

Feb. 24, 1942.

H. RABEZZANA

2,273,990

METHOD OF MAKING SPARK PLUGS

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2 Sheets-Sheet 1

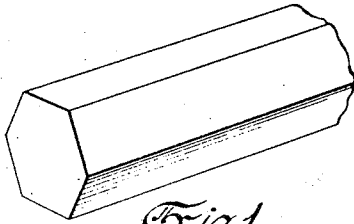


Fig. 1

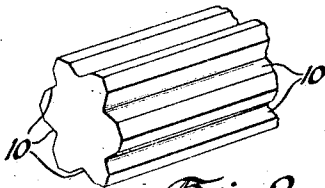


Fig. 2

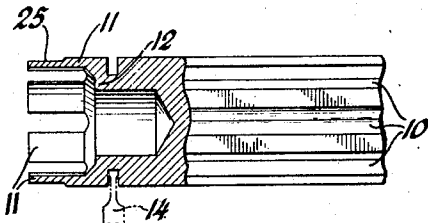


Fig. 3

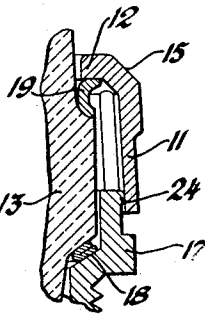


Fig. 4

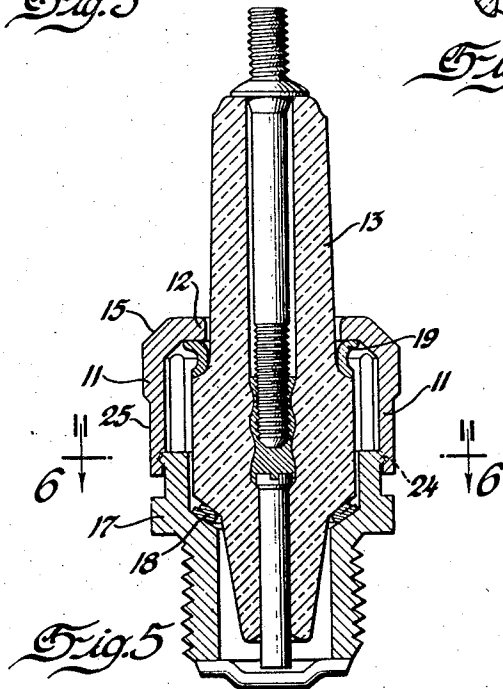


Fig. 5

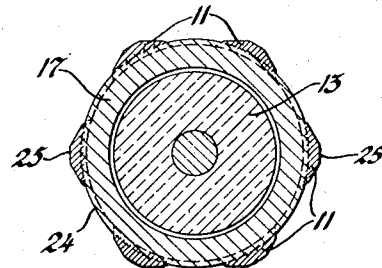


Fig. 6

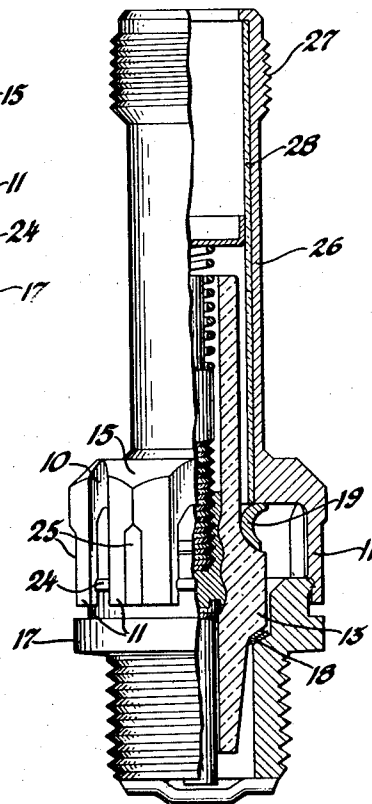


Fig. 7

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2 Sheets-Sheet 2

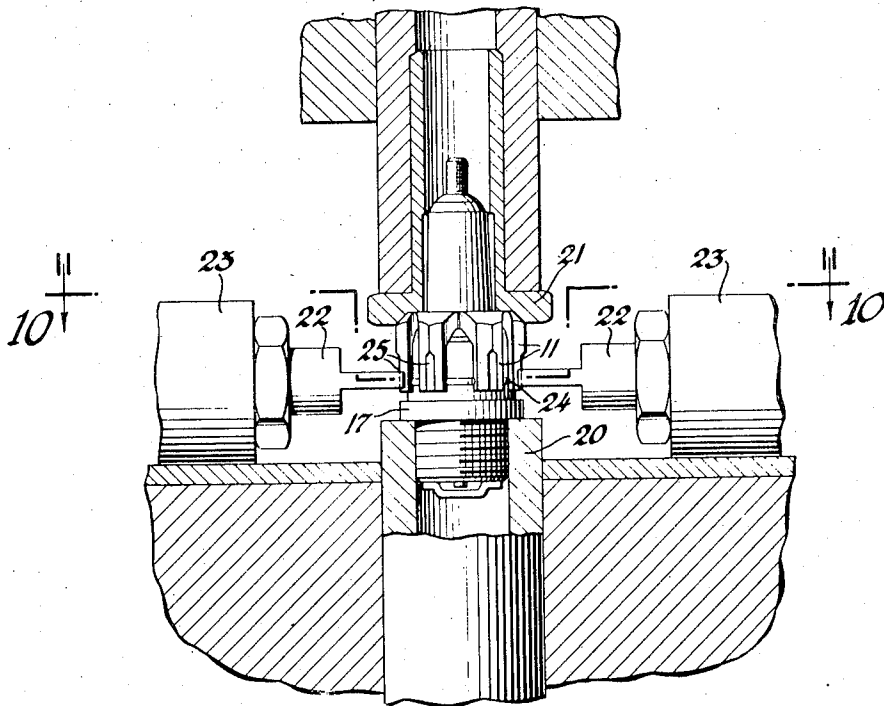


Fig. 9

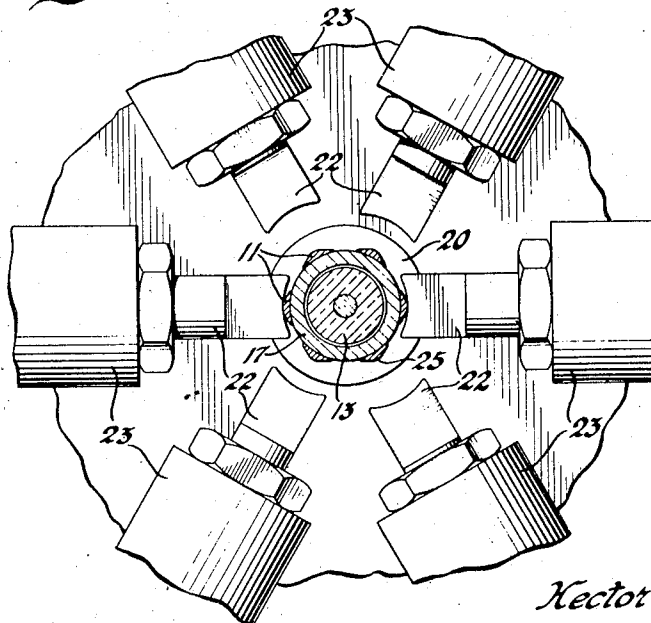


Fig. 10

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING SPARK PLUGS

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3 Claims. (Cl. 29—155.51)

My invention relates to spark plugs wherein the insulating member is held in place within the shell or casing by a securing member having large openings in its peripheral wall, whereby the surrounding atmosphere has free access to the outer part of the insulating member and better cooling of the plug is secured; and the same consists in an improved method of making a holding member for securing the insulating member of a spark plug assembled with the other elements thereof; said insulator securing member being made from hexagonal bar stock by performing certain milling, boring, cutting-off and equivalent operations upon said bar; whereby features of construction of said insulator securing member hereinafter enumerated are provided. My invention consists, further, in the method of making a complete spark plug by assembling a securing member made as herein-after explained with a suitable insulating member, suitable gaskets, and a shell designed to screw into a threaded opening in an internal combustion engine cylinder; and in welding the extremities of certain spaced lugs of said securing member, produced in the manufacture thereof, to the free upper or outer end of said shell.

Referring now to the drawings for a more complete understanding of the method wherein my invention consists:

Figure 1 is a view showing a hexagonal bar used in making insulator securing members for spark plugs in accordance with my invention.

Figure 2 is a view showing the bar shown in Figure 1 as having been provided with a groove in each of its six faces.

Figure 3 is a view showing an insulator securing member formed upon the end of said bar, but not cut off therefrom.

Figure 4 is a fragmentary sectional view illustrating my invention.

Figure 5 is a view showing a section upon a central plane extending longitudinally thereof, of a spark plug made in accordance with my invention.

Figure 6 is a view showing a section upon a transverse plane indicated by the line 6—6, Figure 5.

Figure 7 is a sectional view similar to Figure 5, showing how a spark plug having radio shielding features may be made in accordance with my invention.

Figure 8 is a view illustrating an alternative step which may be made use of in performing the method wherein my invention consists.

Figure 9 is a view showing conventional weld-

ing apparatus in side elevation, usable for welding the extremities of depending lugs of the insulator securing member to the upper end of the shell of a plug.

Figure 10 is a similar view showing conventional welding apparatus in plan, as seen looking down from a transverse plane indicated by the broken line 10—10, Figure 9.

In the drawings, Figure 2 is a view showing a longitudinally grooved bar such as is used in making insulator securing members in accordance with the method wherein my invention consists. It may be made by a maker of spark plugs by milling or otherwise providing a longitudinally extending groove in each of the six exposed faces of a hexagonal bar, such as is shown in Figure 1; or such a bar may be rolled or drawn at the rolling mill, or grooves may be milled or otherwise provided in the exposed faces of such a hexagonal bar as is shown in Figure 1 before it is supplied to the manufacturer of the plugs.

A bar of the form shown in Figure 2 having longitudinally extending grooves 10 having been provided, a central portion thereof of a diameter sufficiently large to eliminate the bottoms of the grooves is removed from one end of the bar, see Figure 3, which step provides attaching lugs 11 spaced apart from one another and the lower ends of which are adapted to be welded to the upper end of a spark plug shell or casing 17. Figure 3 shows how the step of removing the central portion of relatively large diameter from the end of the bar eliminates the bottoms of the grooves and provides the spaced apart attaching lugs. A second central portion of smaller diameter than and disposed beyond the portion removed to provide the lugs 11, is also removed from the end of the bar to thereby provide an inwardly extending annular ledge 12 through which the insulating member 13 of the plug extends; and the insulator securing member thus produced is cut off from the end of the bar by a transversely movable tool 14. The upper end of the insulator securing member is commonly chamfered, as shown at 15, which may be done by an inclined cutting edge upon the tool 14 or by a separate and distinct instrument or device.

The larger central portion of the grooved bar is commonly removed by rotating the same by the chuck of a machine tool of the turret lathe type, and feeding a tool of the drill type into the end of the bar; and the smaller portion which lies beyond said larger portion and provides the ledge 12 is preferably produced in the same way

by a tool of smaller diameter, which may be either an extension of the larger tool which removes the bottoms of the grooves or a separate and distinct tool.

As an alternative procedure the insulator securing member with attaching lugs provided as hereinbefore explained, may be cut from the end of the bar before an inwardly extending ledge like the ledge 12 is provided, thus leaving said member with an imperforate end wall 16, as shown in Figure 8, the central portion of which will be removed by drilling or otherwise to provide an inwardly extending annular ledge which surrounds the insulating member in the finished plug.

In making a complete spark plug an insulator securing member made in accordance with my improved method and having the features of construction and operation hereinbefore enumerated is assembled with a shell or casing 17 having a lower threaded portion adapted to screw into a threaded opening in an internal combustion engine cylinder; an insulating member 13 hereinbefore referred to; and suitable gaskets 18, 19 as shown in Figures 4 and 5; except that when first assembled the lower ends of the lugs 11 are not yet welded to the upper end of the casing 17. The assembly thus formed is then placed between pressure applying members 20, 21 of a suitable press, as indicated conventionally in Figure 9; and pressure applied by the press compresses the gaskets 18, 19 sufficiently to secure gas tightness in the plug. While pressure is maintained and the gaskets are held under compression the lower ends of the lugs 11 are electrically welded to the upper end of the shell 17 by current supplied through electrodes 22 adapted to engage the lower ends of the lugs 11.

Six electrodes are used so that plug does not have to be rotated to bring the lugs into line with the electrodes; and oppositely disposed pairs of them are operated in unison as appears in Figure 10 to press the lower ends of the lugs 11 against the periphery of the shell while the welding is being done, by fluid operated pistons within cylinders 23, one associated with each electrode. Any suitable welding apparatus may, however, be used in making a spark plug in accordance with my invention; and the showing of such a suitable welding apparatus is intended to be and is in fact conventional only.

The circumferentially extending bead 24 at the upper end of the casing 17 is to localize the heating during the welding of the lower ends of the lugs 11 to the shell; and the flat faces 25 provided by chamfering the angles of the hexagonal bar are for securing enlarged areas of contact and better bearings between the lugs 11 and the welding electrodes 22.

Figure 7 shows an insulator securing member

made from a hexagonal bar by the method hereinbefore described, and having lugs 11 the lower ends of which are welded to the shell or casing 17 of the plug; and in which the insulator securing member has an upwardly extending shield tube 26 threaded at its upper end 27 so that it may be used as a part of a shielding system for preventing the high tension ignition current supplied to the spark plugs from interfering with adjacent radio receiving apparatus. The shield is usually provided with a lining 28 of insulating material; and it is commonly made in a turret lathe by the same general method steps employed in making an insulator securing member of the form first herein described. This radio shielding form of my invention is assembled with and secured to the casing of the plug by welding the lugs 11 thereto, as hereinbefore explained, and by apparatus such as is shown conventionally in Figures 9 and 10; the upper pressure applying member 21 being modified so as to receive the shield tube 26 as will be understood.

Having thus described and explained my invention I claim and desire to secure by Letters Patent:

1. The method of making an insulator securing member for a spark plug which consists in providing a hexagonal bar having a longitudinally extending groove in each of its six exposed faces; removing a central portion of a diameter such that the bottoms of said grooves are cut away during such removing step from one end of said bar, to thereby provide a series of separate and independent attaching lugs spaced apart from one another; removing a second central portion continuous with and of lesser diameter than said first portion from said bar to thereby provide an inwardly extending annular ledge located beyond said attaching lugs; and severing the part thus formed from said bar beyond said inwardly extending ledge.

2. The method of making a spark plug which consists in making an insulator securing member in accordance with the method defined in claim 1; assembling said insulator securing member with an insulator and with a spark plug shell; and welding the extremities of said lugs to the upper end of said shell.

3. In a method of making an insulator securing member for a spark plug from a hexagonal bar having a longitudinally extending groove in each of its exposed faces, the step which consists in removing a central portion of a diameter such that the bottoms of said grooves are cut away during such removing step, from one end of said bar, thereby providing a series of separate and independent attaching lugs spaced apart from one another.

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