F. M. FURBER.

SPARK PLUG.

APPLICATION FILED AUG. 22, 1912.

1,084,543. Patented Jan. 13, 1914

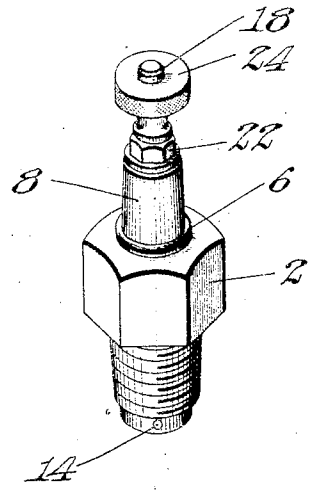


Fig. 1.

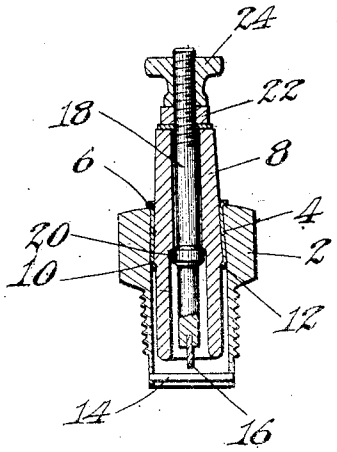


Fig. 2.

WITNESSES.
Harlow M. Davis
Sophronia P. Marsh.

INVENTOR.
Frederick M. Furber
By his attorney
J. H. McCready.

UNITED STATES PATENT OFFICE.

FREDERICK M. FURBER, OF BEACHMONT, MASSACHUSETTS.

SPARK-PLUG.

1,084,543. Specification of Letters Patent. Patented Jan. 13, 1914.

Application filed August 22, 1912. Serial No. 716,420.

To all whom it may concern:

Be it known that I, FREDERICK M. FURBER, a citizen of the United States, residing at Beachmont, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Spark-Plugs, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to spark plugs. Considerable trouble is experienced with the devices of this character commonly used in internal combustion engines due to the cracking of the insulator that electrically separates the electrodes. This result is caused partly by the fact that too great pressure often is applied to the insulator by the clamping devices that hold it in the plug, but more particularly by the fact that the insulator is unable to withstand the pressure produced by the sudden and extreme changes in temperature to which it is subjected while in use.

It is a particular object of this invention to devise a construction in which liability of injury to the insulator from these causes shall be eliminated.

The invention further aims to provide a device of this character which, while of substantial and durable construction, can be cheaply manufactured.

The invention will be readily understood from the following description when read in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of a spark plug constructed in accordance with the invention; and Fig. 2 is a central, longitudinal sectional view of the device shown in Fig. 1.

The spark plug shown comprises a body 2 which may be made from tubular stock having a hexagonal cross sectional outline. This body is turned down for a considerable distance back from one end and the turned portion is threaded to enable the body to be screwed into an engine cylinder in the usual manner, the unturned portion having suitable surfaces for the application thereto of a wrench. The interior of the body is reamed out to form a bore that is cylindrical for a distance from the inner end of the body (that is, the end that is to be inserted in the cylinder) and then tapers gradually toward the outer end of the body. It will be evident that all the machine work on the body can be performed automatically in a screw machine.

A bushing 4, tapered to conform to the tapered portion of the bore in the body 2, is fitted snugly into said bore and is provided with an out-turned flange 6 resting upon the outer end of the body. The insulator 8, which may be made of porcelain, lava, or any other suitable material, has a tapered portion fitting snugly within the bushing 4. Below this tapered portion the insulator is reduced in diameter, forming a shoulder 10 which forms a seat for an in-turned flange 12 provided at the inner end of the bushing 4.

It will be clear from an inspection of Fig. 2 that the arrangement of tapers above described locks the insulator against movement out of the body 2 in one direction, while the bushing 4 with its flanges 6 and 12 prevents any movement of the insulator in the opposite direction. Preferably, the bushing 4 is made of soft metal such, for instance, as aluminum, (although many other metals and alloys may be used for this purpose) since a material of this character seems to yield sufficiently to maintain a tight joint between the body and the insulator, and yet relieves to some extent the pressure to which the insulator is subjected due to sudden changes in temperature, thus avoiding the cracking of the insulator above described. The bushing 4 may consist merely of a piece of tubing of substantially uniform thickness, the tapered form being produced by forcing a suitably shaped plunger into it.

The plug may be assembled by inserting the insulator 8 in the bushing 4, the bushing previously having been tapered as above described, and then swaging the inner end of the bushing over the shoulder 10 to form the flange 12. The insulator and bushing may then be forced into the body 2 and held firmly in the tapered portion of the bore while the outer end of the bushing is swaged over to form the flange 6. A preferable method of assembling the plug, however, consists in forcing the piece of tubing, which later will form the bushing 4, into the body 2 by means of a suitably tapered plunger while the body is heated to a temperature as high as the maximum temperature to which it will be subjected in use. The outer end of the body should be supported during this operation on a die shaped

to turn over the end of the bushing 4 so that this operation will shape the bushing to the taper of the body and also form the flange 6. After this operation the insulator is forced into the bushing 4 and the inner end of the bushing is swaged over the shoulder 10 by a suitably shaped tool. This construction avoids the use of clamping devices for holding the insulator that can be operated by the user of the plug to increase the pressure on the insulator with the consequent liability of breaking it.

The electrodes may be of any convenient construction. As shown, one electrode 14 consists of a pin extending diametrically across the bore of the body 2 and having its ends supported in said body close to the inner extremity of the body. A coöperating electrode, comprising an electrode tip 16 made of any well known material capable of resisting the disintegrating action of the spark, is set into the end of an electrode rod 18 that is provided with a shoulder 20, which is seated at the end of a counter bore formed in the insulator 8 and coöperates with a washer resting on the outer end of the insulator, and a nut 22 threaded on the rod 18 and bearing against said washer to secure the rod firmly in the insulator. A binding nut 24 also is threaded on to the electrode rod 18 and serves to clamp in operative position the conductor by which the plug is connected to the ignition system. If desired, one end of the body 2 may be utilized as one electrode and the electrode 14 may be omitted, the electrode rod 18 being bent to position the tip 16 within sparking distance of the wall of the body.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A device of the character described comprising a body having a tapered bore, an insulator positioned in said body and having a portion tapered in the direction of the taper of said bore, a bushing interposed between and in engagement with the tapered surfaces of said insulator and said body and serving to hold the insulator against movement out of the body in one direction, said bushing having parts engaging respectively with said body and said insulator and operating to hold the insulator against movement out of the body in the opposite direction, and electrodes electrically separated by said insulator.

2. A device of the character described comprising a body having an externally threaded portion and a bore formed therethrough tapered toward the outer end of said body, a tapered bushing of substantially uniform thickness fitting in the tapered portion of said bore, an insulator tapered to conform substantially to the taper of said bushing and fitting in said bushing, said insulator having a reduced shoulder within said body, an inturned flange on said bushing engaging said shoulder, an outturned flange on said bushing engaging the outer end of said body, and electrodes electrically separated by said insulator.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK M. FURBER.

Witnesses:
SOPHRONIA P. MARSH,
HARLOW M. DAVIS.