J. A. & B. A. JEFFERY.

ELECTRIC SPARKING DEVICE.

APPLICATION FILED SEPT. 27, 1907. RENEWED JULY 19, 1915.

1,174,157. Patented Mar. 7, 1916.

Fig. 1.

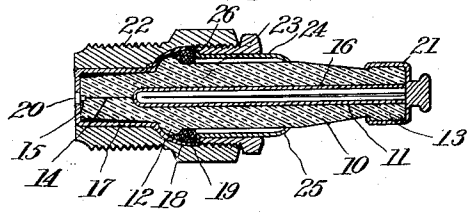


Fig. 2.

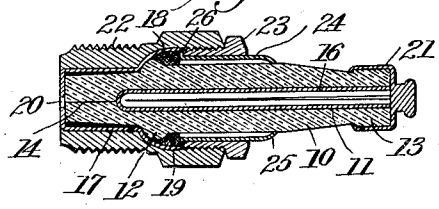


Fig. 3.

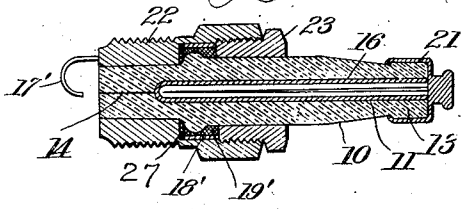


Fig. 4.

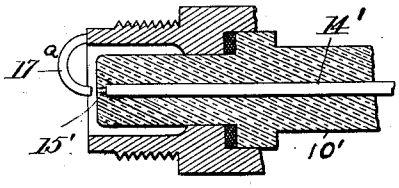


Fig. 5.

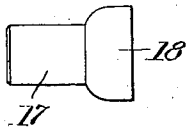


Fig. 6.

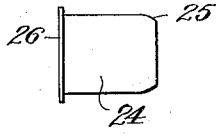
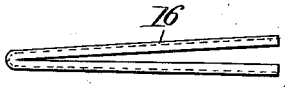


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH ARTHUR JEFFERY AND BENJAMIN ALFRED JEFFERY, OF NEWARK, NEW JERSEY.

ELECTRIC SPARKING DEVICE.

1,174,157. Specification of Letters Patent. Patented Mar. 7, 1916.

Application filed September 27, 1907, Serial No. 394,887. Renewed July 19, 1915. Serial No. 40,807.

To all whom it may concern:

Be it known that we, JOSEPH A. JEFFERY and BENJAMIN A. JEFFERY, of Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Electric Sparking Devices, of which the following is a specification.

This invention contemplates certain new and useful improvements in electric sparking devices and relates particularly to electrical ignition for internal combustion engines.

The invention has for its object the production of means whereby accumulations of short circuiting deposits around and upon the sparking terminals is prevented, or if the same have become deposited, to effect a removal thereof by the normal discharge of the current through the plug.

A further object is to provide an insulating block with an internal terminal conductor so united thereto that air cells, or the like, around the conductor are avoided, whereby the heat generated by the electric discharge will be quickly radiated through the block and fusing of the wire or of the insulating material is prevented.

A further object is to provide improved means for connecting the terminal conductor with a source of electrical energy.

A further object is to provide the grounded electrode with means for accurately locating the spark gap with respect to the terminal conductor and also for protecting the end of the insulating plug from injury by heat and other forces exerted thereagainst.

A further object is to provide a flexible mounting for the insulating plug, whereby danger of breakage of the latter is reduced to a minimum.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a sparking plug embodying our invention. Fig. 2 is a similar view with the terminal conductor slightly modified. Fig. 3 is a longitudinal sectional view illustrating a modified seating for the insulating block. Fig. 4 is a sectional view of another form of the terminal conductor. Figs. 5, 6, and 7 are details.

Referring to the drawing, 10 designates a porcelain insulating block provided with a longitudinal bore 11 leading in from one end and extended nearly through the body of the block, the latter being also provided with an annular rib 12 and a head 13. The terminal conductor 14 is preferably formed of a fine, attenuated wire extended longitudinally through the closed end of the plug, the outer end terminating in a small recess 15 formed in the exposed end of the block, the inner end of said wire contacting with the rounded end of a tubular or quill-like conductor 16 located in said bore. The conductor 16 is split longitudinally, whereby the tendency to spread will cause the same to frictionally engage the wall of the bore and be thereby retained in position. Thus said conductor will not move around in the bore or out of contact with the wire 14, when the engine is in operation, if said conductor should, by accident or design, be made shorter than said bore.

The closed end of block 10 is slightly tapered and fitting over the tapered portion is a sheath or shell 17, the same being provided with a flared or bell-like extension 18 contiguous to rib 12. Suitable packing 19, such as asbestos wicking or the like, is interposed between the flared extension 18 and the rib 12, and an opening 20 is formed in the end wall of the sheath in a position to coincide with the orifice 15 and the outer end of terminal 14. The open end of the block 10 is covered by a cap 21 beaded over the head 13, said cap engaging conductor 16 and being adapted for engagement with the clip of any suitable conductor connected with a source of electrical energy which we have not illustrated. The entire device is supported in operative position by means of a threaded bushing 22, and a packing nut 23 serves to compress the packing 19 to make a gas tight joint.

In order to reduce the danger of fracture of the block 10 we provide a flexible jacket 24 therefor, the same being of somewhat larger diameter than said block, whereby an annular space is formed between them. Said jacket extends well along the block 10 toward the head 13 and the end edge thereof is beaded or turned in at 25 to engage the body of the block. The opposite end is provided with an annular shoulder 26 of a diameter slightly less than the flared portion 18 of the shell 17 and engages the packing 19 to compress the latter, the outer face

of said shoulder being engaged by the inner face of the packing nut 23, as shown.

When in use, the bushing 22 is screwed into the casing of the engine cylinder and the cap 21 connected with a suitable conductor leading from the usual sparking coil. The current passes from cap 21 through conductor 16, thence through wire 14, and jumps the gap between the latter and the wall or edge of opening 20 in sheath 17, and from thence to ground through the bushing 22. The impact or explosive action of the dynamic force of the electrical discharge, as it passes from wire 14 to sheath 17, is such that accumulating short circuiting deposits are scattered from the vicinity of the terminal, and part of the heat generated by the spark is expended upon such of the deposits as are not scattered by the impact, whereby the same is consumed or destroyed. This action is so positive and so thorough in its nature that experiment has proven that a heavy coating of oil over the exposed end of sheath 17 is at once dissipated by the first subsequent electrical discharge through the plug without in any manner impairing the efficiency of the device. Globules of water are eliminated in the same manner, and in fact the device will discharge a spark with both terminals submerged in water.

In the practical manufacture of sparking plugs we have found it extremely difficult to overcome the embarrassment encountered in securing a proper union between the insulating block and the attenuated wire terminal. When formed in the usual manner by molding the insulating material around the wire, air bubbles or the like form around the wire, preventing a perfect contact between the two, whereby the heat generated by the electrical discharge will not radiate through the block, but becomes concentrated in such a manner as not only to fuse the conductor but very frequently to fuse the insulation as well. In this manner the efficiency of the plug is greatly impaired, and in fact, the same is rendered practically useless. We have found, however, that by first molding the block and then forcing the wire thereinto while the plug is in a semi-plastic condition, no air bubbles can be formed around the wire but the latter merely crowds the insulating material back rendering it somewhat denser adjacent the wire. Then by baking the block with the wire therein until the porcelain becomes vitrified, the chemical change which takes place in the block forms a close molecular union between the latter and the wire, and the objections mentioned are entirely overcome. After the baking process the conductors 16 are inserted and cut off approximately flush with the end of the block, after which the cap 21 is beaded over the head 13, thus forming a continuous conductor from one end of the block to the other.

In Fig. 2 we have illustrated a slight modification which consists in dispensing with the recess 15 and bringing the outer end of wire 14 flush with the closed end of the block. The operation and effect are the same as in that form disclosed by Fig. 1. It will be noted that the bell shaped end of the sheath 17 forms a receptacle for the packing 19 and in this manner a seat is provided with which the block 10 has a rocking engagement. In lieu of the enlargement 18, however, we find that good results are secured by a ring or sheath 18′, such as illustrated in Fig. 3. In this form the bushing 22 is provided with a washer 27 of asbestos board and the ring 18′ is also filled with asbestos wicking 19′. In this form we also employ the usual ground terminal 17′ mounted in the bushing 22.

In Fig. 4 we have illustrated another slight modification which consists in placing within the block 10′ a comparatively large wire 14′ the outer end of which is exposed at the internal end of a recess 15′. The ground terminal 17^a is of the usual form. The device illustrated in this figure is a substantial reproduction of one of the forms of our invention described but not claimed in our pending application for patent filed August 15th, 1906, Serial Number 330,620.

The advantages and operation of our improved sparking device are at once apparent from the foregoing. It will be particularly observed that the impact of the electric discharge scatters accumulating short circuiting deposits from the vicinity of the terminals, and the heat generated by said discharge is expended upon such deposits as have accumulated, quickly consuming the latter. It will also be noted that by providing a close molecular union between the terminal and the insulating block, air bubbles, and the like, are prevented, and a perfect absorption and radiation of the heat of the electrical discharge is provided. A further advantage lies in the form of conductor employed to connect the terminal with the source of electrical energy, as by means thereof, the parts may be rapidly assembled, and the frictional engagement thereof with the wall of the insulating block prevents the same from separating from said terminal, thus securing a perfect electrical contact. It will also be seen that by means of the metal sheath over the closed end of the insulating block, a perfect means is provided for conducting heat away from the sparking terminals and the insulating block; the insulating block is protected from injury incident to violent changes of temperature, and the action of sprays of oil, and the like, which ordinarily break the

plug; and in the event of any chipping or disintegration of the insulating block, the broken particles are prevented from finding their way into the cylinder. Another advantage secured by employing this sheath, or the modified ring, is that the insulating block can be quickly removed by merely unscrewing the packing nut, thus rendering the terminals readily accessible for examination, and repair if necessary. It will also be noted that by reason of the taper of the closed end of the insulating block said sheath will conform to any irregularities in the contour of said block, whereby the opening of the sheath is automatically brought into juxtaposition with the embedded terminal by the placing of the sheath in position. It will be further observed that by providing the sheath with the enlarged end to receive the packing a flexible support for the insulating block is provided, and by employing the flexible jacket all danger of fracture of the block is practically overcome.

We claim as our invention:—

1. An electric sparking device comprising an insulating block having a central bore and a closed end, an attenuated conductor embedded in said closed end, a second conductor formed of a split tube located within said bore and in circuit with the attenuated conductor, and a terminal cap closing the open end of said bore and arranged in circuit with said second conductor.

2. An electric sparking device comprising an insulating block having a tapered portion, a conductor wire embedded in said block, a protecting sheath fitted over the tapered portion of said block and having an end wall contacting with and covering the end surface of block adjacent said wire and forming the ground terminal, said sheath being flared at its inner end, and packing interposed between said block and the flared portion of said sheath.

3. An electric sparking device comprising an insulating block, a wire embedded in one end of said block, a conductor leading to said wire, and a protecting sheath inclosing and covering one end of said block and forming the ground terminal of the device, said block and sheath each having complemental means to permit relative lateral movement after the block and sheath are placed in operative engagement.

4. An electric sparking device comprising an insulating block, an attenuated wire embedded in one end of said block, a conductor leading to said wire, and a protecting sheath fitted over the end of said block having an annular shoulder adjacent said wire and forming the ground terminal, said sheath being provided with a flared end inclosing said shoulder, and packing inclosed within said flared end.

5. An electric sparking device comprising a supporting bushing an insulating block provided with a convexed annular shoulder, a conductor wire located in one end thereof, a second independent conductor leading to said wire, and means independent of said bushing and sustained thereby for supporting said block, said block supporting means having means complemental to said shoulder to permit a relative rocking movement.

6. An electric sparking device comprising an insulating block, a conductor wire located in one end thereof, a second independent conductor within said block and leading to said wire, a supporting bushing forming part of the ground terminal, and means for supporting said block in said bushing, said block and bushing having complemental means to permit a relative rocking movement after the block and sheath are placed in operative engagement.

7. An electric sparking device comprising a supporting bushing an insulating block provided with a convexed annular shoulder, a conductor passing through said block, a sheath supported by said bushing and encircling said block said sheath having a complemental seat for said shoulder to permit a relative rocking movement of the sheath and shoulder, and packing interposed between said sheath and block.

8. An electric sparking device comprising a supporting bushing an insulating block provided with a convexed annular shoulder, a conductor passing through said block, a sheath supported by said bushing and encircling said block, said sheath having a flared portion forming a seat for said shoulder whereby the block may rock, and packing located in the flared portion of said sheath.

9. An electric sparking device comprising an insulating block provided with a convexed annular shoulder, a conductor passing through said block, a supporting bushing forming part of the ground terminal of the device, a sheath encircling said block and engaging said shoulder and also forming part of the ground terminal of the device, said sheath being provided with an extension inclosing said shoulder, and packing interposed between said extension and said block.

10. An electric sparking device comprising an insulating block having a longitudinal bore closed at one end, an attenuated wire embedded in the closed end, a protecting sheath fitted over and covering the closed end surface of said block, said sheath being flared at its inner end, packing interposed between said block and the flared portion of said sheath, and an independent conductor removably secured in said bore and contacting with said wire.

11. An electric sparking device compris-

ing an insulating block having a longitudinal bore closed at one end, an attenuated wire located in the closed end of said block, a protecting sheath fitted over and lying against the closed end surface of said block and a conductor located in said bore and contacting with said wire, said sheath being provided with means for supporting said plug in such manner as to permit a rocking movement.

12. An electric sparking device comprising an insulating block provided with an annular shoulder and having a longitudinal bore closed at one end, an attenuated wire embedded in the closed end of said block, a protecting sheath fitted over said closed end and provided with a flared portion inclosing said shoulder, packing inclosed within said flared portion, and a conductor located in said bore and contacting with said wire.

13. An electric sparking device comprising an insulating block having a terminal embedded therein, a bushing forming a part of the ground terminal, and a flexible jacket carried by said bushing and flexibly supporting said block.

14. An electric sparking device comprising an insulating block, a jacket surrounding said block and having an inturned edge at one end, flexibly supporting the same, and means for holding the other end of said jacket against movement.

15. An electric sparking device comprising an insulating block, a protecting sheath for one end thereof, a flexible jacket surrounding said block and having one end in engagement with the latter, the other end of said jacket fitting within said sheath, and means for holding said sheath and tube in position.

16. An electric sparking device comprising an insulating block provided with a conductor terminal embedded therein, a bushing for supporting said insulating block, a reinforcing jacket surrounding said block and extending beyond said bushing, the extended portion of said jacket flexibly supporting said block, and means for securing said jacket in position.

In testimony whereof, we have signed this specification in the presence of two subscribing witnesses.

JOSEPH ARTHUR JEFFERY.
BENJAMIN ALFRED JEFFERY.

Witnesses:
MORTIMER CLUFF DEWITT,
MAGGIE W. SUTPHEN.