United States Patent [19]

Fricke

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[54] **SPARK PLUG CLEANER**

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[52] **U.S. Cl.** ..... **51/9,** 51/8 SP
[51] **Int. Cl.** **B24c 3/34**
[58] **Field of Search** ..... 51/9, 8 SP

[56] **References Cited**

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Primary Examiner—Donald G. Kelly
Attorney, Agent, or Firm—Johnson, Dienner, Emrich & Wagner

[57] **ABSTRACT**

This invention provides a spark plug cleaner which is self-contained, portable, easy to operate, and provided with safety features both to the plug, the equipment itself, and to the operator. The device comprises a motor driven impeller with a charge of granular or crystalline abrasive, generally termed particulate. The device comprises a complete enclosure, the opening of which is interlocked with the electric circuit. Operation is also interlocked with the seating of a spark plug to be cleaned. The device is adapted for operating on various plugs interchangeable as to size, threads, etc. The cleaning cycle which is automatically terminated by depletion of the charge of particulate may be repeated by a simple operation of turning the device end over end through a complete rotation. The device is small enough and sufficiently self-contained to be conveniently carried in a tool kit.

18 Claims, 8 Drawing Figures

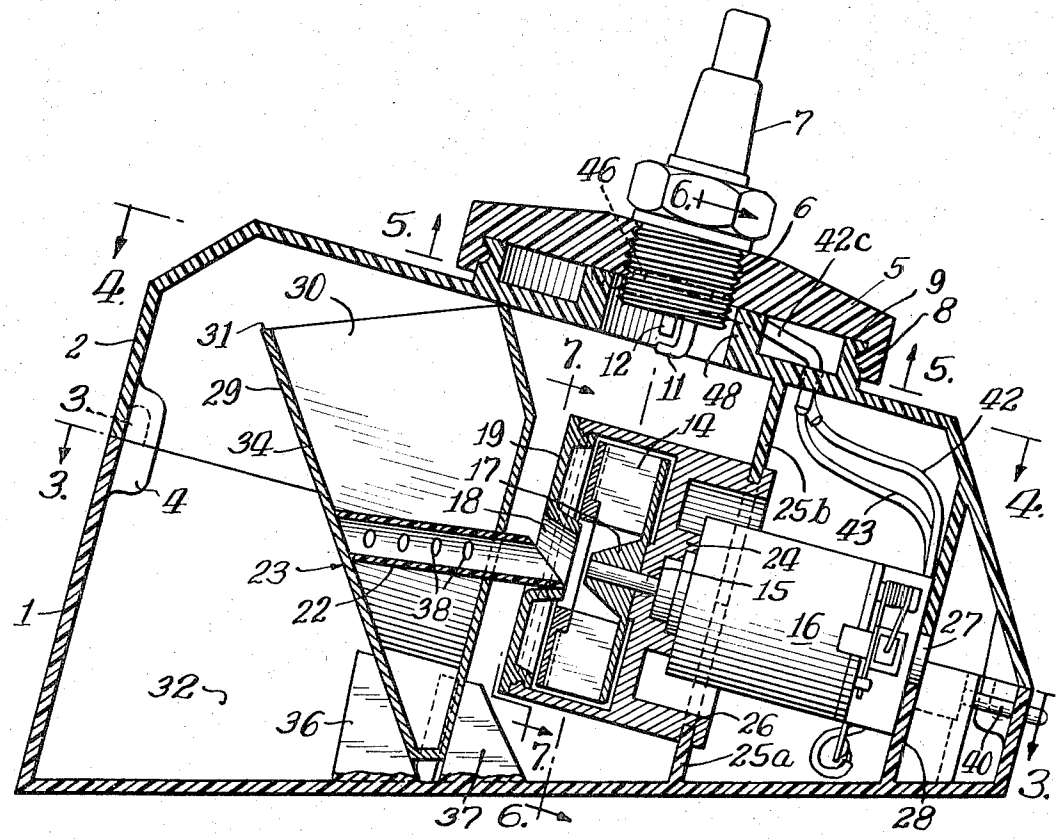


Fig. 1.

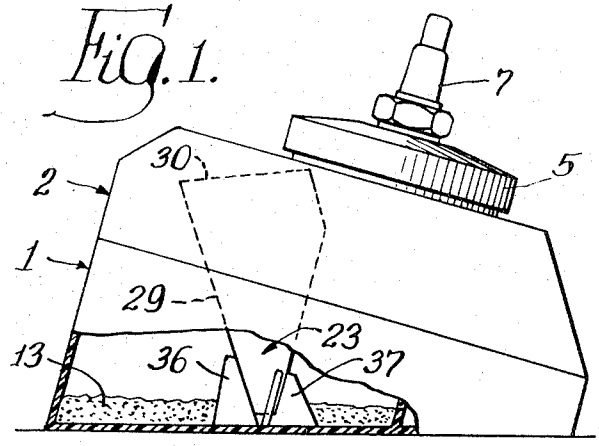


Fig. 2.

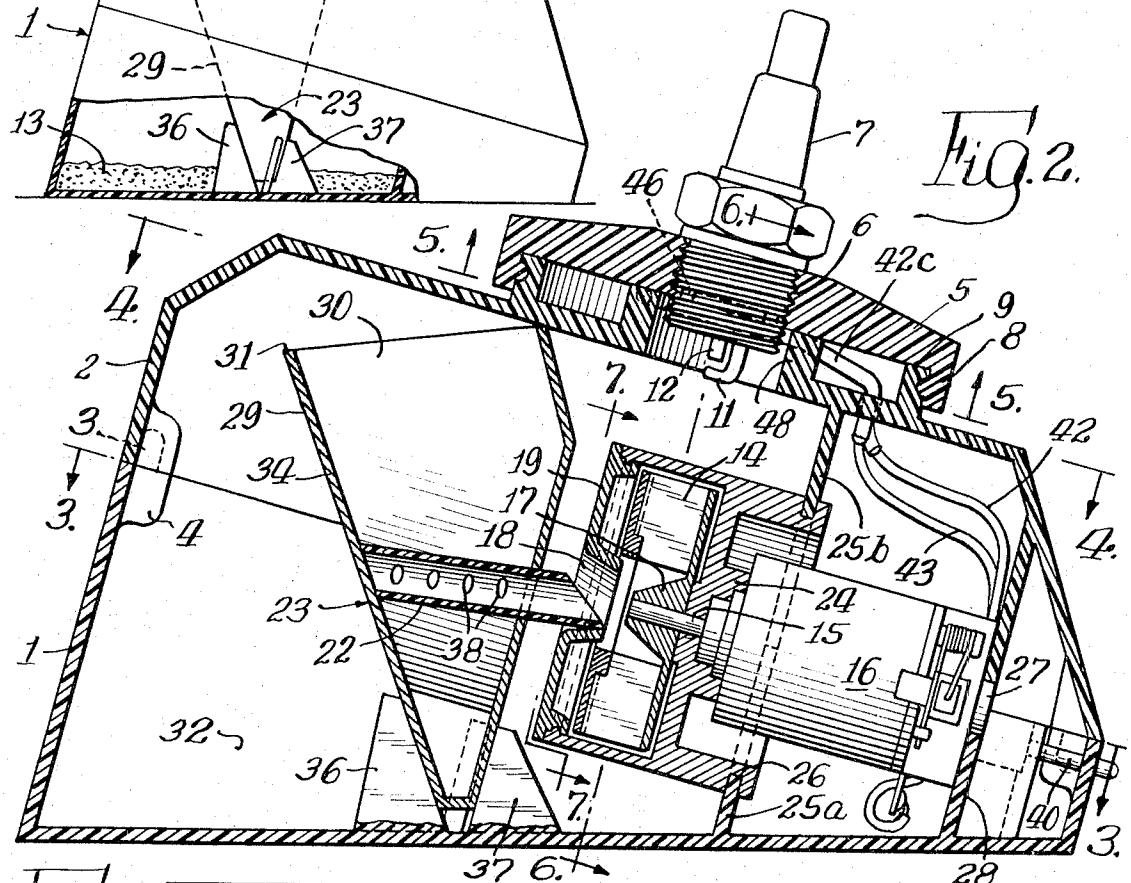


Fig. 3.

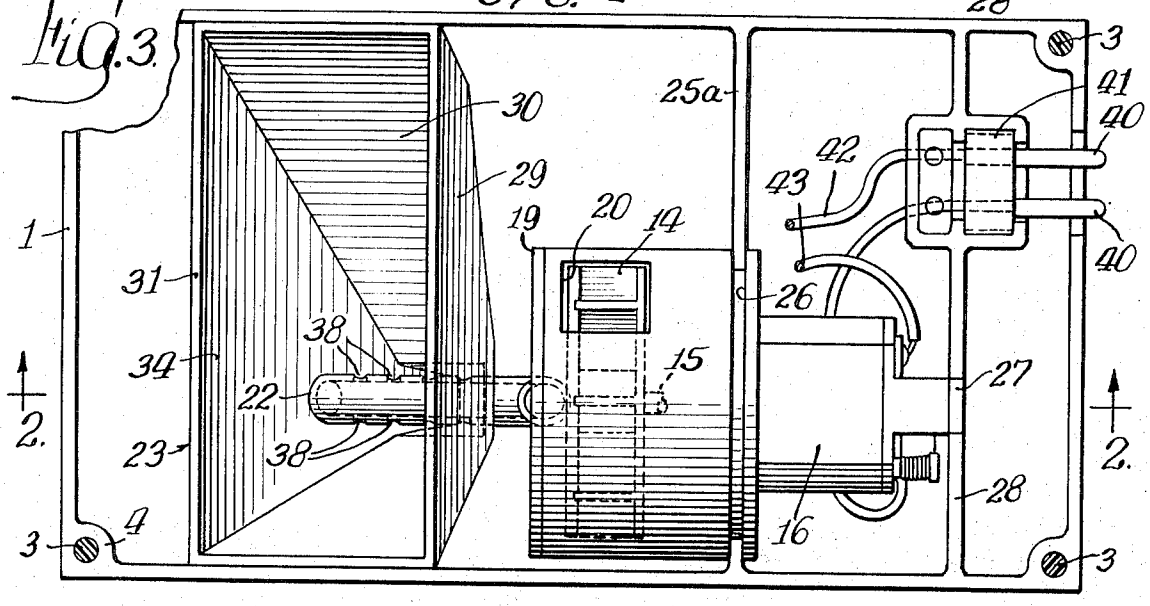


Fig. 4.

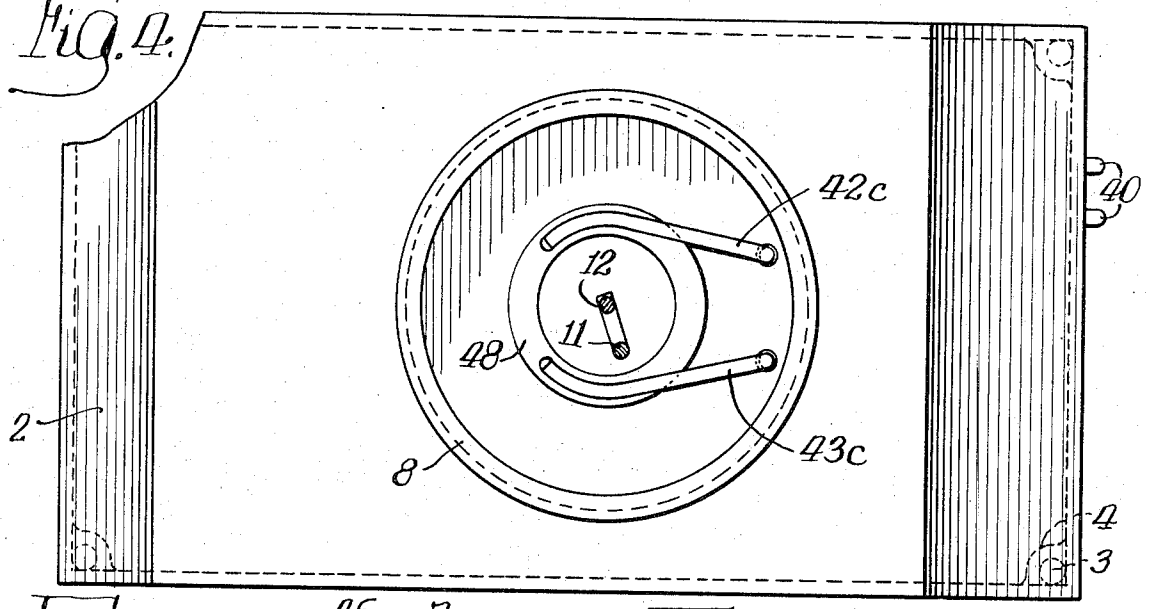


Fig. 6.

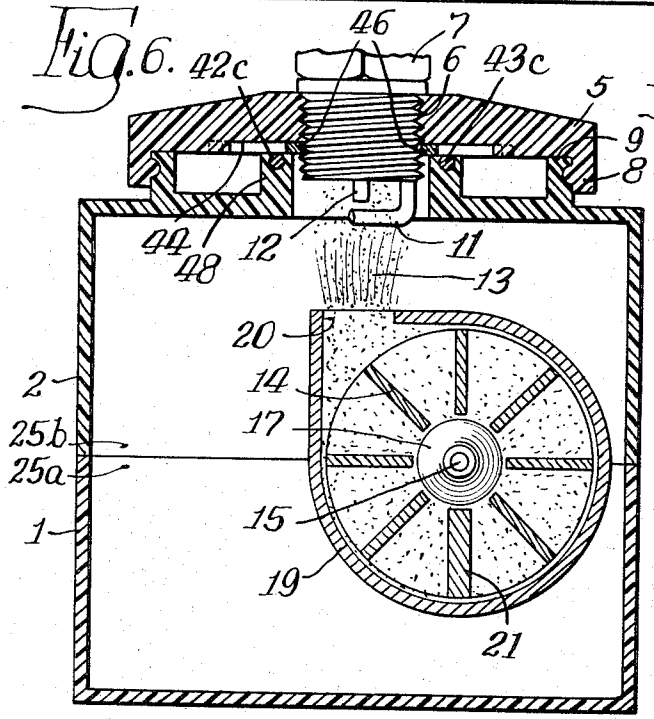


Fig. 5.

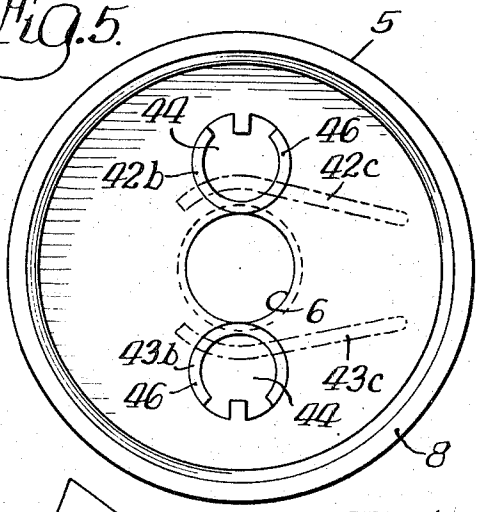


Fig. 7.

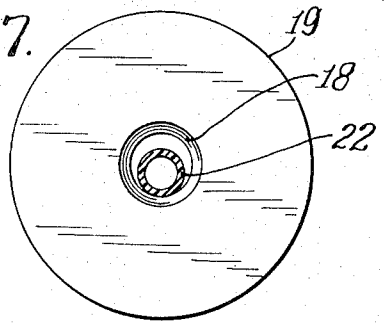
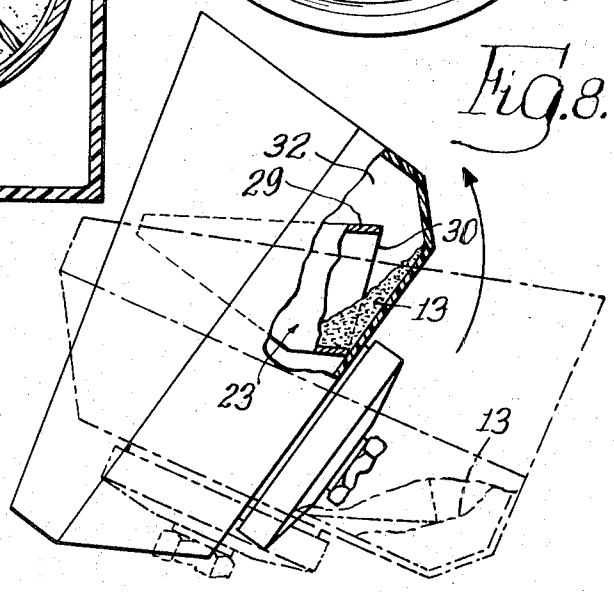


Fig. 8.



SPARK PLUG CLEANER

BACKGROUND OF THE INVENTION

In small high speed engines, and particularly in engines of the two-cycle type, compactness and high speed and power are qualities highly desirable for numerous types of driven loads such, for example, as outboard motors, mowers, motorcycles, snowmobiles, chain saws, and the like. Where internal lubrication is effected by adding lubricating oil to the fuel, fouling of the spark plugs is an inconvenience frequently difficult to meet. Also, in automotive practice, cleaning of spark plugs is frequently desirable. The most common form of cleaning equipment is means for driving a stream of particulate against the fouled end of the spark plug by a jet of compressed air. Such equipment is not portable and the solution of the problem is not satisfactory.

Prior art spark plug cleaners employing the particulate projected by a blast of compressed air are shown in prior U.S. Pat. Nos. 1,292,004; 1,475,992; and 3,604,156.

SUMMARY OF THE INVENTION

The device of the invention comprises a small casing in two parts with an opening for seating a plug to be cleaned in the wall of the casing which part forms the cover of the container as a whole. The motor driven particle projector is arranged to discharge particulate crystalline abrasive particles at high speed to impinge upon the fouled surfaces of the spark plug to be cleaned. A predetermined amount of the particulate is included in the closed casing. After it has been discharged by the rotary impeller against the facing spark plug to be cleaned, the plug may be removed and inspected without danger since the motor circuit is cut through the spark plug holder and is cut through the two parts of the casing so that removal of either the plug itself, or opening the casing, interrupts the driving circuit for the motor so that the operator may not inadvertently be injured by continued operation of the impeller driving the particulate at high speed in an uncontrolled manner. The safety features include a series switch in the motor circuit which is closed only when the two parts of the casing are brought together to complete the closure. An external cord with a standard two-prong or three-prong plug may be employed as a part of the complete equipment.

A member which constitutes the mounting of the spark plug in position to be impinged by the discharge of the impeller may serve as a switch under the control of the operator. A further safety feature resides in employing the metallic shell of the spark plug to constitute a switch member completing the circuit to the motor when the other series switches are closed. This avoids operation except as a spark plug is located on its seat.

The feed of the particulate from the hopper into the center of the rotor is through a generally horizontal duct from the lower part of the hopper into the central part of the impeller. This duct is substantially horizontal when the main casing is in horizontal position. In that position, the particulate will not by gravity alone drain through the feed tube in an uncontrolled manner, particularly when the impeller is not in operation or when it is in operation and the device is going through a normal cycle.

The feed tube is disposed at an angle to the horizontal less than the critical angle of the particulate. The feed tube has transverse vertically extending slots which allow the entry of particulate by gravity but allows no free flow through the tube by gravity alone. The short path through the side walls of the feed tube allows gravity passage from the hopper into the tube, but since the tube is at an angle less than the angle of repose of the particulate, free flow is inhibited and will occur only under the vibration of the impeller which may purposely be unbalanced in order to insure vibration. Switching off the motor may be accomplished either at the plug mount or by withdrawing the plug from its seat or opening the casing. Then the housing may be opened without danger of injury or loss of the particulate and the plug may be inspected. If further treatment is desired, the casing may be closed, the plug reintroduced into its seat, the particulate shifted, and the cycle repeated.

In the preferred form of the machine, interchangeable collars for different sizes and threads of plugs are provided for interchangeability of the equipment to be able to treat various plug constructions.

OBJECTS OF THE INVENTION

The chief object of the invention is to provide a compact inexpensive spark plug cleaning device which may be constructed to operate on electric current either from the storage battery of a vehicle or from the house current.

A further object of the invention is to provide such equipment as may be carried in the tool kit of the vehicle and be usable wherever current is available.

A further object is to provide such a device in a form and embodiment which is provided with adequate safety features for guarding the operator against injury or mischance.

A further object is to provide such a device as is highly efficient and effective.

A further object is to provide a device of this type which obtains its effect with minimum idle circulation of air and consequently operates at high efficiency.

A further object is the provision of a spark plug cleaning device which will operate with a wide range of particulate material, especially since such material is not dependent upon being propelled wholly or mainly by an air blast.

A further object is to provide a spark plug cleaner with an automatic feed control which insures optimum operation and guards against escape of the particulate without performing its function.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the unit on a reduced scale with parts broken away to reveal the disposition of the charge of particulate when the machine is not in operation;

FIG. 2 is a vertical longitudinal section taken on the line 2—2 of FIG. 3 looking in the direction of the arrows;

FIG. 3 is a top plan view of the unit with the top cover removed;

FIG. 4 is a top plan view of the cleaner with the spark plug carrier removed to illustrate the safety feature of cutting the motor circuit when the spark plug is not in place;

FIG. 5 is a plan view showing how the safety switch connection adapts for spark plugs of different size or threads;

FIG. 6 is a detail cross section of the device on the line 6—6 of FIG. 2 through the axis of the spark plug;

FIG. 7 is a cross sectional detail on the line 7—7 of FIG. 2 showing the feed tube leading into the inlet of the impeller; and

FIG. 8 is a diagram illustrating how the transfer of the particulate from the supply chamber onto the feed hopper is effected by turning the device end over end counterclockwise.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, the spark plug cleaner of this invention comprises a casing which is completely closed in normal operating condition. It consists of a lower body part 1 and a cover member 2 held together by registering pin and socket connectors 3, 4 as shown in FIGS. 2 and 3. A spark plug holder 5 of shallow inverted cup shape has a central opening 6 which optionally is threaded to receive a particular size and pitch of thread for a corresponding spark plug 7. For different sizes and threads of spark plugs, different carriers 5 may be provided. The cover 5 is mounted by its depending flange 8 upon an upstanding cylindrical flange 9 forming a part of the cover member 2 of the casing. The spark plug carrier 5 has radially inward projections in the form of curved spring contacts which may be pressed against the threads of the plug or, alternatively, tangentially disposed spring contacts may be bridged by the shell of the plug. The opening 6 which carries the threaded part of the spark plug 7 holds the plug electrodes 11, 12 in a position to receive the discharge of particulate cleaning material, indicated at 13 in FIG. 6, driven by rotary impeller 14 carried on the shaft 15 of the high speed electric motor 16. The impeller 14 is preferably constructed of a tough resilient synthetic material which will withstand the impingement of the abrasive particles which are driven at high speed against the working face of the spark plug to clean off accumulation of carbon from the electrodes 11, 12 and the adjacent metallic and ceramic surfaces of the spark plug of well known construction.

The impeller 14 has a hub 17 mounted on the end of the motor shaft 15. It preferably partakes of the form of what is known as a closed impeller in the pump and blower art. The impeller has an axial inlet opening 17 through its front disc, and particulate for projection against the spark plug electrodes enters the impeller through the inlet opening 18 in the impeller 19, said impeller casing 19 having a tangential discharge opening 20 for delivering the discharge of the impeller 14 in a straight line to the spark plug surfaces to be cleaned. For the purpose of producing the feed of particulate, as will be described later, the impeller is provided with an eccentric weight in the form of a blade 21 which is heavier than the other blades of the impeller for the purpose of providing an eccentric weight relative to the axis of the impeller and impeller shaft to produce a rapid vibration which is imparted to the feed tube 22 (FIGS. 2 and 3) and the hopper 23 which, at the beginning of a cleaning operation, contains a charge of particulate. The particulate is preferably a crystalline abrasive—natural or synthetic—like emery or metal carbide particles and of a degree of fineness which may readily be determined by the user for his particular purposes.

The field frame of the motor 16 and its shaft bearings are rigidly mounted in a central hollow barrel, which frame in turn carries the motor 16 as previously described. The particulate thrower and the motor as a unit are mounted in the split partition 25*a*, 25*b* which embraces the bottom of the groove 26 in said particulate thrower and motor casing. The rear hub 27 of the motor shaft 15 is embraced by the edges of a circular opening which is formed partly in the lower part of the partition 28 and partly in the upper part of the corresponding partition which is integral with the cover member 2. The motor is thus carried firmly at each end of its frame or housing and it carries the outer end of the shaft 15 and its impeller 14 in an outboard manner. The impeller casing is held in its angular position by the frictional grip of the groove 26 in the partition 25*a*, 25*b*. As will be seen from FIG. 6, the shaft 15 and its connected parts lie at one side of the casing 1, 2 in order to bring the tangential outlet 20 into alignment with the spark plug 7 as shown in FIG. 6.

The feed of particulate to the impeller is supplied from the hopper 23 which hopper is open at the top and closed at the bottom. The open mouth 30 (FIGS. 2 and 3) is disposed in a plane at an angle to the top wall of casing part 2 to permit ample opening between the inside wall of the cover member 2 and the rim 31 of the hopper 29 so that the charge of particulate which is shown at 13 in FIG. 8 has ample room to move from the particulate storage chamber 32 over the rim 31 of the hopper 29 when it is desired to transfer the charge of particulate from the storage space 32 to the inside of the hopper 30. This transfer is performed, as indicated in FIG. 8, by taking the device as a whole with the particulate in the storage chamber 32 and rotating the unit counterclockwise in the plane of the paper as indicated in FIG. 8 whereby the charge of particulate will be transferred from the storage space 32 to the inside of the hopper 29.

The hopper 29 has a front wall 34 which leaves at the top or rim ample room for the transfer of the particulate charge into the hopper. At its top the hopper 29 is wide enough to confine flow of particulate from the storage space into the interior of the hopper. The manner of performing this shifting of the particulate from the well or storage space 32 over and into the hopper 30 is illustrated in FIG. 8.

After the cleaning operation is completed by exhaustion of the supply in the hopper 30, the electric current is cut off externally. At that time the particulate will have dropped into the bottom of the lower casing section, particularly around the casing 19 of the impeller 14.

The hopper 29, which is shaped somewhat like an inverted irregular hollow pyramid, provides room on each side of the lower width of the hopper for the passage of particulate which has fallen into the central compartment containing the centrifugal particulate thrower 14. The collection of particulate in the lower part of the casing tends to flow toward the left in FIGS. 2 and 3 through the openings provided in the space between the lower tapered walls of the hopper 29 in the manner indicated in the bottom part of FIG. 1 of the drawings.

The lower end of the hopper 29, which is shaped like a truncated inverted pyramid, is seated in a socket formed by brackets 36, 37 as shown in FIGS. 1 and 2. The upper end of the hopper projects above the parting

line between the top cover portion 2 and the main body portion 1 of the casing.

For the beginning of an operation of cleaning a spark plug, the hopper 29 is substantially filled with the particulate; then with the spark plug in place, as shown in FIG. 2, the device is prepared for operation.

The problem of a suitable rate of feeding the particulate into the interior of the impeller 14 is solved by the feeding tube 24 which extends from inside the hopper 20 through the right hand wall of the hopper, as viewed in FIG. 2, and into the interior of the impeller casing and the central part of the impeller.

While the impeller 14 operates like a paddle wheel on the contained air, it is not the contained air in the blast of the impeller which is significant, it is the throwing of the particulate grains by impact of the impeller blades which imparts the necessary energy to chip the carbon deposit from the spark plug points and insulation.

The feeding means which comprises the hopper 29 and feed tube 22 has a unique structure and mode of operation. The feed tube 22 has a series of vertical oblong slots 38, 38 in each side, as illustrated in FIGS. 2 and 3. The feed tube itself is inclined at a low angle down towards and into the intake opening 18 of the housing.

Safety Features

While the device is totally enclosed in operating condition, it is undesirable to permit opening of the casing by separation of the casing parts or removal of the spark plug 7 while the impeller is blasting a stream of particulate material which would spray out through the sprak plug opening or to allow removal of the spark plug mount 5 while the device is in action. The electric circuit to the motor involves the stationary contacts 40, 40 which are set in a terminal block 41 at the right hand end of the casing below the plane of parting of the top and bottom housing parts. The conductors 42 and 43 which lead from the plug points 40, 40 are connected together to energize the motor 16 when the casing parts 1 and 2 are held together by the studs and sockets 3, 4 and while a spark plug is in the spark plug mount 5 and the said mount 5 covers and is attached to the annular mounting ring or flange 8 which is integral with the top housing part 2 and the mounting cap 5 for the spark plug 7 as viewed in FIGS. 2 and 6.

The underside of the cap 5 is shown in FIG. 5. The cap has a downwardly extending cylindrical flange 8 which has a bayonet joint connection with the annular flange 9 concentric with the opening 6 in which the spark plug is received. The cap has on its lower side bosses 44, 44 which receive spring wire contact rings 46, 46, in the shape of the major segment of a circle, adapted to engage the threads of a spark plug which may be introduced into the opening 6 by thrusting the same through the resilient resistance of said springs 46, 46 to make good electrical contact with said threads without requiring the turning of the spark plug on its threads. The springs 46, 46 are held on bosses 44, 44 which are formed on the underside of the spark plug holder 5. The upper part 2 of the casing has a cylindrical flange 48 surrounding the spark plug receiving opening, and it supports at diametrically opposite points the stationary springs 42*c*, 43*c* which are connected to the wires 42 and 43 respectively.

The above described construction is such that the plug supporting cap 5 carries a spring contact on each side of the spark plug receiving opening and these spring contacts 46, 46 are engaged by the metallic threads of the plug when the plug is inserted in the opening. While the plug is shown as threaded in the opening, it is not necessary that such threading be employed since the hole may be cylindrical, and in that case the plug may be pressed down between the spring contacts 46, 46 to make contact with them. The collar 48 has a seat for holding and exposing the two springs 42*c* and 43*c* which are connected to the circuit wires 43 and 42.

The result of this construction is that the safety spring rings 46, 46 on each side of the spark plug hole are arranged to press radially inwardly against the threads of the sprak plug shank to make electrical contact which may be broken by withdrawal of the plug. These spring contacts 43*c*, 43*c* are arranged in the stationary collar 48 and are exposed on its top surface to engage the spring contacts 46, 46 which in turn make contact with the plug threads as shown in FIG. 6. The cap or spark plug holder 5 is held to the cylindrical flange 8 by a bayonet joint connection indicated at 9 in FIG. 6.

The result of this construction is that the circuit of the motor may be broken by withdrawal of the spark plug which, upon leaving the contacts 46, 46 opens the circuit. Alternatively, the cap or holder 5 for the spark plug may be released at the bayonet joint and removed from the position shown in FIG. 6 to interrupt the circuit at contacts 46, 46. A series of spark plug holders or cap members 5 for different sizes and threads of spark plugs may be provided and may be used interchangeably as the situation requires.

For each different cap the spring contact rings which engage the threads of the plug will also make contact with the stationary contacts 46, 46 which are connected in the motor circuit.

Operation of the Device

A spark plug 7 to be cleaned is inserted in a cap 5 as shown in FIGS. 1 and 2. The casing being opened, a charge of particulate as indicated in FIG. 1 is deposited in the bottom of the lower part 1 of the casing.

If desired, the charge may be deposited inside of the hopper 29. With the charge of particulate in the hopper, the top cover part may be put in place by registering the pin and socket members 3, 4 which tend to hold the parts together by the friction of the holding means. The active part of the charge of particulate will be only that which lies above the openings 38 in the feeding duct 22.

This action is chiefly a throwing action and is not an air blast action. The space between the tangential delivery of the particulate from the impeller blade throughout the impingement area is advantageously short whereas if the particulate were to be carried by the stream of air, such close spacing would not necessarily be advantageous.

When the particulate in the hopper has been blasted the operator can determine from the sound of the device that the operation is completed. He may inspect the plug by releasing the cover or cap 5 from the annular flange 8 on the bayonet joint. This interrupts the motor circuit. The operation of the motor ceases as soon as the cap 5 has been rotated to take the spring

rings 43*b*, 42*b* out of contact with the stationary springs 43*c*, 42*c*.

If further blasting is desired, the operator replaces the cap and plug in the position shown in FIG. 2 and disconnects the circuit of the motor. Then since the particulate has all settled into the bottom of the lower half of the casing, as shown in FIG. 1, the operator rotates the device on a horizontal axis on a counterclockwise direction in the manner indicated in FIG. 8. This rotation causes the particulate to gravitate into the hopper. When the rotation through 360° has occurred, the particulate will have been transferred, at least in major part, from the position shown in FIG. 1 to a condition wherein an adequate charge of particulate is contained in the hopper. Thereupon the motor circuit may be closed and the blasting operation repeated.

I claim:

1. An enclosed spark plug cleaner comprising a closed main casing which includes a main body portion, a high speed motor and connected centrifugal particle projector in said main body portion, said projector comprising an impeller and an impeller housing having an axial inlet and a peripheral outlet, a hopper which opens upwardly for receipt of a charge of particulate cleaning material, and having a delivery outlet at its lower end communicating with the inlet of the impeller, a generally horizontally disposed feeder tube having inlet openings along its sides for a delivery of particulate material from the hopper through said openings into the tube, said tube leading into the central inlet of said impeller housing, said casing comprising a removable cover portion for said main body portion, said cover comprising a holder for the threaded end of a spark plug to hold the same with its open end in alignment with said impeller housing outlet.

2. The combination of claim **1** with a vertical wall between the motor and the blower casing separating the motor from the blower, the particulate discharged by the impeller gravitating into the bottom of the main casing outside the hopper.

3. The combination of claim **2** wherein the circuit for the motor contains separable contacts, said contacts being separable by removal of the spark plug from said cover.

4. The combination of claim **2** wherein there is a pair of cooperating contacts in the motor circuit separable by removal of the cover from the main body portion of the casing.

5. The combination of claim **2** with a removable spark plug receiving collar carried on the cover portion of the main casing, said collar having a socket for receiving the metallic threaded body of a spark plug and electric contacts carried by said collar and closeable by said metallic body of the spark plug carried in said collar, and said contacts being in series in the motor circuit.

6. In a device of the class described, an impeller housing having a tangential outlet and a central inlet with an impeller in said housing, an impeller shaft extending out through the center of said housing, there being a central inlet in said housing on the side opposite the impeller shaft, a hopper for particulate, an inclined inlet tube having its uppermost end closed, said tube being disposed in the lower part of the hopper and its lower end opening endwise into the central part of the impeller housing, and said tube having transverse openings extending through the sidewalls only of the tube said tube being mounted to extend downwardly from the hopper to the central inlet of the impeller housing.

7. In a spark plug cleaner, a casing, a blower in said casing, said blower having a rotatable impeller, an impeller housing having an axial inlet and substantially vertically disposed tangential outlet, means forming part of said casing for holding the threaded end of a spark plug in vertical alignment over said outlet, impeller having a central inlet registering with said axial inlet of the impeller housing, a wedge-shaped feed hopper open at the top and closed at its bottom, a feed tube disposed substantially horizontally lengthwise in the lower part of said hopper and extending substantially horizontally from the inside of the hopper to the inlet of the blower housing, said feed tube having its outer end substantially closed and having a plurality of substantially vertically extending slots through the side walls thereof, said feed tube opening into the housing inlet.

8. The combination with the elements of claim **7** of a high speed driving motor and a rotatable rotationally unbalanced mass connected to the motor and impeller for vibrating the hopper and feed tube to cause particulate material in the hopper to move through the slots in the feed tube and lengthwise of said tube.

9. In a device of the class described, a casing comprising cooperating top part and bottom part, a transverse wall in the casing formed partly in the top part and partly in the bottom part, dividing the casing into two compartments, a connected motor blower supported in said transverse wall, said motor blower comprising an electric motor disposed in the motor compartment and a directly connected centrifugal blower disposed in the second compartment said blower comprising a volute type impeller casing with an upwardly directed outlet and with an axially disposed inlet opening, a downwardly converging hopper having an outlet at its lower end connected to the inlet of the impeller casing, the top part of the casing having a socket for receiving the open end of a spark plug substantially vertically disposed over the outlet of the impeller casing.

10. The combination of claim **9** wherein the top part of the casing has a removable mounting member for receiving and holding the threaded end of a spark plug to be cleaned substantially coaxially over the discharge outlet of the blower.

11. The combination of claim **10** with a circuit for said electric motor and a series switch in said circuit controllable by angular motion of said movable mounting member.

12. In a device of the class described the combination of a closed main casing made of separable top part and bottom part, the top part having means for mounting a spark plug to be cleaned with its electrode exposed inside the casing, a rotary motor driven particle blower having an impeller and being supported in the bottom part of the casing said blower having an inlet opening facing horizontally, said impeller casing having an outlet directed at said electrodes to be cleaned and having an axial inlet and a tangential outlet, an electric motor in the casing for rotating said impeller, a feed hopper mounted inside the casing said hopper having an open top and extending from the lower part of the hopper which is adjacent to the impeller, a feed tube extending substantially horizontally from the inside of the hopper to the intake of the impeller, oblong transverse openings in the side of the feed tube forming slots for admit-

ting particulate into the bore of the tube, the vibration of the driven impeller causing the flow of particulate from said hopper through said slots and through the feed tube into the impeller inlet, the wall of the open upper end of the hopper adjacent the impeller being disposed adjacent the top wall of the casing and the top of the wall of the hopper remote from the impeller being spaced from the top wall of the casing whereby rotation of the closed casing on a horizontal axis transverse to the vertical plane of the axis of the impeller will cause shifting of contents of the casing from outside the hopper into the hopper.

13. In a spark plug cleaner, a normally closed main casing (1) providing a particulate supply chamber (32), means providing a particulate feeding hopper (29), said supply chamber and said hopper communicating at their upper ends with each other, said main casing (1) also containing an impeller casing (19) a particulate impeller (14) in ssid casing, said impeller casing containing a rotary particulate impeller (14) and having a particulate discharge outlet (20), said main casing containing a motor (16) for driving said impeller, said main casing having a spark plug holder (5) with a seat (6) for holding the open end of a spark plug in alignment with the said particulate discharge outlet (20), means (22) for conducting particulate from said particulate feeding hopper (23) to said impeller chamber (19), said particulate discharge outlet (20) being directed at the open end of a spark plug (7) mounted in said holder (5), the particulate projected against the spark plug falling to the bottom of the supply chamber there being an opening from below the impeller chamber to the lower end of the supply chamber whereby with the casing closed endwise tilting of the supply chamber downwardly causes the particulate to gravitate to the supply chamber and further rotation causes the particulate to gravitate from the upper end of the supply chamber into the feeding chamber.

14. The combination of claim 13 wherein the spark plug holder is mounted on the cover forming part of the main casing and is separable from the casing, and the motor circuit is cut through the connection of the cover to the casing.

15. The combination of claim 13 wherein the abrasive conducting means from the feeding chamber to the impeller housing comprises a laterally perforated tube which is inclined to the horizontal at an angle not substantially higher than the angle of repose of the abrasive.

16. The combination of claim 13 wherein the open top of the feeding hopper is below and open to the top part of the supply chamber which is closed, whereby inverting and then continuing and righting the cleaner as a whole serves to rotate the opening of the feeding hopper above and then below the top of the main chamber whereby to transfer abrasive from the main chamber to the feeding chamber.

17. In a device of the class described, an oblong two-part casing divided horizontally and having a spark plug holder and means for exposing the plug points downwardly inside the upper part of the casing, a rotary impeller for driving particulate upwardly against the exposed plug points, the axis of rotation of the impeller extending substantially horizontally longitudinally of the casing, a motor for driving said impeller, a partition in the casing for isolating the motor from the particulate, a hopper in the casing, said hopper having a duct for leading particulate from the hopper into the impeller, said hopper having a front wall adjacent the impeller in contact with the inside top wall of the casing and occupying substantially the full width of the upper part of the casing, the lower part of the hopper being relatively narrow to provide a passageway between the parts of the casing in front of the hopper and back of the hopper, a full rotation of the casing and its contents on a horizontal axis parallel to the plane of the impeller causing the loose contained particulate to enter the open top of the hopper and drop into position to feed the particulate to the impeller upon rotation of said impeller when said rotation of the casing and contained parts is completed.

18. In a spark plug cleaner, an impeller casing and a supporting frame, a rotatable shaft mounted on said frame, a rotary impeller on said shaft having blades for receiving and discharging particulate, said rotatable parts being unbalanced and producing vibration of the frame, a feed bin having a duct disposed partly in the lower part of the feed bin and extending downwardly at an angle less than the angle of repose of said particulate, from inside said bin to the inside of the impeller casing and being closed at its upper end and having transverse slots in its side walls inside the bin, said duct being responsive to said vibrations for feeding particulate to said impeller by gravity when said unbalanced parts are rotating and causing vibrations of said duct.

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