Dec. 17, 1935. H. RABEZZANA 2,024,387

GLOW PLUG

Filed July 21, 1932

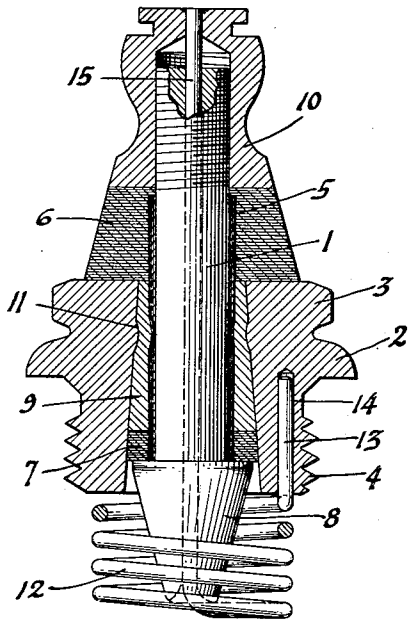


Fig. 1

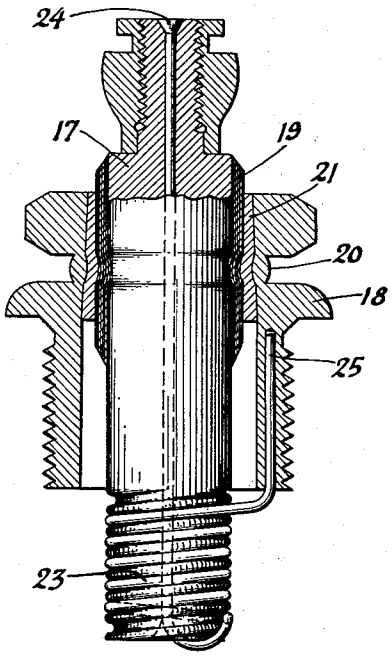


Fig. 2

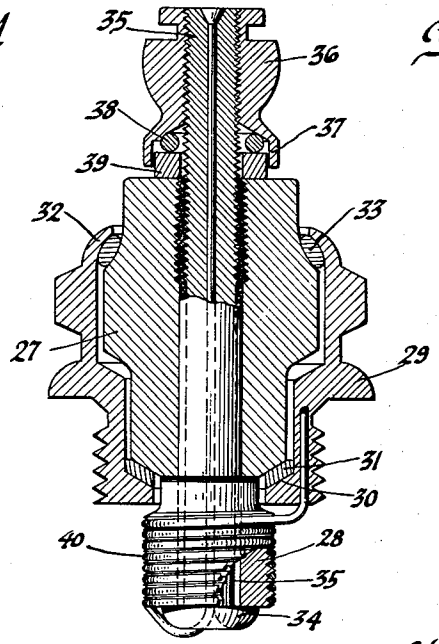


Fig. 3

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Patented Dec. 17, 1935

2,024,387

UNITED STATES PATENT OFFICE

2,024,387

GLOW PLUG

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Application July 21, 1932, Serial No. 623,710

2 Claims. (Cl. 123—145)

This invention relates to ignition devices for internal combustion engines and particularly to glow plugs for use with the compression ignition type of engine.

As an aid to starting, engines are sometimes equipped with a plug extending through the combustion chamber wall and carrying a resistance wire which can be heated to incandescence by the passage therethrough of electric current of relatively low voltage. Because of the low voltage and the conditions to which the plug is subjected, it has been difficult to produce a plug which will stand up and give satisfactory service for any appreciable length of time. The intense heat of combustion and the chemical changes that take place in an engine combustion chamber cause oxidation and corrosion of the wire which destroys the electrical contact between the ends of the wire and the parts to which the wire is connected. To avoid troubles of this sort, it is here proposed to fasten the ends of the resistance wire at as cool a spot possible and beyond the zone of greatest heat and to protect the contact against excessive oxidation.

A construction to accomplish this purpose is illustrated in the accompanying drawing wherein optional plug structures are shown in the sectional views, Figures 1, 2, and 3.

Referring to the drawing, the plug shown in Figure 1 includes inner and outer metallic members 1 and 2, respectively, suitably insulated from one another. The outer member or shell 2 is here shown as provided with a hexagonal head 3 for engagement by a wrench to facilitate installation and removal of the plug, and with a dependent screw threaded skirt 4 adapted for engagement with a screw threaded opening in the wall of the engine through which it is grounded. Interposed between the inner and outer members for insulation purposes is a tube 5 of mica or the like and upper and lower bodies of mica washers 6 and 7. The lower mica body 7 is seated at opposite ends against an enlarged head 8 on the lower end of the central rod 1 and against a sleeve 9 of brass, copper or other ductile metal, while the upper body 6 rests against the top surface of the head 3 and the undersurface of a coupling or terminal nut 10 threaded or otherwise fastened on the upper end of the central member and adapted for connection with the usual ignition cable. To hold the parts in assembly and prevent leakage therethrough, the outer shell, at the time of assembly, may be heated at an intermediate portion and placed under axial pressure to collapse the same and cause an inward bulge as at 11, which deforms the sleeve 9 and through the sleeve exerts an inward compression of the mica tube 5, whereby the tube tightly hugs the adjacent portion of the central rod 1.

The inner and outer metallic members 1 and 2 carry a suitable glow wire or resistance element at the lower end of the assembly, the intermediate portion of which is shown in the form of a helical coil 12 with one end portion 13 turned upwardly and projected into an opening in the bottom of the skirt, extending upwardly into the body of the shell and preferably beyond the skirt portion engaged by the wall of the combustion chamber. At its upper end, as at 14, the portion 13 enclosed within the skirt, is staked, welded, or otherwise secured to the shell for the purpose of making an electrical contact therewith. The opposite end portion 15 extends upwardly through an opening in the central rod 1 and at its extremity is secured to either the member 1 or to the terminal connector 10 by silver solder, staking or the like, for contact purposes. It will be seen, therefore, that both ends of the resistance wire are electrically connected to their respective connector portions at points considerably removed from the hot end of the plug and are saved from effects of the intense heat and protected against oxidation.

The plug heretofore described will be found suitable for use with a six volt ignition system, but for those systems where the voltage is higher, for example in the neighborhood of twelve volts, the diameter of the resistance wire must be materially reduced and in order to give proper support for the wire it is proposed to mount the exposed portion on the lower end of the central member as shown in Figure 2. In this figure, the inner and outer metal parts 17 and 18 are insulated from each other by mica or an equivalent tube 19, and are held together by the thermoplastic collapse of the restricted neck 20 of the shell 18, which deforms a ductile sleeve 21 to seal the parts and transmit the deformation pressure to the mica tube. The lower portion of the central rod 17, which projects beyond the bottom of the skirt, may be provided with a helical groove in which is seated the coil 23 of the resistance wire, one end of which projects up through the member 17 and is secured at 24 at the top with the other end projecting upwardly through the skirt of the outer member 18 and being secured thereto as at 25.

In this particular construction, an enamel or an oxidized coating is provided on the exposed

surface of the central rod 17 and below the insulator tube 19, to assist in the insulation of the inner and outer metal members from each other. Obviously such coating insulates adjacent turns of the glow wire coiled upon the rod. It may even be found practical for some uses to coat the entire outer surface of the central rod and entirely eliminate the need for the separate insulator sleeve 19.

A porcelain core insulator is illustrated in Figure 3 where the core is formed in two pieces 27 and 28, respectively. The outer shell 29 in this case is provided with an internal shoulder 30 at its lower end forming a seat for a gasket 31 and the base of the insulator 27. It is also provided with a flange or lip 32 which may be pressed or spun inwardly over a gasket 33 seated on the upper end of the core 27. The lower insulator sleeve 28 bears at opposite ends against the bottom of the core 27 and an enlarged head 34 at the lower end of the central rod 35, which projects upwardly through the core 27 and carries at its upper end a coupling nut 36. The bottom of the nut 36 is preferably provided with a dependent skirt 37 which encloses a sealing gasket 38 and a washer 39 interposed between the nut and the core 27. The resistance coil 40 in this case is wound about and seated on the sleeve 28 with its opposite ends extending through and connected to the inner and outer members as before described. In this connection the two part insulator is important because of the tremendous difference of temperature existing between the lower end of the plug and the upper end. If the core were to be made in a single piece, the temperature difference would cause it to crack. However, by providing a separate insulator sleeve at the lower end, cracking is eliminated because this body is subjected to a somewhat uniform temperature throughout its mass, and furthermore, it can be of a different composition from that of the main core body, and be selected because of its ability to withstand high temperatures. On the other hand, the material in the main core only needs to be suitable for taking the pressure exerted upon it between the seat 30 and pressed in flange 32.

I claim:

1. A glow plug for use with compression ignition engines and adapted to be secured in an aperture in the wall of the combustion chamber comprising a central member having a substantially axially extending bore therein of uniform diameter from end to end, an outer shell having a skirt portion to be secured in said wall and being provided with a bore of uniform diameter extending upwardly beyond the portion to be received in the wall, and a glow wire having a portion of its length intermediate its ends exposed within the combustion chamber with the upwardly extending ends thereof completely filling the respective bores before mentioned and connected with both the central member and the shell outside the wall of the combustion chamber when the plug is in operating position.

2. In a glow plug, an outer shell, an insulator core mounted in said shell, a central spindle having its lower end projecting beyond the core and terminating in an enlarged head, an exposed sleeve fitted to the projecting spindle end between said head and the bottom of the core, and composed of insulating material having heat resistance properties different from the material of said insulator core, and a glow wire connection between the spindle and shell, having an intermediate portion coiled upon and supported by said insulating sleeve.

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