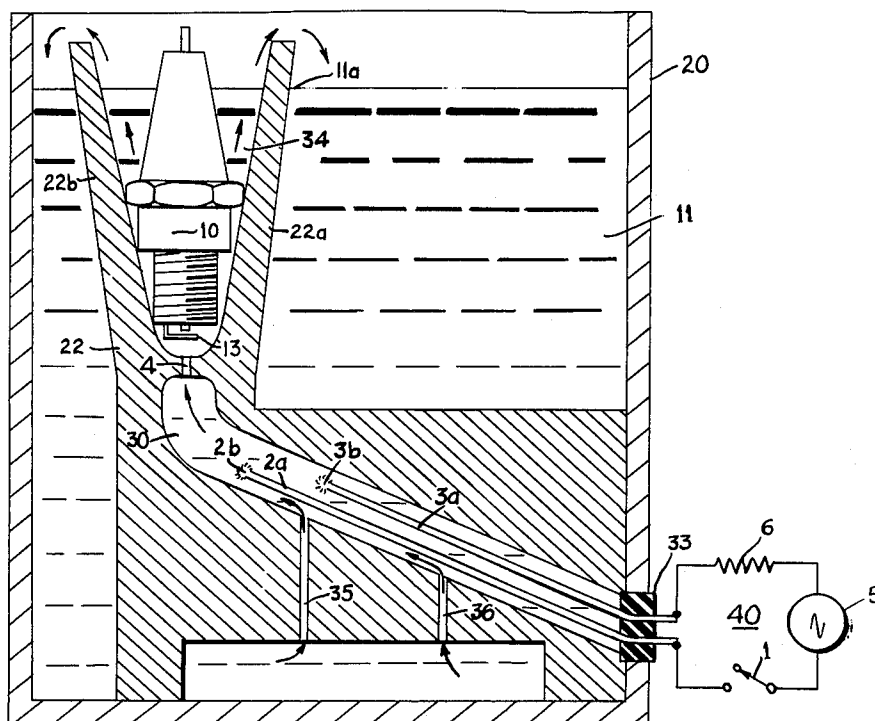


Feb. 8, 1966

E. C. OLSON  
METHOD OF CLEANING CARBON AND COMBUSTION  
DEPOSITS FROM SPARK PLUGS  
Filed Feb. 5, 1962

3,234,047



INVENTOR

Everette C. Olson

By *Anthony D. Cennamo*

ATTORNEY

1

3,234,047

## METHOD OF CLEANING CARBON AND COMBUSTION DEPOSITS FROM SPARK PLUGS

Everette C. Olson, 1482 College Hill Drive,  
Columbus 21, Ohio

Filed Feb. 5, 1962, Ser. No. 171,172

4 Claims. (Cl. 134-20)

This invention relates in general to cleaning devices and particularly to the method and apparatus for cleaning foreign deposits on metallic objects.

The present invention is of particular interest and finds unique utility in the cleaning of carbon and chamber combustion deposits from spark plugs. It is to be understood, however, the invention is not limited to specific workpiece or object to be cleaned and the deposits may have been made or produced naturally, accidentally, or intentionally. The word cleaning as used hereinafter is defined, therefore, as the act of removing adhering matter from an object without particular regard to the nature of the matter or the composition of the object. This will include the removal of dirt, scale, rust, oxides and deposits formed during chemical or physico-chemical actions.

The principal prior art method of cleaning spark plugs is by the sand blast method. The cleaning action is limited to brute force and in many respects the spark plug is in a worse condition after it is purportedly cleaned than before. The sand blast will not remove carbon formed in pits, clefts and crevices. Further, the sand deposits left on the plug may be as bad as the original carbon. Finally, the spark plug may be physically injured if the blast is not properly controlled, thereby, the sand blast method is limited to cleaning of the metal since the porcelain would easily be damaged.

In other prior systems for the cleaning of deposits from objects other than spark plugs there is the caustic or acid bath. More recently the more sophisticated systems include an ultrasonic generator to speed up the cleaning action. To enhance the utility of the ultrasonic devices, combination systems, including pressure and container arrangements, have been proposed. The ultrasonic systems, because of the size of the objects and the nature of the deposits, are not completely effective to the cleaning of many types of foreign deposits.

The present invention provides a new and improved cleaning method that finds special utility in the cleaning of gasoline combustion chamber deposits from the spark plug. More specifically, the invention generally comprises immersing the spark plug or object in a caustic bath, and applying an electrical current to the bath to impart a pulsating motion to the liquid. Also, the liquid becomes heated in the transformation and circulation. The pulsating movement of the heated liquid through and around the object to be cleaned is extremely effective in removing all the foreign deposits from the entire surface of the object.

Accordingly, it is a principal object of the present invention to provide a new and improved cleansing device for the removal of foreign matter from a workpiece.

It is another object of the present invention to provide a new and improved cleansing device that completely cleans the workpiece without damage thereto.

Another object of the present invention is to provide a new and improved cleansing device that employs a liquid bath having a pulsating circulatory motion imparted thereto.

Another object of the present invention is to provide a new and improved cleansing device that employs a liquid bath that is heated to enhance the cleaning action.

Still another object of the present invention is to provide a new and improved cleansing device that is rela-

2

tively simple in operation and does not require trained or skilled operators.

Finally, another object of the present invention is to provide a new and improved cleansing device that is comparatively inexpensive to manufacture and utilizes mostly conventional components.

Other objects and features of the present invention will become apparent from the following detailed description when taken in conjunction with the single figure drawing showing a preferred embodiment of the invention.

Referring to the drawing, there is illustrated a preferred embodiment of the present invention generally comprising a container 20 having a fixed support 22. This support further includes a combustion chamber 30 and a receptacle 34 therein for receiving the workpiece or object to be cleaned. Also within the container 20 is a caustic fluid 11 that is circulated through the combustion chamber 30, around the object 10 and then recycled. To cause the continuous circulatory movement of the fluid a means 49 is provided for interjecting an electrical current to the fluid in the chamber. This current, through violent chemical action, causes a pulsating wave to be imparted to the caustic fluid together with a heating action.

The pulsating and heating action on the fluid causes the fluid to circulate in a continuous motion around the object 10 to be cleaned. In this way the entire object 10 is cleaned—and if object 10 is a spark plug, the porcelain as well as the points will be cleaned. No damage to the object occurs and no foreign material is substituted for that removed.

Referring specifically to the drawing, container 20 may be of the polyethylene plastic or other plastic material; alternatively, container 20 may be of glass or of asphalt base. Within the container 20 is a caustic fluid, such as potassium hydroxide or sodium hydroxide, in a concentrated saturated alkaline solution. Within the container 20 and immersed in the caustic solution is the support piece 22. This support piece is preferably of ceramic but may be rubber or other material. In the upper portion of the support 22 there is a receptacle 34 for holding the object to be cleaned in the caustic solution. The size and shape of the receptacle is of course dependent upon the size, shape and number of objects to be cleaned at any given time. In the preferred embodiment of the figure a spark plug 10 is shown as the object to be cleaned. The receptacle 34 is therefore made of a general shape to support in an upright position the plug 10.

In the lowermost portion of the support 22 there is a combustion chamber 30. In this particular embodiment chamber 30 is elongated, i.e., having a greater diameter in its length than in its width. Communication between the chamber 30 and the receptacle 34 is maintained by the injection orifice 4. Other than the injection orifice 4, the chamber 30 has its ends sealed off. Also entering the chamber from a somewhat central area are fluid circulating tubes 35 and 36. It is understood, of course, the number, size, and position of these tubes may be a matter of choice so long as they provide sufficient recirculation of the fluid. Finally, at the lower end of the container 20 there is provided an orifice in intimate relation with the chamber 30. A seal or grommet 33 prevents the loss of fluid from the chamber. Entering the chamber 30 through the grommet 33 are a pair of electrodes 2a and 3a having their one end connected to power supply 40. In this embodiment the power supply simply comprises a voltage source 5, a dropping resistor 6, and an on-off switch 1. The other ends of the electrodes 2a and 3a are permitted to end freely within the chamber.

In the construction of the embodiment shown in the figure a wire having a standard number 18 gauge was

utilized as the electrodes 2a and 3a. Again these electrodes may comprise other sizes of wire either stranded or solid; or alternatively, the electrodes may be formed as part of the chamber 30. The electrodes 2a and 3a are conventionally covered with vinyl plastic and are of different lengths, the electrodes 2a having a greater length than that of 3a. The end 2b of electrode 2a and end 3b of electrode 3a are skinned back to allow an exposed area of the electrodes within the chamber 30. The position of the wires and particularly the position of the one exposed end to the other exposed end was found to be somewhat critical and must be corrected for uniform circulatory action as explained hereinafter. In this particular embodiment the one exposed end was approximately four inches from the other exposed end.

In operation of the cleansing device shown in the figure when the switch 1 is closed, a nonlinear electrical field is created at the exposed areas 2a and 3a of the two electrodes 2b and 3b. This electrical field causes a combustion in the caustic fluid surrounding the exposed areas 2a and 3a. The combustion in turn causes the fluid around the exposed areas to sputter and to become violently heated. When the fluid in this localized area arrives at a state where combustion can no longer occur, the combustible components in the fluid are consumed and the combustion ceases. The combustion, however, at this stage will have caused the fluid to become agitated and heated giving rise to a thermal current. This current in turn washes away the non-combustible fluid and introduces, through the closed fluid loop, cool caustic fluid. With the new fluid now surrounding the exposed areas, combustion again occurs. This cycle of combustion and non-combustion occurs repetitively thereby imparting a pulsating action to the fluid.

The caustic fluid being subjected to pulsating agitation in the combustion chamber is forced up through the injection orifice 4 into the object receptacle 34 over the walls 22a and 22b down the walls of the container 20 and then back into the combustion chamber 30 through tubes 35 and 36. The pulsating heated caustic fluid passes through the receptacle 34 and consequently forces its way into the pits, crevices and all areas small or large of the object 10 that may contain foreign matter that is desired to be removed. To assure circulatory movement of the fluid 11 in the direction toward the object 10, the orifice 4 is of greater diameter than the return orifices 35 and 36. Alternatively, it may be desired under certain conditions to incorporate a check valve to assure the movement of the fluid 11 in the proper direction.

The time required to clean the object is of course dependent upon the object and the accumulation of foreign deposits. In the cleaning of a single spark plug, it was found to be of the order of 3 to 5 minutes. It may be desired in certain instances to include a circulating water bath for removal of the caustic from the object and to rinse the object for handling.

Although there is described certain and specific illustrations of the invention, departures may be had thereto without departing from its true spirit and scope.

What is claimed is:

1. The method of cleaning carbon and combustion deposits from spark plugs comprising the steps of immersing the spark plug in a caustic fluid bath, supporting said plug in an upright position in said bath, confining a portion of said fluid to a given area in contiguous relation to said supported spark plug, applying an electrical voltage to said fluid in said given area to cause combustion therein and thereby impart a pulsating motion thereto and to heat the same, restricting the movement of said pulsating fluid to leave said given area in one direction and to force the heated caustic fluid into a continuous circulatory movement past said spark plug, and replenishing said fluid in said confined area with fresh fluid from said bath.
2. The method as set forth in claim 1 wherein said caustic fluid is potassium hydroxide.
3. The method as set forth in claim 1 wherein said caustic fluid is sodium hydroxide.
4. The method as set forth in claim 1 wherein said caustic fluid is a concentrated alkaline solution.

#### References Cited by the Examiner

##### UNITED STATES PATENTS

|           |        |               |           |
|-----------|--------|---------------|-----------|
| 1,403,686 | 1/1922 | Helle         | 313—127   |
| 1,913,442 | 6/1933 | Hanks         | 219—288   |
| 1,992,309 | 2/1935 | Hultman       | 204—274   |
| 2,307,928 | 1/1943 | Hogaboom      | 204—141   |
| 2,346,562 | 4/1944 | De Long       | 204—141   |
| 2,470,741 | 5/1949 | Gordon        | 204—273   |
| 2,582,781 | 1/1952 | Johnson       | 219—288 X |
| 2,807,701 | 9/1957 | Conlin et al. | 219—288   |
| 2,836,700 | 5/1958 | Chapman       | 219—40.6  |
| 2,888,939 | 6/1959 | Nitsche       | 204—281   |

JOHN H. MACK, *Primary Examiner*.

JOHN R. SPECK, *Examiner*.

R. GOOCH, *Assistant Examiner*.