April 6, 1937. L. J. McKONE 2,076,038

SPARK PLUG

Filed Feb. 18, 1935

Fig. 1

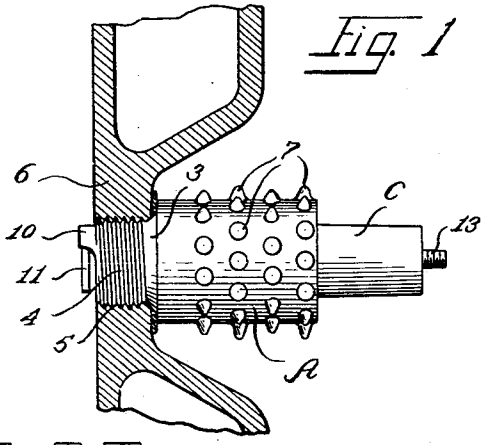


Fig. 2

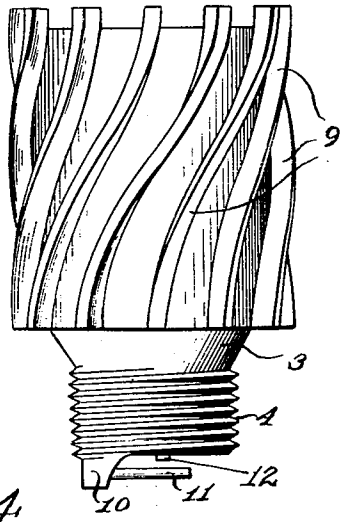


Fig. 3

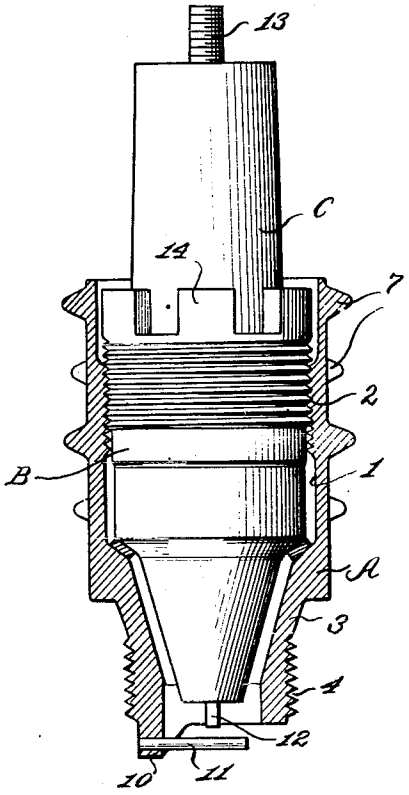
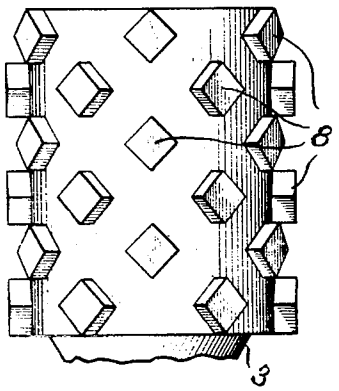


Fig. 4



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2,076,038

SPARK PLUG

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Application February 18, 1935, Serial No. 6,984

2 Claims. (Cl. 123—169)

The present invention relates to spark plugs and more particularly to spark plugs useful in the present day types of internal combustion engines, employing aluminum or aluminum alloy heads, wherein the plugs are inserted in the heads with the plug axes substantially horizontal.

Internal combustion engines, particularly of the automotive type, are constructed with the spark plugs inserted vertically, and others with the spark plugs inserted horizontally, or substantially horizontally.

Since the advent of the use of aluminum or aluminum alloy for engine heads, the provision of spark plugs having steel or iron shells has proved unsatisfactory, in that the spark plugs bind in the spark plug openings in the heads, to a point where difficulty is encountered in removing the plugs, and oftentimes resulting in damage or destruction of the plugs as well as of the spark plug openings.

The use of steel or iron spark plug shells in aluminum heads has been found unsatisfactory because of the fact that the high residual heat present in the steel or iron shells of the plugs prevented rapid contraction of the shells, and the head and spark plugs having steel or brass shells have been broken by twisting in efforts made to remove the shells from aluminum heads.

The present invention contemplates a plug of the type disclosed in applicant's copending application Serial No. 5,192, filed Feb. 6, 1935, Patent 2,055,204.

An object of the present invention is to improve spark plug construction for use in internal combustion engines having aluminum or aluminum alloy heads wherein the plugs are installed with their axes horizontal or substantially horizontal.

Another object of the present invention is to provide spark plugs for installation in horizontal position in internal combustion engines and having means for ready dissipation of heat to maintain the plugs in sufficiently cool condition.

A further object of the present invention is to provide a spark plug shell having heat radiating means suitable for ready heat dissipation when the plugs are installed in substantially horizontal position in an engine.

A still further object of the present invention is to provide a spark plug and bush construction wherein both are provided with heat radiating means for ready heat dissipation when the plugs are installed in substantially horizontal position in an internal combustion engine.

The above, other and further objects of the present invention will be apparent from the following description, accompanying drawing, and appended claims.

Embodiments of the present invention are illustrated in the accompanying drawing, and the views thereof are as follows:

Figure 1 is a fragmental section view of an internal combustion engine head showing in elevation a spark plug constructed in accordance with the principles of the present invention, installed in substantially horizontal position in the head.

Figure 2 is an elevational view of a spark plug shell, of modified form, and constructed in accordance with the principles of the present invention.

Figure 3 is a view of a spark plug of the present invention showing the bush and core in elevation and the shell in axial section.

Figure 4 is an elevational view of a fragmental portion of a spark plug shell illustrating another modification of the present invention.

The drawing will now be explained.

The spark plug of the present invention includes a shell A, a bush B, and a core C.

The shell A is provided with an enlarged interior 1 for receiving the core C, and having a portion of its length threaded at 2 to receive the bush B. The shell A has a reduced neck 3 with its exterior threaded at 4 for threaded engagement with a spark plug opening 5 in the head casting 6. The shell A is so constructed that the interior of the neck 3 has substantially the same taper as the tapered end of the core C for the purpose of reducing the area of the core exposed to the heat of combustion.

The shell A, in the form of the invention illustrated in Figures 1 and 3, is provided with a plurality of conical protuberances 7 arranged so as to permit the flow of convection air currents circumferentially of the shell.

The form of shell illustrated in Figure 4 has a plurality of diamond shaped protuberances 8 on its exterior surface, arranged in staggered relation, one to another, axially and circumferentially of the shell to provide paths for the flow of convection air currents.

The shell of the form illustrated in Figure 2 is provided with a plurality of fins or ribs 9 which are curved axially and circumferentially of the shell to thus provide paths for the flow of convection air currents.

The form of shell illustrated in Figure 2 may be used with spark plugs which are installed in

vertical position as well as in horizontal position, in the engine heads.

The neck is constructed to provide an extension 10 in which is installed a straight electrode 11 extending perpendicular to the axis of the plug and with its end projecting beyond the axis of the core electrodes 12. By reason of this construction the spark gap is maintained constant irrespective of the erosion of the electrode 11.

The outer extremity of the electrode 12 is threaded at 13 to receive suitable nuts for attaching a conductor to it.

It will be observed from Figure 1 that a spark plug constructed in accordance with the principles of the present invention, and inserted in substantially horizontal position in the engine head, will readily dissipate heat, because of the protuberances on the shell. There is nothing in the construction of the spark plug shells, of the present invention, which will interfere with the flow of convection air currents, upwardly, so that satisfactory cooling of the plug shells is accomplished.

The shell of the present invention is made preferably of a non-ferrous alloy, such as a composition of approximately eight parts of copper to one part aluminum, and herein termed "aluminum bronze".

The fins or ribs 9 are thin so as to readily dissipate heat and thus maintain the plug in a comparatively cool condition.

Another feature of the present invention which is effective for increasing the efficiency of the spark plug is the positioning of the parts so that the core electrode 12 is housed substantially within the neck of the shell.

The formation of the shell of the present invention of non-ferrous metal of substantially the same heat characteristics as the engine head together with the provision of the heat dissipating protuberances, maintains the plug in a comparatively cool condition and prevents residual heat remaining in the plug. Consequently freezing of a plug to a spark plug opening in the head is prevented, thereby enabling ready removal of a used plug without damage to the plug or to the spark plug opening in the head.

The plugs of the present invention warm up quickly but at the same time do not become too hot as heat is readily dissipated to the atmosphere.

The construction of the shell is such as to lend itself readily to die casting operations and as no subsequent machining operations are required the manufacture of the present plug is relatively inexpensive.

Because of the presence of the protuberances on the shells of the plugs of the present invention, no hexagonal or other polygonal tool receiving part is necessary, as any suitable tool may be applied to the shell for installing or removing a plug. Preferably, however, the shells are provided circumferentially with six or twelve ribs or protuberances to facilitate the use of a 12-point wrench.

The bush B is provided with lugs 14 which serve the double purpose of tool engaging means for assembling and disassembling the plug, and also as means for dissipating heat to the atmosphere.

The invention has been described herein more or less precisely as to details, yet it is to be understood that the invention is not to be limited thereby as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted, without departing from the spirit and scope of the invention.

The invention is claimed as follows:

1. A spark plug shell of non-ferrous alloy having high heat conductive characteristics and having a part for removably receiving a core and surrounding and enclosing said core, said part having ribs on its exterior extending generally in the direction of the axis of the body and curved in length to provide axially extending and curved paths for the flow of convection air currents, said paths being open at both ends to air current flow.

2. A spark plug shell of non-ferrous alloy having high heat conductive characteristics and having a part for removably receiving a core and surrounding and enclosing said core, said part having ribs on its exterior which are curved axially and circumferentially of said part to provide curved paths of travel along the length of said part for the flow of convection air currents, said curved paths of travel being unobstructed to air current flow through them.

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