April 18, 1933. H. L. CROWLEY 1,904,274

GRINDING APPARATUS

Filed April 9, 1931

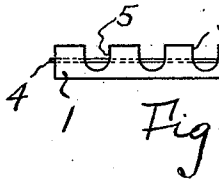


Fig. 1.



Fig. 2.

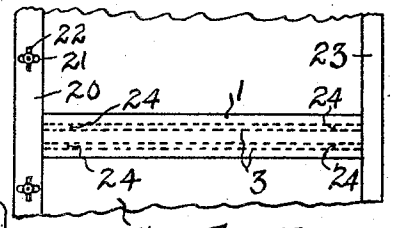


Fig. 5.

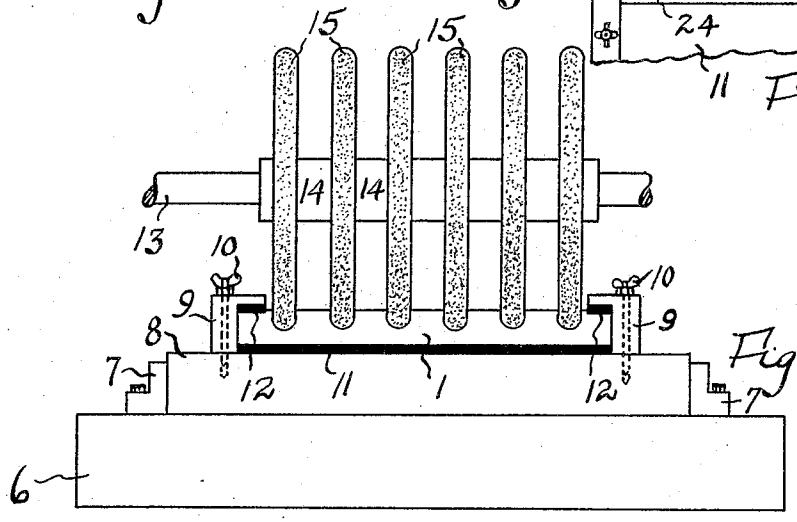


Fig. 3.

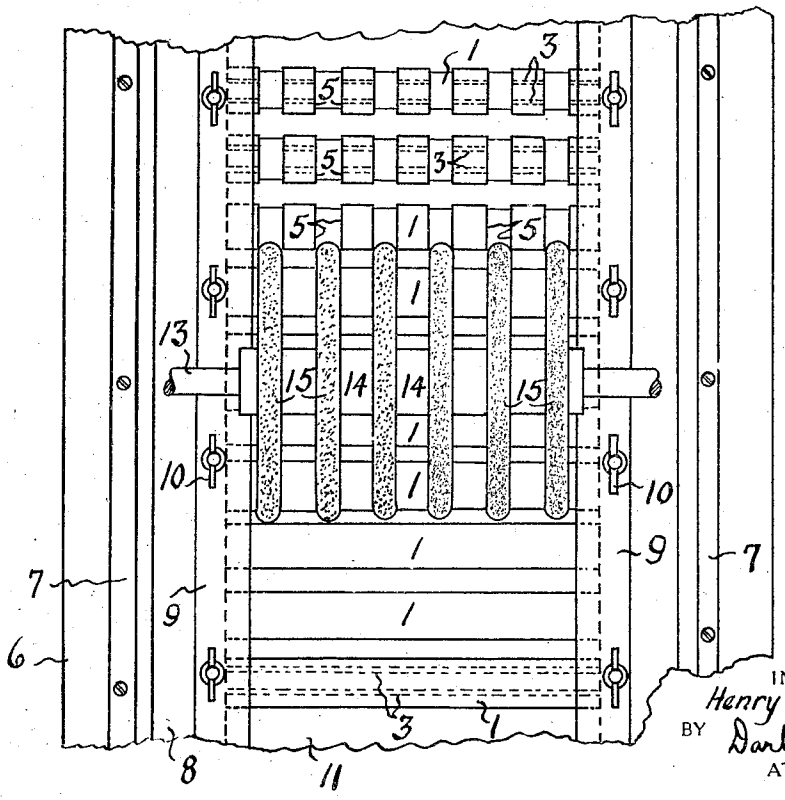


Fig. 4.

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UNITED STATES PATENT OFFICE

HENRY L. CROWLEY, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO HENRY L. CROWLEY & COMPANY, INC., OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY

GRINDING APPARATUS

Application filed April 9, 1931. Serial No. 528,729.

This invention relates in general to a ceramic product of a particular form and the apparatus and method for producing the same.

One of the objects of this invention is the provision of a ceramic insulator such as now used for heating the cathode for an electron discharge device.

Another object of this invention is the construction of a ceramic support of this type which is notched to expose the heating element without interfering with the supporting qualities of the ceramic support and its ability to properly space the heating wires or cathode.

A further object of this invention is the provision of a ceramic support generally in circular form and flat on one side to facilitate handling during manufacture.

A still further object of this invention is to provide the ceramic support with a flattened side with the plane thereof parallel to the plane of the holes through which the insulating wires pass, which holes are offset transversely of the center of the body.

A further object of this invention is the provision of an apparatus by means of which ceramic bodies of this type may be handled efficiently and in large numbers during the notching operations.

A still further object of this invention is the provision of a machine by means of which such ceramic bodies will be rapidly and efficiently ground without substantial breakage.

These and many other objects as will appear from the following disclosure are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement, relative location of parts, steps and series of steps of the article produced thereby, all as will be described below.

Referring to the drawing:

Figs. 1 and 2 are side and end views of the ceramic support;

Figs. 3 and 4 are end and top plan views of the apparatus of this invention;

Fig. 5 is an enlarged modified detail view of part of the apparatus.

The ceramic body of this invention may be produced by any known method, as well as by the method of my copending application Serial No. 332,555, filed January 14, 1929, and by the method disclosed in my copending application Serial No. 528,732, filed April 9, 1931.

The ceramic body itself will be described in detail first since an understanding of its construction makes the method and apparatus employed easily understandable. The ceramic body comprises a rod 1 of substantially circular cross-section which is flat on one side as indicated at 2. Extending longitudinally through the body are two holes 3 which emerge at both ends thereof. The plane of the center lines of these two bores is parallel to the flattened side 2 and is offset from the axis of the rod in a direction away from the flattened side 2. All of this is clear from Fig. 2. Within the holes 3 is threaded a hair-pin shape wire 4 which forms a cathode or heater. The ceramic body 1 is notched at regular intervals, as shown at 5, so as to cut through the plane of the holes. Thus, when the wires are threaded through the holes a portion thereof is exposed. These notches exposing a part of the heater wire effect a more rapid heating of the cathode in an electron discharge device because there is less mass insulator to be heated up and because the hot wires are directly exposed to the electronically active surface. By offsetting the holes through the center of the rod the wires which lie in them are more easily exposed with a shallower cut with the result that the body is stronger. The relative position of the flattened side of the rods and the holes permits of a process by means of which the notches may be accurately and quickly cut in the proper position as will appear below.

A suitable machine for cutting these notches will now be described. It is first pointed out that heretofore these notches have been ground into the rods one at a time by holding them against a gang of grinders; there being as many grinding wheels as there are notches to be cut in the rod. Such a process was found to be slow, tedious and expensive. However, it is not easy to support these ceramic bodies in chucks or jigs of the usual type, since it was found that

they broke or crushed when gripped under the proper pressure; since they are usually slightly warped or bent, when gripped, in a jig or chuck, they being non-flexible cracked. All these difficulties are overcome by this invention. At 6 is a suitable table or platform on which are secured the fixed parallel guides 7. Within these guides and on the table is slidably supported a plate 8. Secured to this plate by means of the bolts and wing nuts 10 are the L-shaped parallel bars 9. Between these bars and resting on the plate 8 is a thin sheet of suitable soft resilient material, such as a sheet of rubber 11. The upper projecting flanges of the bars 9 are provided on their under surfaces with similar thin strips of sheet rubber 12 which are secured in place in any suitable manner. Supported over these parts in the proper relation is a rotatable shaft 13 upon which are mounted a number of grinding or emery wheels 15, which are held in a separated position by means of the spacers 14. As is clear from the drawings, a number of ceramic bodies 1 are mounted with their flat sides against the rubber sheet 11 and their ends lying under the rubber strips 12. A number of these are mounted in place, as shown in Fig. 4, and are then gripped by tightening down on the wing nuts 10. With the grinders 15 revolving at the proper speed the jig comprising the parts 8, 9, 10, 11 and 12 is slid along the support 6 between the guide 7, so that one after the other of the rods 7 are presented to the grinders and are notched. The flat sides of the rods permit accurate positioning of the holes or bores 3 in the rods with respect to the grinders, so that these holes or bores will be cut through. The resilient gripping of the rods prevents their breakage and the supporting of a number of them, as shown, permits a rapid grinding. With one machine and a number of jigs, it is possible to handle large numbers of these supports. Workmen can be mounting the rods in the jigs while the machine operator runs them through the grinder.

A slightly modified arrangement is shown in Fig. 5 from which a ceramic body of the same form as before is mounted on the jig between the fixed bar 23 and the parallel transversely slidable bar 20. Each of these bars is provided with a number of pins 24 projecting towards each other as shown. These pins are simple enough to slip into the bores 3. Bar 20 is then slid over to the position as shown in Fig. 4 and slipped in place by means of the wing nuts 22. As before, the flat side of this ceramic lies against the resilient cushion 11.

In good practice this resilient blanket 11 is approximately $\frac{1}{16}$ to $\frac{1}{8}$ of an inch thick. This invention is applicable to hard vitreous ceramic bodies, as well as to the softer bodies such as disclosed in my above mentioned application.

From the foregoing disclosure it will be apparent that my invention involves certain principles of construction and operation which may be embodied in different physical forms and carried out in other ways without departure therefrom. I do not, therefore, desire to be strictly limited to the disclosure as given for purposes of illustration, but rather to the scope of the appended claims.

It is well to point out here that the principles of this invention may be applied to other shapes of ceramic supporting body. For example, the rod is not necessarily of circular cross-section, but can be square, rectangular, octagonal and of other cross-sectional shapes.

What I seek to secure by United States Letters Patent is:

1. A jig of the type described comprising a plate, a pair of parallel L-shaped bars releasably secured along the edges of said plate, a resilient cushion on said plate between said bars, and resilient cushions on the flanges of said bars.

2. A grinding machine of the type described comprising the combination with a support, guides on said support, a plate slidably mounted on said support between said guides, and resilient means for holding work pieces on said plate, of means for rotatably supporting a plurality of grinding wheels in spaced relation so as to engage the work pieces when secured to said plate.

3. A jig or chuck holder comprising a plate, a bar secured to said plate having a plurality of pins projecting therefrom, and a second bar slidably secured to said plate and parallel to said first bar having a plurality of pins thereon in alignment with the pins on the first bar.

In testimony whereof I have hereunto set my hand on this 6th day of April, A. D. 1931.

HENRY L. CROWLEY.