Jan. 9, 1945. H. R. FEICHTER 2,366,778

ARBOR CHUCK

Filed June 18, 1942

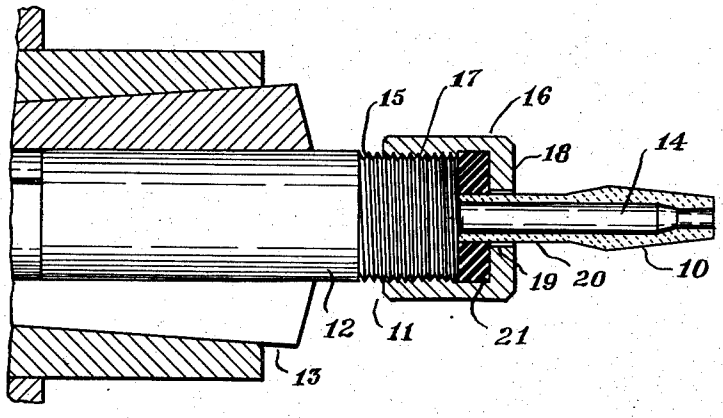



Fig. 1

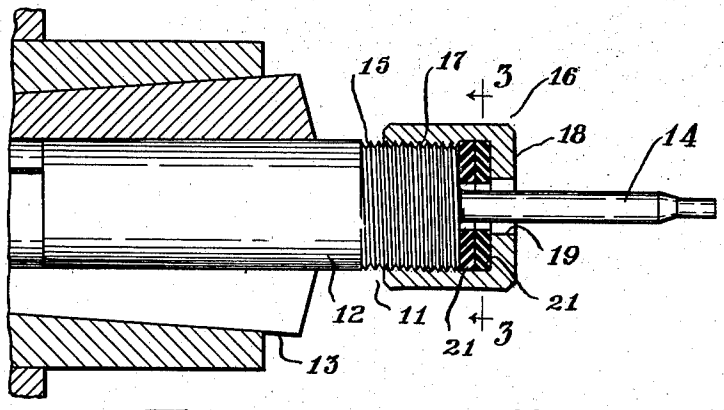



Fig. 2

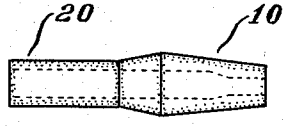



Fig. 4

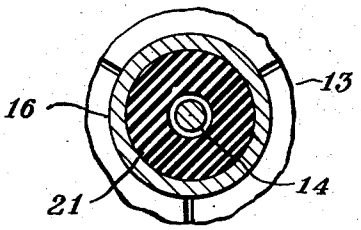



Fig. 3

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2,366,778

## ARBOR CHUCK

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Application June 18, 1942, Serial No. 447,545

10 Claims. (Cl. 279—102)

My invention relates to arbor chucks, and more particularly to arbor chucks for use in polishing ceramic spark plug insulators of the type set forth in my application for United States Letters Patent for Spark plug manufacture, filed May 20, 1942, Serial No. 443,733, now Patent No. 2,351,029, issued June 13, 1944.

The ceramic spark plug insulators shown in said application, Serial No. 443,733, include a fired ceramic body having a generally tubular form and on which certain of its fired surfaces are made smooth by mechanical polishing to remove the usual projections formed after firing and which projections surround pits.

By mechanical polishing the selected surfaces of such a ceramic spark plug insulator, the projections are reduced and the polished surfaces on the body, such as the tip, nose, and shoulder surfaces are smooth and substantially free from the projections and intervening pits, for attaining the advantages set forth in said application, and including facilitating the seal of the insulator at its shoulders in its metal shell in the spark plug of which it is a part, and minimizing deposit of carbon on its tip and nose and facilitating cleaning the tip and nose.

The material of such an insulator is preferably very hard, approaching the hardness of a diamond, but is subject to fracture when gripped by the metal jaws of a usual chuck.

The objects of the present invention include the provision of an improved arbor chuck adapted for securely gripping the neck of a ceramic spark plug insulator and the like, without slipping during subsequent polishing operations, and without crushing or fracturing the material of the insulator and the like.

The foregoing and other objects are attained by the arbor chuck apparatus, parts, combinations, and sub-combinations, which comprise the present invention, the nature of which is set forth in the following general statement, and preferred embodiments of which, together with their mode of use, are set forth by way of example in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improved arbor chuck of the present invention may be stated in general terms as including a shank preferably adapted for being gripped by the metal jaws of a usual lathe chuck or the like.

An arbor or mandrel extends from one end of the shank which is the outer end when the shank is gripped by the jaws of a lathe chuck or the like.

The outer end of the shank has formed thereon external threads, and a clamp sleeve nut has in one of its ends internal threads which screw on the shank threads, and has an annular clamp flange on its other or outer end.

The central preferably circular opening defined by the clamp flange is slightly larger in diameter than the diameter of the neck of the insulator or workpiece which fits on the arbor.

Between the clamp flange of the nut and the outer end face of the shank, are located one or more rubber washers each having a substantial thickness, and the arbor thus extends through the rubber washers and clamp sleeve nut.

Each rubber washer is shaped to accurately fit the interior of the clamp nut and the exterior of the insulator or other workpiece gripped in the improved arbor chuck by tightening the clamp nut and compressing the rubber washers and gripping the neck of the insulator and the like on the arbor and inserted in the holes of the rubber washers.

By way of example, embodiments of the improved arbor chuck and improved parts of the present invention are illustrated in the accompanying drawing forming part hereof, in which

Figure 1 is a side elevation with portions in longitudinal axial section showing one of the improved arbor chucks in use gripping a ceramic spark plug insulator, the arbor chuck being gripped by jaws, shown in fragmentary form, of a lathe chuck or the like;

Fig. 2, a view similar to Fig. 1, showing the use of two rubber washers in the improved arbor chuck instead of the single rubber washer shown in Fig. 1, and showing the parts before the placing of the ceramic spark plug insulator on the arbor and insertion into the hole of the rubber washers;

Fig. 3, a fragmentary transverse view thereof as on line 3—3, Fig. 2; and

Fig. 4, a detached elevation view of the insulator shown being gripped in the improved arbor chuck in Fig. 1.

Similar numerals refer to similar parts throughout the several views.

The ceramic spark plug insulator indicated generally by 10 is generally tubular in form, and in order to provide external mechanically polished surfaces on the insulator 10, and thus produce the improved insulator set forth in my application for United States Letters Patent for Spark plug manufacture, filed May 20, 1942,

Serial No. 443,733, it is necessary to secure the the insulator 10 for rotation, preferably about its longitudinal axis.

The material of the ceramic spark plug insulator 10 particularly when made with a body as described in said application Serial No. 443,733, is very hard, approaching the hardness of a diamond, but is subject to fracture or crushing when gripped by the metal jaws of a usual chuck.

The improved arbor chuck of the present invention is indicated generally by 11, and includes a shank 12, preferably cylindric in form, and which is arranged for rotation about its longitudinal axis in use, as by being gripped by the jaws 13 of a lathe chuck or the like.

An arbor or mandrel 14 extends coaxially with the longitudinal axis of the shank 12 from its outer end. As shown the arbor 14 is integral with the shank 12, but may be separable by providing a bore in the shank and locating the inner end of the arbor in the bore. As shown and preferably, the arbor 14 is externally cylindric.

The outer end of the shank 12 has formed thereon external threads 15.

A clamp sleeve nut 16 has in one end internal threads 17 which screw on the shank threads 15, and the sleeve nut 16 has on its other end an annular clamp flange 18.

The central circular opening 19 defined by the flange 18 is slightly larger in diameter than the diameter of the cylindric neck 20 of the insulator 10 as shown which fits on the cylindric arbor 14 preferably with the end face of the neck 20 abutting the outer end face of the shank 12.

Within the sleeve nut 16 and between the flange 18 thereof and the outer end face of the shank 12, one or more resilient washers 21 are located.

The washers 21 are preferably made of rubber and have holes which must be accurately punched in true form, usually circular or cylindric, to fit the cylindric neck 20 of the insulator 10, and likewise the outer peripheries of the rubber washers 21 must be of true form, preferably circuit or cylindric, to fit the preferably cylindric bore of the clamp sleeve nut 16.

The arbor 14 thus extends through the rubber washers 21 and the clamp sleeve nut 16.

In using the improved arbor chuck 11, the sleeve nut 16 is loosened on the threads 15, and an insulator 10 is inserted on the arbor 14 through the flange opening 19 and the holes of the washers 21 with the inner end of the neck 20 of the insulator 10 abutting the outer end face of the shank 12.

The nut 16 is then screwed up or tightened on the threads 15 compressing the rubber washers 21 and causing a gripping action of the surfaces of the holes of the rubber washers on the neck 20 of the insulator 10 and between the outer surfaces of the washers 21 and the inner surfaces of the sleeve nut 16 and the outer end face of the shank 12.

The insulator 10 is thus gripped securely in the improved chuck 11 without slipping during the subsequent polishing operations, and without fracturing or crushing. The arbor 14, however, extends through the rubber washers 21, and being coaxial with the shank 12, serves to maintain the tubular insulator 10 for rotation about its longitudinal axis, as is necessary during the polishing operations.

The polishing or other operations performed on the ceramic spark plug insulator 10 as thus secured in the improved chuck 11 may be according to usual lapping operations as set forth in said application Serial No. 443,733, or otherwise as may be desired.

If the holes or the outer peripheries of the rubber washers 21 are rough and not of true form, preferably circular or cylindric, to fit the cylindric neck of the insulator 10 and the cylindric interior of the sleeve nut 16, there is not sufficient surface contact between the parts of the chuck and the insulator to effect clamping without slipping.

The true form of holes of the rubber washers, or resilient annular members 21, is likewise with respect to the cylindric outer surface of the arbor 14. Also from a broad standpoint, the cylindric bore surface of the clamp sleeve nut 16, and the outer peripheral surface of the resilient annular members 21 may be described as abutting surfaces of true form and extending longitudinally of the arbor and being radially spaced therefrom, the abutting surfaces fitting each other when the resilient member is uncompressed.

The embodiments of the present invention illustrated and described herein are by way of example, and the scope of the present invention is not limited to the same or to the particular details thereof but is commensurate with any and all novel subject matter contained herein which may at any time properly under the United States patent laws be set forth in the claims hereof or originating herein, and the elements of any such claims are intended to include their functional or structural equivalents.

I claim:

1. In an arbor chuck adapted for gripping and securing a tubular member of ceramic material and the like for rotation without slipping when subject to polishing operations and the like and without crushing or fracturing, a shank adapted for rotation about an axis, screw threads on the shank, a clamping sleeve having screw threads coacting with the shank threads and having an annular clamping flange spaced from an adjacent end of the shank, a resilient annular member within the clamping sleeve between the clamping flange and the adjacent end of the shank, the clamping flange and the resilient annular member having central openings, and an arbor extending from the end of the shank adjacent the clamping flange and through the openings of the resilient annular member and the clamping flange, the resilient annular member having its outer periphery fitting with true form the interior of the clamping sleeve when the resilient annular member is uncompressed by the clamping sleeve, and the opening of the resilient annular member being sized to fit with true form the outer surface of a tubular member fitting on the arbor and having an end extending through the openings of the clamping flange and the resilient annular member.

2. In an arbor chuck adapted for gripping and securing a tubular member of ceramic material and the like for rotation without slipping when subject to polishing operations and the like and without crushing or fracturing, a shank adapted for rotation about an axis, screw threads on the shank, a clamping sleeve having screw threads coacting with the shank threads and having clamping flange means spaced from an adjacent end of the shank, resilient annular means within the clamping sleeve between the clamping flange means and the adjacent end of the shank, the clamping flange means and the resilient annular means having central openings, and an arbor extending from the end of the shank adjacent the

clamping flange means and through the openings of the resilient annular means and the clamping flange means, the resilient annular means having its outer peripheral portions fitting with true form the interior of the clamping sleeve when the resilient annular means is uncompressed by the clamping sleeve, and the opening of the resilient annular means being sized to fit with true form the outer surface of a tubular member fitting on the arbor and having an end extending through the openings of the clamping flange means and the resilient annular means.

3. In an arbor chuck adapted for gripping and securing a tubular member of ceramic material and the like for rotation without slipping when subject to polishing operations and the like and without crushing or fracturing, a shank adapted for rotation about an axis, clamping sleeve means adjacent one end of the shank and having annular clamping flange means spaced from the adjacent end of the shank, screw means associated with the shank and the clamping sleeve means for varying the position of the sleeve with respect to the shank, resilient annular means within the clamping sleeve means between the clamping flange means and the adjacent end of the shank, the clamping flange means and the resilient annular means having central openings, and an arbor extending from the end of the shank adjacent the clamping flange means and through the openings of the resilient annular means and the clamping flange means, the resilient annular means having its outer peripheral portions fitting with true form the interior of the clamping sleeve means when the resilient annular means is uncompressed by the clamping sleeve means, and the opening of the resilient annular means being sized to fit with true form the outer surface of a tubular member fitting on the arbor and having an end extending through the openings of the clamping flange means and the resilient annular means.

4. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, a shank adapted for rotation about an axis, external screw threads at one end of the shank, a clamping sleeve having a bore with internal screw threads coacting with the external shank screw threads and having an annular clamping flange spaced from the threaded end of the shank, a resilient annular member fitting with true form in the bore of the sleeve between the clamping flange and the threaded ends of the shank, the clamping flange and the resilient annular member having central openings, and an arbor extending from the threaded end of the shank through the openings of the resilient annular member and the clamping flange, and the central opening of the resilient annular member having a true form with respect to the outer surface of the arbor.

5. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, an arbor adapted for fitting in the bore of a tubular member, a resilient member having an opening therethrough of true form with respect to the outer surface of the arbor, the arbor extending through the resilient member opening, means for compressing the resilient member and gripping a tubular member fitting on the arbor and extending through and fitting the opening of the resilient member, the compressing means and the resilient member having abutting surfaces of true form and extending longitudinally of the arbor and being radially spaced therefrom, the abutting surfaces fitting each other when the resilient member is uncompressed.

6. In arbor chuck adapted for gripping a tubular member of ceramic material and the like, an arbor adapted for fitting in the bore of a tubular member, a resilient member having an opening therethrough of true form with respect to the outer surface of the arbor, the arbor extending through the resilient member opening, means for compressing the resilient member and gripping a tubular member fitting on the arbor and extending through and fitting the opening of the resilient member, the compressing means and the resilient member having abutting surfaces of true form and extending longitudinally of the arbor and being radially spaced therefrom, the abutting surfaces fitting each other when the resilient member is uncompressed, and means connected with the arbor and compressing means and adapted for rotation and for rotating the arbor and compressing means with each other.

7. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, an arbor adapted for fitting in the bore of a tubular member, a plurality of resilient members each having an opening therethrough of true form with respect to the outer surface of the arbor, the arbor extending through the openings of the resilient members, means for compressing the resilient members and gripping a tubular member fitting on the arbor and extending through and fitting the openings of the resilient members, the compressing means and the resilient members having abutting surfaces of true form and extending longitudinally of the arbor and being radially spaced therefrom, the abutting surfaces fitting each other when the resilient member is uncompressed.

8. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, an arbor adapted for fitting in the bore of a tubular member, a plurality of resilient members each having an opening therethrough of true form with respect to the outer surface of the arbor, the arbor extending through the openings of the resilient members, means for compressing the resilient members and gripping a tubular member fitting on the arbor and extending through and fitting the openings of the resilient members, the compressing means and the resilient members having abutting surfaces of true form and extending longitudinally of the arbor and being radially spaced therefrom, the abutting surfaces fitting each other when the resilient member is uncompressed, and means connected with the arbor and compressing means and adapted for rotation and for rotating the arbor and compressing means with each other.

9. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, a cylindric arbor adapted for fitting in the cylindric bore of a tubular member, an externally cylindric resilient member having a cylindric opening therethrough of true form with respect to the outer cylindric surface of the arbor, the arbor having a smaller diameter than and extending through the resilient member cylindric opening, means for compressing the resilient member and gripping a tubular member fitting on the arbor and extending through and fitting the opening of the resilient member, the compressing means including a sleeve around the resilient member and the arbor and having a cylindric bore, and the resilient member having an external cylindric surface of true form and fitting

the cylindric bore of the sleeve when the resilient member is uncompressed.

10. In an arbor chuck adapted for gripping a tubular member of ceramic material and the like, a cylindric arbor adapted for fitting in the cylindric bore of a tubular member, an externally cylindric resilient member having a cylindric opening therethrough of true form with respect to the outer cylindric surface of the arbor, the arbor having a smaller diameter than and extending through the resilient member cylindric opening, means for compressing the resilient member and gripping a tubular member fitting on the arbor and extending through and fitting the opening of the resilient member, the compressing means including a sleeve around the resilient member and the arbor and having a cylindric bore, and the resilient member having an external cylindric surface of true form and fitting the cylindric bore of the sleeve when the resilient member is uncompressed, and means connected with the arbor and compressing means and adapted for rotation and for rotating the arbor and compressing means with each other.

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