pipe leading from near the bottom of said receptacle to said nozzle; and a dust collecting bag supported by and depending from said head and surrounding the abrasive material receptacle aforesaid.

2. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned, and a boss upon its underside and which boss has a flat lower face; an abrasive material receptacle located beneath said head; a combined air chamber and nozzle member having a flat face underlying the lower face of said boss, said member having also a nozzle arranged to discharge a jet of mixed air and abrasive material against a spark plug supported by said supporting means, and an internal air chamber; an air supply member extending through holes in said head and boss and combined air chamber and nozzle member whereby said last named member is fastened to said head, and which air supply member has a central passage through which air under pressure is supplied to the air chamber aforesaid; a valve for controlling the flow of air from said air chamber through a suitable passage and to said nozzle; and an abrasive material supply pipe leading from near the bottom of said receptacle to said nozzle.

3. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned, and a boss upon its underside and which boss has a flat lower face, said head and boss having three passages extending through them; an abrasive material receptacle located beneath said head; a combined air chamber and nozzle member having a flat face underlying the lower face of said boss, said member having also a nozzle arranged to discharge a jet of mixed air and abrasive material against a spark plug supported by said supporting means, and an internal air chamber; an air supply member extending through one of the passages aforesaid and through a hole in said combined air chamber and nozzle member whereby said last named member is fastened to said head, and which air supply member has a central passage through which air under pressure is supplied to the air chamber aforesaid; a reciprocating valve operating member operating in another of said passages, and having a valve for controlling the flow of air from said air chamber through a suitable passage and to said nozzle; an abrasive material supply pipe leading from near the bottom of said receptacle to said nozzle; a reciprocating plunger having an air passage extending longitudinally thereof operating in the third of the passages aforesaid; and a valve operable by said plunger for controlling the flow of air from said air chamber to and through the passage in said plunger.

4. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned, and a boss upon its underside and which boss has a flat lower face, said head and boss having three passages extending through them; an abrasive material receptacle located beneath said head; a combined air chamber and nozzle member having a flat face underlying the lower face of said boss, said member having also a nozzle arranged to discharge a jet of mixed air and abrasive material against a spark plug supported by said supporting means, and an internal air chamber; an air supply member extending through one of the passages aforesaid and through a hole in said combined air chamber and nozzle member whereby said last named member is fastened to said head, and which air supply member has a central passage through which air under pressure is supplied to the air chamber aforesaid; a reciprocating valve operating member operating in another of said passages, and having a valve for controlling the flow of air from said air chamber through a suitable passage and to said nozzle; an abrasive material supply pipe leading from near the bottom of said receptacle to said nozzle; a reciprocating plunger having an air passage extending longitudinally thereof operating in the third of the passages aforesaid; a valve operable by said plunger for controlling the flow of air from said air chamber to and through the passage in said plunger; a dust collecting bag supported by and depending from said head and surrounding the abrasive material receptacle aforesaid and which receptacle has openings adjacent its upper end through which air and dust may escape from the interior thereof; and legs depending from said head whereby the cleaning device is supported.

5. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned; a nozzle arranged to project a stream of mixed air and abrasive material against a spark plug supported by said supporting means; a pipe through which an abrasive material is supplied to said nozzle; a passage through which air under pressure is supplied to said nozzle; and a restriction plug arranged in said last mentioned air supply passage and having a permanently open and invariable restricted opening therethrough of less area than said passage.

6. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned, and a boss upon its underside and which boss has a flat lower face; a combined air chamber and nozzle member having a flat face underlying the lower face of said boss, said member having also a nozzle arranged to discharge a jet of mixed air and abrasive material against a spark plug supported by said supporting means, and an internal air chamber; an air supply member extending through holes in said head and boss and combined air chamber and nozzle member whereby said

last named member is fastened to said head, and which air supply member has a central passage through which air under pressure is supplied to the air chamber aforesaid, which passage is enlarged at its upper end; a restriction plug located in the enlarged upper end of said air supply passage and which plug has a passage therethrough of less area than said air passage; and an abrasive supply pipe leading from a source of abrasive material to said nozzle.

7. In a spark plug cleaning device, a head having means for supporting a spark plug to be cleaned; a nozzle arranged to project a stream of mixed air and abrasive material against a spark plug supported by said supporting means; a pipe through which an abrasive material is supplied to said nozzle; a passage through which air under pressure is supplied to said nozzle; a restriction plug arranged in said last mentioned air supply passage and having a permanently open and invariably restricted opening therethrough of less area than said passage; and a valve for controlling the flow of air under pressure through said last mentioned passage and to said nozzle.

8. In a spark plug cleaning device, an elevated head, and legs whereby said head is supported, said head having a central opening and means associated therewith for supporting a spark plug to be cleaned; an abrasive material receptacle supported from and located beneath said head and the lower end of which is conical in form; a nozzle arranged beneath said head and supported therefrom, and which nozzle is located above the level of abrasive material in said receptacle and adjacent a spark plug supported by said spark plug supporting means; an air supply conduit through which air under pressure is supplied to said nozzle; an abrasive material supply conduit leading from near the bottom of said abrasive receptacle to said nozzle; and a dust collecting bag supported by and depending from said head, and which bag surrounds said nozzle so as to arrest the flow of suspended dust particles to the surrounding atmosphere.

9. In a spark plug cleaning device, an elevated head, and legs whereby the same is supported, said head having a central opening adapted to receive a spark plug supporting member; an abrasive material receptacle supported from and located beneath said head and having openings through which air and entrained dust may flow; a nozzle supported by and located beneath said head and adjacent said spark plug supporting member and adapted to discharge a jet of air and abrasive material against a spark plug supported thereby; a conduit leading through said head and to said nozzle and through which air under pressure is supplied thereto; means for controlling the flow of air through said conduit and to said nozzle; an abrasive material supply pipe leading from near the bottom of said abrasive receptacle to said nozzle; a cylindrical baffle member supported from said head and which member surrounds said nozzle and is open at its lower end; and a dust collecting bag supported by and depending from said head, and which bag surrounds said baffle member and said nozzle.

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