Aug. 10, 1954 F. E. BERSTLER 2,685,872

SPARK PLUG WITH IMPROVED INSULATOR MEANS

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Fig. 1

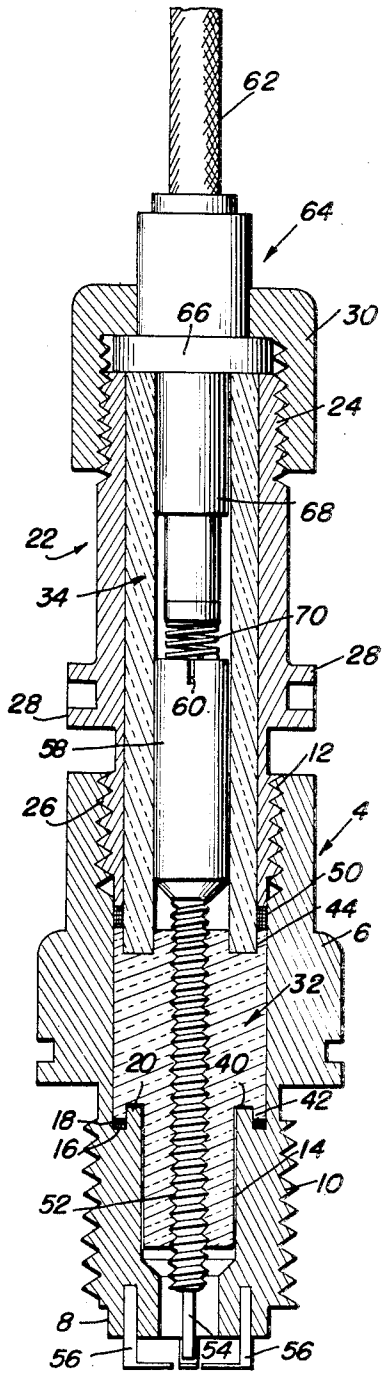


Fig. 2

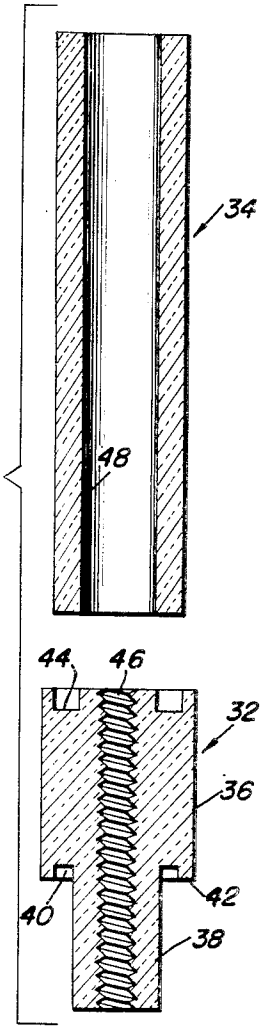
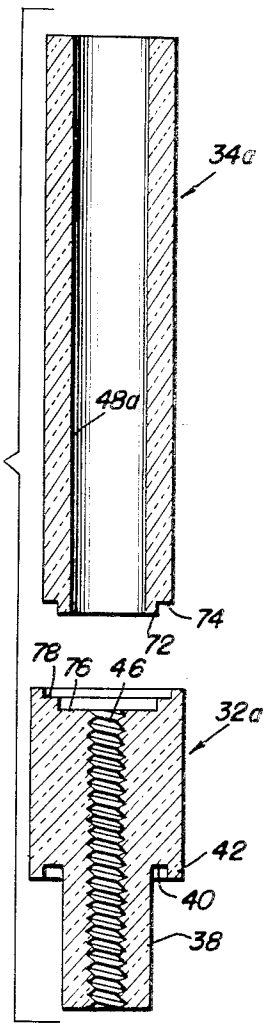


Fig. 3



Francis E. Berstler

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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SPARK PLUG WITH IMPROVED INSULATOR MEANS

Francis E. Berstler, Middletown, Pa., assignor of one-third to Charles V. Hoke, Hummelstown, and one-third to Ezra O. Brubaker, Elizabethtown, Pa.

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The present invention relates to certain new and useful improvements in spark plugs and has to do with a plug which is virtually leak-proof, whereby to prevent electrical current leakage and further to prevent gas leakage between the center or positive electrode and insulating jacket therefor as well as between said jacket and the complemental base and shell portions of the plug proper.

More specifically stated, one phase of the overall improved plug has to do with properly located leak-proofing gaskets or packing rings and the manner in which they are situated between the screw-threaded base and coacting portion of the insulator means.

Another object of the invention is to provide greatly improved insulator means which is structurally unique in that it is characterized by two complemental sections of dielectric material, said sections being susceptible of practical and expedient manufacture with the coacting ends of the sections telescopically interconnected to provide a leak-proof joint between themselves.

A further object of the invention is to provide insulator means wherein one section has a reduced lower end portion with associated recess means and wherein the other end is also provided with recess means, said section being axially bored and screw-threaded and being of a kind and grade of dielectric material which makes it possible and practical to produce the bore with a boring machine and to thereafter thread the bore without breakage or fracture and, at the same time, providing precision threads for direct screwing of a screw-threaded electrode shank therein.

A still further object of the invention is to provide a sectional insulating construction or means wherein the remaining or complemental section is of the same kind or grade of material and takes the form of a simple cylindrical tube or sleeve, the latter being cut to desired length from a long pre-formed tube, whereby to thus provide insulator means which meets the requirement and needs of manufacturers to an extent long desired in this line of endeavor.

Then, too, novelty is predicted on the two-part insulator means with the parts constructed as stated, in combination with a center or positive electrode having a reduced screw-threaded shank for coaction with the first named section and an enlarged head fitting the bore of the second named section, said head having a simple screw-driver kerf which is accessibly located in the bore of the second section to permit the electrode to be adjusted relative to said sections.

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Other objects and advantages will become more readily apparent from the following specification taken in conjunction with the drawings and subjoined claims.

In the accompanying sheet of drawings wherein like numerals are employed to designate like parts throughout the views:

Figure 1 is an assembly view with parts in section and other parts in elevation and showing a complete operative spark plug constructed in accordance with the principles of the instant invention;

Figure 2 is a sectional view of the sections which go to make up one form of insulator means; and

Figure 3 is a like sectional view showing a modified construction of the stated insulator means.

Reference is now made to Figure 1 wherein the base of the plug is denoted by the numeral 4. This is a somewhat conventional type of metallic base and includes a body portion 6 with a reduced lower end portion 8 externally screw-threaded at 10. The axial bore of the base is internally screw-threaded at the upper end, as at 12. The lower end of the bore in the base is reduced in cross-section, as at 14 and the intermediate portion of the bore is formed with an annular channel 16 in which a gasket or packing ring 18 of compressible material is located. The cross section of the gasket is less than the depth of the channel, as shown. The inner wall 20 of the channel provides an interlocking lip in a manner to be described.

The upper part of the plug body takes the form of a somewhat conventional cylindrical shell 22 which is also of metal, the upper end being externally screw-threaded at 24 and the lower end externally screw-threaded at 26 and screwed into the threads 12 in the base. The numerals 28—28 designate spanner wrench socket members. The numeral 30 denotes a screw cap which is threaded on the upper end 24.

The two-part insulator means comprises a lower or base section 32 and a complemental upper section 34. The base section, by itself is best shown in Figure 2 wherein it will be seen that it comprises a cylindrical body portion 36 having a reduced lower end portion 38 and having an annular groove 40 in said lower end providing a lip 42. There is a second channel 44 in the flat upper end of the body. These channels constitute "recess means" hereinafter referred to in the claims. This insulator section is provided with an axial screw-threaded bore 46. The upper section 34 is a simple cylindrical tube or sleeve whose bore 48 is a diameter considerably greater than

the screw threaded bore 46. The outside diameter of the tube or sleeve is such that the lower end thereof fits telescopically in a leak-proof manner into the groove 44. In the assembly view in Figure 1 it will be seen that the lip 29 of the base extends into the channel 40 and the lip 42 in the insulator section extends into the channel 16 thereby providing an interlocking joint which is rendered substantially leak-proof by the associated compressible packing ring 18 in an obvious manner.

There is a second compressible gasket ring 50 and this encircles the lower end portion of the insulator sleeve 34, rests upon the flat upper end of the insulator section 32 and is interposed between the latter, the lower end of the shell 22 and the surrounding wall of the body 6, whereby to provide a second leakproof seal or joint.

The positive or center electrode comprises a reduced screw threaded stem or shank 52 which is adjustably threaded through the bore 46. This terminates in a contact 54 cooperating with the negative electrodes or contacts 56—56 on the base extension 8. The upper end of the electrode is formed into a large cylindrical head 58 which fits with requisite nicety into the bore of the upper insulated section or sleeve 34. The upper end of the head is provided with a screw driver kerf which is accessible for adjusting the electrode and consequently adjusting the contacts 54 and 56.

The conductor is denoted by the numeral 62 and is provided with a somewhat conventional adaptor and fitting 64 having a retaining flange 66 held in place by the cap 30 and a reduced portion 68 extending into the bore of the insulator sleeve and the desired electrical connection with the electrode head is made by coil spring 70.

At this point in the description it is to be explained that the sections 32 and 34 of the electrode means may be of the same kind of material although this is not absolutely essential. The upper section should be made from strong dielectric material which can be turned out in long tubes and the tubes then severed into sections of the desired size, whereby to render the manufacturing step of a two-part insulator construction feasible and practical. It is to be remembered that most insulators are of one-piece construction. Here the insulator is made up of two sections 32 and 34, with the sections fitting together by way of the recess means 44. More importantly, the section 32 must be made of material of special mineral content, of a material which permits said section 32 to be satisfactorily machined or otherwise formed to the shape shown in Figure 2. What is more, the material must, of necessity, be substantially fracture proof for it is, as stated, a primary object of the invention to utilize an insulator section whose axial bore may be machined with no likelihood that the walls of the bore will fracture or break and which, in addition, has to be such that it may be tapped with a threading die to produce threads which are as accurate in gauge and kind as would be the case if said section 32 were of metal or some other material which is susceptible of being precision bored and tapped. These properties are not found in porcelain or any other insulators of equivalent material generally known. Since the section 34 does not have to be machined but may be molded it does not necessarily have to be of the same kind of material as the companion section 32. This is an important aspect of the overall problem because the part 32 will be of expensive material while the part 34 can be comparatively inexpensive. But what is of chief importance, the insulator is made up of independent readily assembled sections which lend themselves to the effective use depicted in Figure 1 of the drawings.

In the modification seen in Figure 3 the sleeve section is of insulation material and denoted by the numeral 34*a*, the bore being denoted at 48*a*. The structural difference here is that the lower end 72 is reduced to provide an endless shoulder 74, these features 72 and 74 fitting into the stepped recesses 76 and 78 respectively, in the section 32*a*. Otherwise, this part is the same as 32. Therefore, the same numerals used in Figure 2 are used likewise in Figure 3.

This invention is an improvement on the subject matter disclosed in co-pending application Serial No. 185,977 filed September 21, 1950, now Patent No. 2,626,595.

It is thought that persons skilled in the art to which the invention relates will be able to obtain a clear understanding of the invention after considering the description in connection with the drawings. Therefore, a more lengthy description is regarded as unnecessary.

Minor changes in the shape, size and arrangement of details coming within the field of invention claimed may be resorted to in actual practice, if desired.

Having described the invention what is claimed as new is:

1. A spark plug comprising an axially bored metallic base provided with external screw threads and negative electrode means at one end and internal screw-threads at the other end, said bore being reduced in diameter at the externally screw-threaded end and provided with an annular channel, a compressible gasket mounted in said channel, an axially aligned metallic cylindrical shell having a screw-threaded end screwed into the internal screw-threads in said base, a first insulator section fitted wholly into the bore in said base and having a reduced lower end portion telescoping into the reduced end of said bore and further having its lower end formed with an annular channel interlocked with the first named annular channel and coacting with said gasket to provide a sealed joint, the upper end of said insulator section having groove means, a second insulator section of a length greater than the length of said first section, fitted into said shell and having its lower end telescoping into said groove means and having precision gas-proof engagement with said first section, additional gasket means encircling said second section and jammed between the latter, the first section, and lower end of said shell, said second section being of uniform diameter from end to end and of an outside diameter less than the outside diameter of said first section, said first insulator section being of a hard fracture-proof machinable dielectric material which is susceptible of being precision-machined to assume a predetermined external shape, also machine-bored, said bore being precisely screw-threaded, and an adjustable positive electrode having an accurately screw-threaded shank screwed into and all the way through and beyond said bore.

2. For use in a spark plug, a two-part insulator comprising a machine-bored and screw-threaded base section and a companion tubular second section, the latter being of uniform cross-sectional diameter from end to end and of a length

greater than said base section, the upper end of said base section having groove means exactingly machined therein, the lower end of said second section fitting telescopically and accurately in said groove means and having positive leak-proof engagement with said base section, and the lower end of said base section having an annular channel and a reduced portion extending axially beyond said lower end, said base section consisting of a grade and kind of fracture-proof dielectric mineral which is capable, without breakage, of being machine-shaped exteriorly.

3. The structure defined in claim 2 and the combination therewith of a positive electrode having a reduced screw-threaded shank screwed into the bore of said base section and an enlarged head portion fitting snugly in the bore of said second section, said head having an accessible screwdriver kerf for adjusting said electrode relative to said sections.

4. For use in a spark plug, a sectional insulator comprising a first base-forming section having a body of cylindrical cross-section, the upper end of said body being flat and provided with an endless groove concentric to the lengthwise axis of the body, the lower end of said body being reduced in cross-section and providing an axial extension, said lower end of the body being provided with an endless groove concentrically encircling that part of the reduced portion which is joined with the body portion, said section being of rigid fracture-proof non-metallic dielectric

mineral material which is inherently capable of being formed to a given shape and then machined exteriorly to provide the desired over-all exterior shape, said section being machine-bored axially and then tapped and screw-threaded to provide a screw-threaded bore opening through the upper and lower ends, and a second complemental section, the latter being a cylindrical tube of a length greater than said first section and of uniform diameter from end-to-end and of an external diameter less than the external diameter of the body of the first section and having a bore opening through its opposite ends and of a diameter greater than the bore in said first named section, the lower end of said second section fitting telescopically into said groove and providing a snug gas-proof junctural connection between the sections.

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