Oct. 2, 1962 W. G. CLAYTON 3,056,899

SPARK PLUG ADAPTER

Filed Nov. 23, 1959

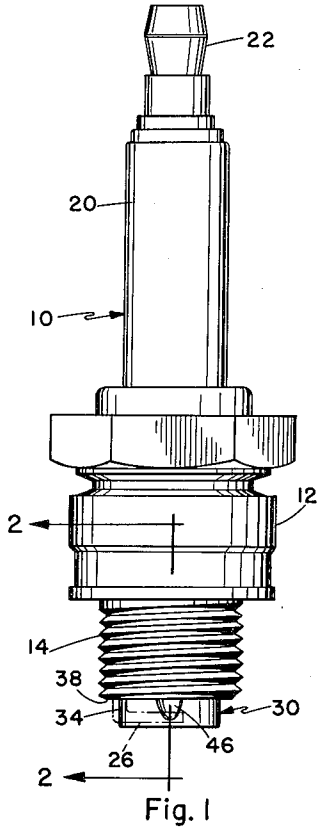

Fig. 1

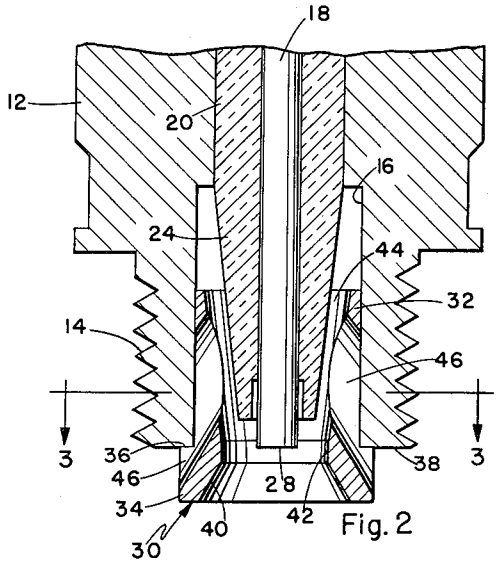

Fig. 2

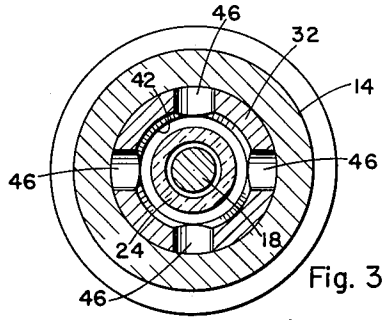

Fig. 3

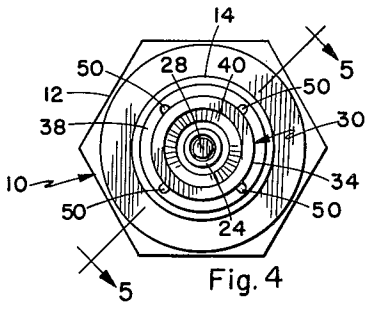

Fig. 4

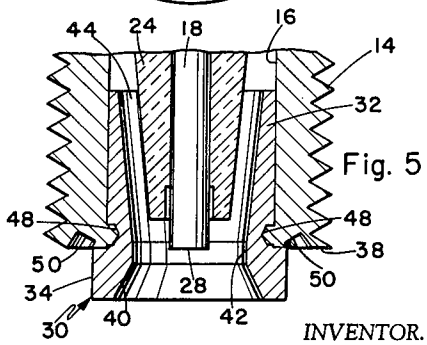

Fig. 5

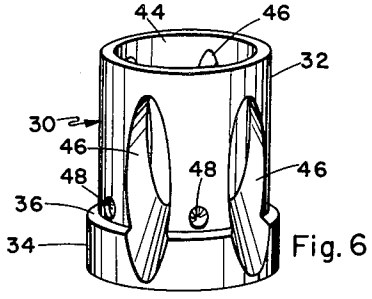

Fig. 6

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SPARK PLUG ADAPTER

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The present invention relates generally to spark plugs and more particularly to a spark plug adapter.

The primary object of this invention is to provide a spark plug adapter which can be added to a slightly modified, conventional spark plug to produce a plug having a generally cylindrical electrode, which allows the sparks to be distributed around the electrode instead of to a single point, thereby eliminating pitting.

Another object of this invention is to provide a spark plug adapter having a cup portion in which the spark is contained and which holds a pocket of relating static gases in the region of the spark to ensure proper ignition.

Another object of the invention is to provide a spark plug adapter of a configuration ensuring its proper functioning while also assuring against any possible damage to the ceramic element of the plug during installation of the adapter or during the normal use of the adapted plug.

Still another object of this invention is to provide a spark plug adapter having ventilating means through which the gases can circulate around the electrodes and thus minimize fouling.

A further object of this invention is to provide a spark plug adapter which is easily yet securely attached to a spark plug with simple hand tools.

It is a further object of this invention to provide a spark plug which displays the advantages listed near the end of the specification.

Finally, it is an object to provide a spark plug adapter of the aforementioned character which is simple and convenient to install and use and which will give generally efficient and durable service.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, particularly pointed out in the claims, and illustrated in the drawing which forms a material part of this disclosure, and in which:

FIGURE 1 is a side elevation view of a spark plug fitted with the adapter;

FIGURE 2 is an enlarged fragmentary sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken on the line 3—3 of FIGURE 2;

FIGURE 4 is an end elevation view as taken from the lower end of FIGURE 1;

FIGURE 5 is an enlarged fragmentary sectional view taken on the line 5—5 of FIGURE 4; and

FIGURE 6 is a perspective view of the adapter.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing.

The spark plug 10, as illustrated, is of conventional type having a metallic body 12, at one end of which is a threaded portion 14 for insertion into the usual spark plug bore, said threaded portion having a deep internal socket 16. Extending axially through the body 12 is a rod-like central electrode 18 enclosed in a cylindrical insulating jacket 20 of ceramic or similar material, said insulating jacket projecting from the other end of said body and having an end terminal 22 thereon connected to said electrode. The insulating jacket 20 has a tapered portion 24 extending into the socket 16, the electrode 18 projecting beyond the tapered portion. Normally, the electrode 18 is provided with a radially extending tongue 26, indicated in broken line in FIGURE 1, the spark jumping between said tongue and the rim of the central electrode 18. In the present embodiment, however, the tongue 26 is cut off and the electrode 18 finished with a flat end 28 generally planar with the end of the threaded portion 14 and concentric with the socket 16.

The adapter 30 is of generally cylindrical construction having a sleeve portion 32, which is a close fit inside the socket 16, and an enlarged end 34, providing a shoulder 36 which rests on the end face 38 of the threaded portion 14. The enlarged end 34 has a generally conical cup 40 therein, converging to an electrode collar 42 having an axially parallel wall concentric with the central electrode 18 and radially aligned with the flat end 28. The sleeve portion 32 has a tapered inner bore 44 diverging from the electrode collar 42 and concentrically spaced from the tapered portion 24.

The adapter 30 is provided with a plurality of vents 46, four being indicated as an example, each vent extending from the outer wall of the enlarged end 34 to the interior of the tapered inner bore 44 and bypassing the cup 40 and electrode collar 42. The vents 46 extend across the shoulder 36 and provide clearance over the peripheral edge of the socket 16 at said shoulder. The adapter 30 is locked in place by means of a plurality of small indentations 48 in the outer face of the sleeve portion 32 adjacent the shoulder 36. With the adapter held in the socket 16, portions of the end face 38 are peened into the indentations 48, as indicated at 50. This may be accomplished with a common punch and hammer or by any other suitable tool, the material from which the body 12 is made normally being soft enough to allow such deformation. To facilitate the peening operation, the indentations 48 are preferably disposed symmetrically between the vents 46, said vents thus serving as guides to the location of the indentations for positioning the punch or other peening tool.

In operation in an internal combustion engine, the sparks jump between the central electrode 18 and the surrounding electrode collar 42, at any position. Since the sparks are thus distributed around the electrode collar 42, there is no concentration of pitting or burning at any particular spot, resulting in extended electrode life. The cup 40 tends to hold an accumulation of explosive gases in immediate proximity to the spark, thus ensuring proper ignition. Due to the vents 46, the gases can circulate through the vents, in the socket 16 and between and around the electrode structure to prevent overheating and to prevent fouling.

While the vents 46 are preferable, certain types of engines operate at relatively low temperatures and, for such engines, the adapter may be made without vents at a reduced cost, while retaining all the other advantages of the structure. In the vented adapter, any number of vents may be used according to size and specific requirements.

While the adapter 30 is specifically intended for installation in existing spark plugs, modified by removal of the radially extending electrode tongue, it should be understood that the novel construction can be incorporated as part of the basic structure of a spark plug. As an addition to conventional spark plugs, the adapter offers greatly extended plug life at low cost, since the electrode element normally showing the greatest wear is removed when installing the adapter, the basic plug structure usually having a useful life well in excess of the electrodes. The adapter is thus applicable to used spark plugs which would normally be discarded, as well as offering improved performance from new or relatively new plugs.

Advantages claimed for this spark plug include the

features that it is non-fouling, capable of operating at the optimum spark gap with optimum spark size according to changing conditions of voltage, differential, temperature and pressure within the cylinder, elimination of manual spark gap adjustment, and smooth operation of the motor. Long sparks also jump between the flat end 28 of the electrode 18 and the adjacent inner surface of the cup 34. It should be noted, in this regard, that the taper of the cup may be altered considerably from that illustrated in the drawing or may be deleted and the inner surface made recti-cylindrical.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawing and the above recited objects. It will be obvious that all said objects are amply achieved by this invention.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawing are to be considered as merely illustrative rather than limiting.

I claim:

1. In combination: a spark plug having a body; said body having a threaded portion for insertion into a spark plug receiving bore and an internal socket in said threaded portion; a central electrode concentrically mounted in said socket; an adapter fixed in said spark plug; said adapter having a sleeve portion fitting closely into said socket; an enlarged end on said adapter having a shoulder engaging the end face of said threaded portion; an internal electrode collar in said adapter and concentrically spaced from said central electrode; and said adapter having a plurality of circumferentially spaced vents therein communicating from the outside of said enlarged end adjacent said shoulder to the inside of said sleeve portion within said socket; said sleeve portion having a plurality of indentations in the outer surface thereof adjacent said shoulder to receive deformations of said threaded portion, whereby said adapter is locked against displacement.

2. In combination: a spark plug having a body; said body having a threaded portion for insertion into a spark plug receiving bore and an internal socket in said threaded portion; a central electrode concentrically mounted in said socket; an adapter fixed in said socket of said spark plug; said adapter having a sleeve portion fitting closely into said socket; an enlarged end on said adapter having a shoulder engaging the end face of said threaded portion; an internal, annular grounded electrode collar in said adapter and concentrically spaced from said central electrode; said electrode collar having a tapered cup diverging toward the outer end of said adapter; said sleeve portion having a tapered inner bore diverging from said electrode collar; and said adapter having a plurality of circumferentially spaced vents therein communicating from the outside of said enlarged end adjacent said shoulder to said tapered inner bore.

3. In combination: a spark plug having a body; said body having a threaded portion for insertion into a spark plug receiving bore and an internal socket in said threaded portion; a central electrode concentrically mounted in said socket; an adapter fixed in said spark plug; said adapter having a sleeve portion fitting closely into said socket; an enlarged end on said adapter having a shoulder engaging the end face of said threaded portion; an internal electrode collar in said adapter and concentrically spaced from said central electrode; said electrode collar having a tapered cup diverging toward the outer end of said adapter; and said adapter having a plurality of circumferentially spaced vents therein communicating from the outside of said enlarged end adjacent said shoulder to the inside of said sleeve portion within said socket; said sleeve portion having a plurality of indentations in the outer surface thereof adjacent said shoulder to receive deformations of said threaded portion, whereby said adapter is locked against displacement; said indentations being circumferentially spaced substantially symmetrically between said vents.

4. A spark plug and adapter combination according to claim 1, wherein said central electrode has a flat end substantially planar with the end face of said threaded portion.

5. An adapter for a spark plug of the type having an externally threaded socket and an axially disposed central electrode, said adapter comprising: a sleeve portion; means to secure said sleeve portion in said socket, axially thereof and spaced from said electrode, said securing means comprising a plurality of circumferentially spaced indentations in the exterior surface of said sleeve portion, and an external shoulder on said sleeve portion adjacent to said indentations, whereby the shoulder may be employed as a stop to limit insertion of the sleeve portion into said externally threaded socket and thus to facilitate location of said indentations adjacent to the end of the externally threaded socket; said sleeve portion having an internal, annular electrode collar encircling said central electrode, whereby an annular spark gap is defined between said electrode collar and said central electrode.

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