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DEVICE FOR AND METHOD OF FORMING CERAMIC OBJECTS

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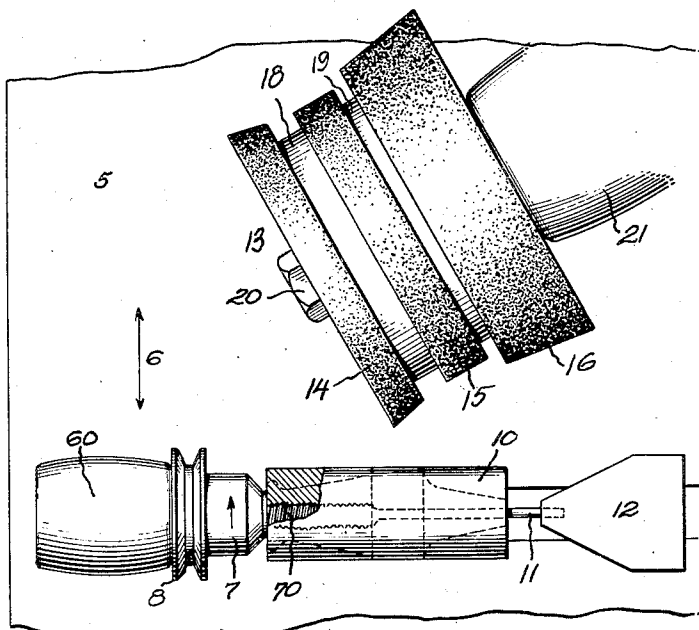


Fig. 1

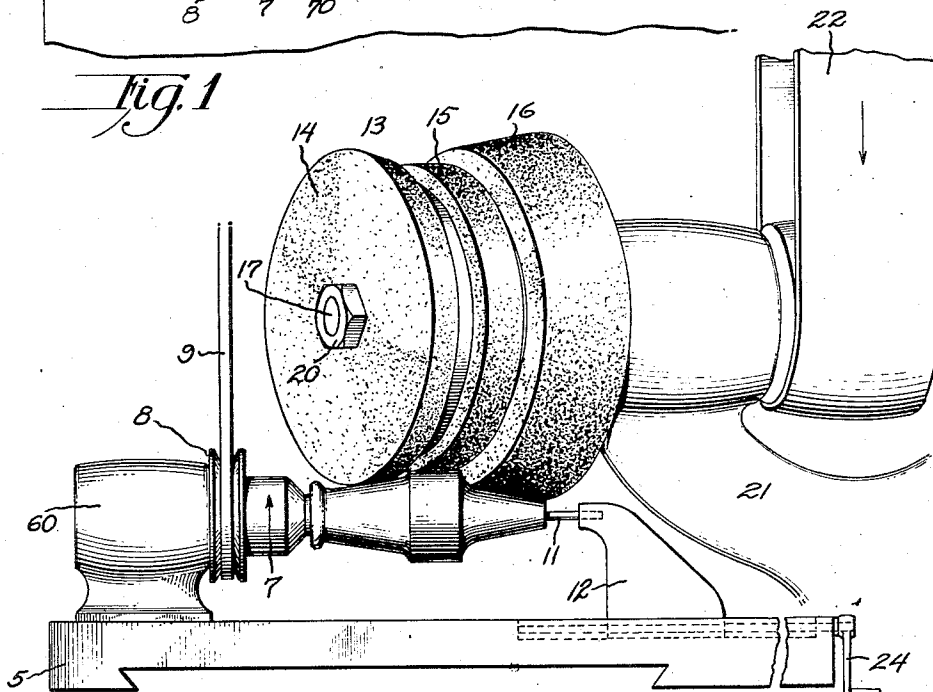


Fig. 2

Witness:
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UNITED STATES PATENT OFFICE.

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DEVICE FOR AND METHOD OF FORMING CERAMIC OBJECTS.

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To all whom it may concern:

Be it known that I, ALBERT CHAMPION, a citizen of the United States, and a resident of Flint, county of Genesee, and State of Michigan, have invented certain new and useful Improvements in Devices for and Methods of Forming Ceramic Objects, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

This invention relates in general to devices for, and method of, forming ceramic or other fictile objects, and more particularly to the formation of porcelain spark plugs from plastic material.

In the formation of spark plugs, it is the common practice to rotate the blanks while still in a form more or less plastic and move them in contact with knives that turn the blank to the proper formation. But the wearing action on the knives is so great that it is necessary to sharpen them frequently and to replace them at comparatively short intervals. By means of the method and apparatus herein disclosed, I have found that these blanks may be turned without the use of knives and one of the objects of this invention is a method of fashioning the exterior of spark plugs and other ceramic bodies by means of abrasion.

Another object of the invention is the provision of a device employing rotary grinders or abrasive members for turning spark plugs and other ceramic bodies from plastic material.

Other and further objects and advantages will appear as the description of the invention proceeds.

On the drawing,

Figure 1 is a plan view of one structure or mechanism for practicing the method mentioned above, with parts broken away; and

Figure 2 is a front elevation thereof.

The reference numeral 5 designates a frame, table or platform that is adapted to be reciprocated in the direction of the double headed arrow 6 shown in Figure 1. This table is adapted to be reciprocated manually or by any suitable power means. It is not thought necessary to show the means for

reciprocating this table or platform, since it is of the conventional form.

Rigidly mounted on one edge of the table 5 is a bearing 60 in which is rotatably mounted the spindle 7. The spindle 7 is provided with a pulley 8 which is adapted to be rotated by a suitable power element, as the belt 9.

A blank 10 of fictile or ceramic material that is more or less plastic is adapted to be secured to the spindle 7 in any convenient manner to rotate therewith. The blank is rotated in order to expose all sides to the action of the abrasive member. The blank 10 may be cylindrical in form and if intended for a spark plug it may be provided with the usual axial bore for the inner electrode. Since the blank 10 is the usual form employed in making the conventional spark plugs, a description here of the blank and its method of manufacture is deemed unnecessary. Any suitable means for securing the blank to the spindle may be employed. As shown, the spindle 7 may be provided with a reduced extension 11, the inner end of which is screw threaded as at 70. Its outer end is still further reduced to correspond to the size of the bore in the blank and is adapted to be engaged by a support 12 which is movable by any suitable means such as a screw of conventional character operated by the crank 24 to permit the attachment and removal of the blank 10 therefrom.

The blank is secured in operative position by sliding it on the spindle until it comes in contact with the screw threads on the same and then it is rotated in the direction to cause the screw threads to engage the plastic material to thereby constitute a holding means to cause the blank to rotate with the spindle. Since the more or less plastic blank is secured to the spindle only by means of the screw threads it is evident that this attachment would be easily ruptured or disconnected.

Abrasive means are provided for turning the exterior of the blank to the proper conformation. This I accomplish by means of the rotating abrasive member 13. For a purpose soon to appear, as well as for ease in manufacture and assembly, the abrasive element may be composed of a plurality of elements.

As shown, the abrasive member consists

of three rotating disc elements, 14, 15 and 16, mounted on the rotating shaft or axle 17. Spacing members 18 and 19 are provided between the discs 14, 15 and 15, 16 respectively. They are held in position on the shaft or axle by means of a nut 20 or any other suitable fastening means. The shaft or axle 17 is rotatably mounted in the fixed support 21 and is provided with a pulley 10 at the end opposite the abrasive member. The pulley is adapted to be operated by any suitable power means such, for instance, as the belt 22.

The blanks may be abraded while they are wet, or, if preferred, they may be dried or partially dried before being abraded. But in any event, owing to the insecure connection between the blank and the spindle, it is evident that the entire external surface of the more or less plastic blank cannot be abraded simultaneously because the strain on the blank would be sufficient to cause the blank to turn relatively to the spindle. In other words, the strain would strip the internal threads of the blank and thus permit the blank to turn freely on the spindle. It is necessary therefore that the abrasive element be so arranged that successive portions of the blank are caused to come in contact with the abrasive elements. This may be accomplished by employing a plurality of spaced abrading discs, as above described, and so arranging them that they will operate on the blank substantially successively, each disc shaping a certain portion of the periphery of the plug. This is made possible by arranging the axis of the abrasive member in a horizontal plane parallel with the axis of the spindle 7 and in a vertical plane at an oblique angle to said spindle as shown on the drawings. It will be noted that when the blank passes beneath the abrasive member the disc 14 first comes into contact with the blank and that the discs 15 and 16 are successively brought into contact with it. It will also be seen that the spacing members are of such thickness that the paths made by the abrading discs are contiguous, so that when the platform, frame or table 5 carries the blank beneath the abrading member the entire surface of the blank will be abraded thus shaping it to the proper or desired form.

The difference in the speeds of the spindle and abrasive member may be varied depending on whether they are rotated in the same or in opposite directions. The speed of the spindle will depend also on the rate of movement of the table 5. The strain upon the blank must, of course, always be such that it will keep the blank screwed on the spindle 11. In the preferred construction the shaft 17 and spindle 7 are rotated so that their contacting faces are more in the same direction as indicated by the arrows in Figure

2. In this arrangement the shaft 17 is, of course, rotated at a higher speed than the spindle 7. By turning the members so that their contacting surfaces are moving in the same direction, the abrading element is prevented from tearing out portions of the more or less plastic blank, because the strain on the portion being abraded is always more nearly in the direction of the body of the blank.

In the formation of ceramic objects having surfaces generated by a curved, broken or non-straight line, it is necessary that the abrasive members be so constructed that they will form the surface of the article to the desired shape under the abrasive operation. The number of discs employed will, of course, depend on the contour of the finished articles. In forming spark plugs for instance, the proper contour may be given the article by three discs having smooth peripheries. This is accomplished by the arrangement shown in the drawing, in which the inner and outer discs 14 and 16 are shown as being bevelled toward each other while the periphery of the middle disc 15 is shown as being parallel with the axis of the disc. The discs are then spaced apart as described above.

It will also be noted that the disc 14 almost finishes its abrasive action before the middle disc 15 begins its work. Likewise the disc 15 has almost completed its work before the disc 16 comes into action. By this arrangement no great strain is placed on the rotating blank and consequently it is not torn loose from the rotating spindle 7, even though the blank be composed of wet material. This is a very important feature of my invention because it permits the abrasion of the blanks while they are yet in a more or less plastic form.

I claim:

1. A method of forming fictile objects which consists in forming a blank circular in cross section from fictile material, and then abrading the surface thereof circumferentially throughout a portion only of the length of the blank and progressively from one end of the blank to the other, substantially as and for the purpose set forth.

2. A method of shaping the periphery of a fictile object circular in cross section which consists in forming a blank from fictile material and then bringing zones of the surface of the same progressively into contact with a rotating abrasive member whereby said object is finished first at one end, and then progressively throughout the length thereof to the other end, substantially as and for the purpose set forth.

3. A method of forming unburned spark plugs which consists in forming a blank from green ceramic material and then shaping the contour thereof to non-cylindrical

form by abrading circumferentially extending portions or zones of the surface of the blank progressively from one end thereof to the other, substantially as and for the purpose set forth.

4. In a device of the class described, a spindle member, means for rotating the same, means for securing a blank of fictile material to said spindle member, a shaft
10 member arranged in a plane substantially parallel with the plane of the axis of rotation of said spindle member, and at an angle

to said spindle member, means for rotating said shaft member, an abrasive element carried by said shaft member, and means for
15 moving one of said members transversely to the other, whereby a blank carried by said spindle may have its periphery reduced to the desired formation by abrasion and progressively from one end thereof to the other,
20 substantially as shown and described.

In testimony whereof I affix my signature.

ALBERT CHAMPION.