Sept. 27, 1949. T. R. ARDEN 2,482,831

IGNITION PLUG

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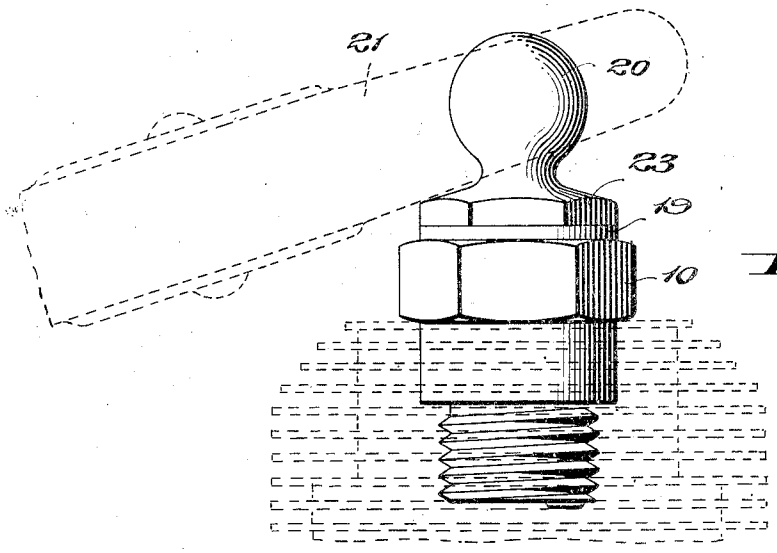


Fig. 1.

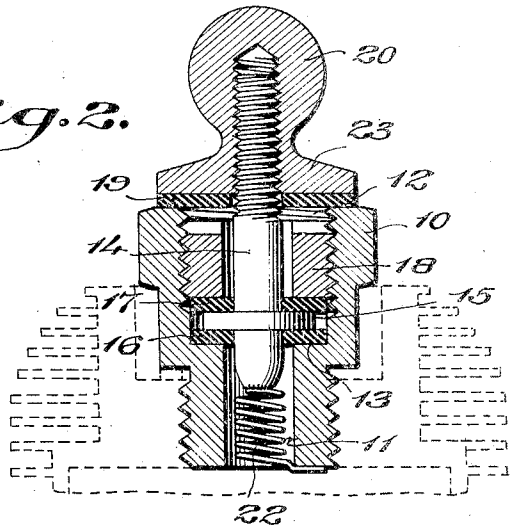
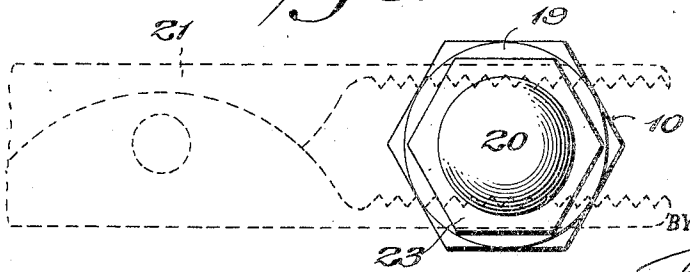


Fig. 2.

Fig. 3.



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IGNITION PLUG

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1 Claim. (Cl. 123—145)

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This invention relates to ignition plugs for internal combustion engines, and has particular reference to improvements in ignition plugs of the so-called "glow" type which are heated by the fuel charges which they ignite, as distinguished from the electric arc or so-called "spark" type.

One object of the invention is to provide an ignition plug of the glow type which is generally similar to, and may readily be used to replace, ignition plugs of the spark type, and which, in addition, embodies a simple, practical construction such that its heating or glow element may readily be heated electrically for engine starting purposes.

Another object of the invention is to provide an ignition plug of the glow type in which the heating or glow element is contained in a small chamber which is located in and opens through the inner end of the base or inner end portion of the plug, whereby it is disposed to effectively serve its purpose of igniting fuel charges and, at the same time, is protected against flow over the same of fuel charges to be ignited and hence against chilling by the latter. Further in this connection, another object of the invention is to form said chamber, or at least the open end thereof, of such small size that gases flowing into the engine cylinder and over the open end of said chamber are not caused by the latter to partake of turbulence.

A further object of the invention is to provide an ignition plug of the glow type with a substantially spherical head for the temporary and convenient attachment to the plug of a battery circuit terminal clip of the popular, so-called "alligator" type when it is desired to electrically heat the heating element of the plug for engine starting purposes, and to so construct said head as to preclude the possibility of attaching the terminal clip thereto in a manner such that it might contact any portion of the engine and thereby become grounded.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in an ignition plug embodying the novel features of construction, combination and arrangement of parts as are illustrated by way of example in the accompanying drawings and as will be hereinafter more fully described and claimed,

In the accompanying drawings, wherein like

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characters of reference denote corresponding parts in the different views:

Figure 1 is a side elevation of an ignition plug constructed in accordance with the invention, a portion of an engine to which it is to be applied and a terminal clip for connection with the same being shown by dotted lines;

Figure 2 is a central, longitudinal section through the plug; and

Figure 3 is a top plan view of the plug showing the terminal clip in dotted lines.

Referring to the drawings in detail, it will be observed that the present ignition plug is generally similar in appearance to an ordinary spark plug and has the inner end portion of its body 10 exteriorly threaded in accordance with conventional spark plug design and practice, whereby it is adapted to be used interchangeably with, and to replace, ignition plugs of the spark type.

Extending axially of the plug body 10 into the same from its inner and its outer ends are inner and outer bores 11 and 12, respectively, which communicate with each other at their inner ends. The outer bore 12 is of greater diameter than the inner bore 11 and thereby there is provided an outwardly facing shoulder 13 at the junction of the inner ends of said bores.

Extending from the outer end of the plug inwardly through the outer bore 12 and a short distance into the inner bore 11, is an electrical conductor 14 of rod form, the outer end portion of which is threaded and which is provided, near its inner end, with an annular enlargement or flange 15.

Seated upon the shoulder 13 is a washer 16 of suitable electrical insulating material in the center of which is a hole through which the inner end portion of the conductor 14 extends into the bore 11.

The enlargement or flange 15 of the conductor 14 is seated upon the washer 16, while engaged upon said conductor outwardly of said enlargement or flange 15 and seated upon the latter, is a second washer 17 of suitable electrical insulating material. A nut 18 is threaded into the outer bore 12 against the washer 17 and acts through the latter and the flange 15 and the washer 16 and the shoulder 13 to secure the conductor 14 firmly to the plug body 10 against any possibility of its endwise movement relative

thereto. Lateral or sidewise movement of said conductor relative to said plug body is prevented by the washers 16 and 17. Thus, the conductor 14 is fastened securely and centrally relative to the plug body 10 and is electrically insulated from the latter, since the enlargement or flange 15 is of lesser diameter than the bore 12 and the central opening in the nut 18 through which the conductor 14 extends is of greater diameter than said conductor.

Against the outer end of the plug body 10 is seated a washer 19 of suitable electrical insulating material and against this washer is seated the inner end of a ball head 20 which is threaded upon the outer end portion of the conductor 14 and which constitutes an electrical terminal to have engaged therewith a terminal clip 21 of an electrical heating circuit.

The inner bore 11 constitutes a chamber in which is disposed a heat absorbing element 22 which preferably, but not necessarily, is in the form of a helix wound from wire having a high electrical resistance. The helix 22 is disposed coaxially with respect to the bore or chamber 11 and at one end is welded or otherwise suitably connected to the inner end of the conductor 14 and at its other end is welded or otherwise suitably connected to the inner end of the plug body 10.

When the ignition plug is applied to an internal combustion engine, the plug body 10 is, of course, grounded with respect to the engine. Accordingly, when one side of an electrical heating circuit is connected to the engine and the other side of said circuit is connected to the plug terminal 20, the element 22 is included in the circuit and thereby becomes heated.

The element 22 is electrically heated only for engine starting purposes, for after the engine is started, the heat of combusion of its fuel charges maintains said element heated whereby it is effective to ignite subsequent charges. In this connection, the present plug is especially advantageous for use in connection with internal combustion engines employed as power plants for model or toy airplanes, boats, land vehicles, and the like, since it not only relieves the same of the burden of carrying the weight of batteries and other accessories of spark ignition apparatus, but avoids the uncertainties of spark ignition. In other words, after an engine equipped with the present ignition plug has been started, the electrical apparatus for initially heating the heating element 22 may be disconnected from the plug. Consequently, electrical apparatus for initially heating the element 22 need never be mounted in or carried by a model aircraft the engine of which is equipped with the present ignition plug.

Since the element 22 is disposed entirely within the bore or chamber 11, as shown, it is disposed outside the path of flow of fuel charges entering the combustion chamber of an engine upon which the plug is used and therefore is not cooled or chilled by the fuel charges. Moreover, in practice, the bore or chamber 11 is so very small (in the neighborhood of only about one eighth of an inch in diameter) that fuel charges flowing across the inner end of the plug are practically unaffected by said chamber insofar as creation of turbulence in the fuel charges is concerned. As the fuel charges are compressed, they are, of course, heated. Consequently, when they are forced into the bore or chamber 11 during the final part of the compression stroke of the engine

piston, they are so hot as to have little, if any, cooling effect upon the element 22.

Terminal clips of the so-called "alligator" type, as illustrated in the drawings, are well known and may be employed for connecting ignition circuit wires to spark plug terminals. When such clips are used for this purpose with ignition plugs as heretofore constructed, it has been found that the clips tend to gravitate to downwardly and inwardly disposed positions relative to the plugs such that they contact parts of the engines and create short circuits. In this connection, the ball head 20 of the present plug substantially insures a positive grip of a clip of the alligator type therewith in any attitude of the clip relative to the ball head so that there is little or no danger of the clip changing its position relative to the ball head due to gravitation alone or assisted by vibration. Moreover, the present ball head is provided with a base 23 which acts as a stop, engageable by a terminal clip of the alligator type engaged with said ball head, to limit the zone in which the clip may be engaged with said ball head in different angular positions relative thereto and to thereby preclude the possibility of the clip contacting any part of an engine with which the present plug is used. In other words, the base 23 limits application of a terminal clip of the alligator type to the ball head 22 to a substantially hemispherical zone the base of which is located at the inner side of said ball head. Therefore, there is little or no chance of a terminal clip engaged with the ball head 20 ever producing a short circuit by contacting part of an engine with which the present plug is used.

From the foregoing description considered in connection with the accompanying drawing, it is believed that the construction and operation of the present ignition plug will be clearly understood and its advantages appreciated. It is desired to point out, however, that while only a single, specific embodiment of said plug has been illustrated and described, the same is readily capable of modifications and changes within the spirit and scope of the invention as defined in the appended claim.

I claim:

An ignition plug comprising a plug body having its inner end portion exteriorly threaded for threaded engagement in an opening in an internal combustion engine, said plug body having therein inner and outer bores connected with each other and opening through its inner and outer ends, respectively, said inner bore being of lesser diameter than said outer bore whereby a shoulder is formed at the inner end of the latter, an electrical conductor extending through said larger bore into said smaller bore, a flange on said conductor, a washer of electrical insulating material seated against said shoulder inwardly of said flange and having said flange seated thereon, a second washer of electrical insulating material disposed outwardly of said flange and seated thereon, a nut threaded in said outer bore against said second washer and acting through said washers and said flange and said shoulder to clamp said conductor firmly to said plug body, said washers closely fitting said outer bore and snugly embracing said conductor whereby they act to hold said conductor coaxially with respect to said bores and spaced from the walls defining the sides of the latter, a heat retaining element disposed in said smaller bore and connected at spaced points to said conductor and said plug body, whereby it is adapted to be heated

electrically and also by the heat of combustion of fuel charges which it ignites to ignite subsequent fuel charges, said nut being disposed entirely within said outer bore, a washer of electrical insulating material seated against the outer end of said plug body and closing the outer end of said outer bore, and an electrical terminal element threaded on the outer end portion of said conductor against said last mentioned washer and serving to clamp the latter tightly against the outer end of said plug body.

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