March 12, 1929. F. E. OWEN 1,705,093

TUBE PERFORATING DEVICE

Filed Oct. 22, 1926

Fig. 1.

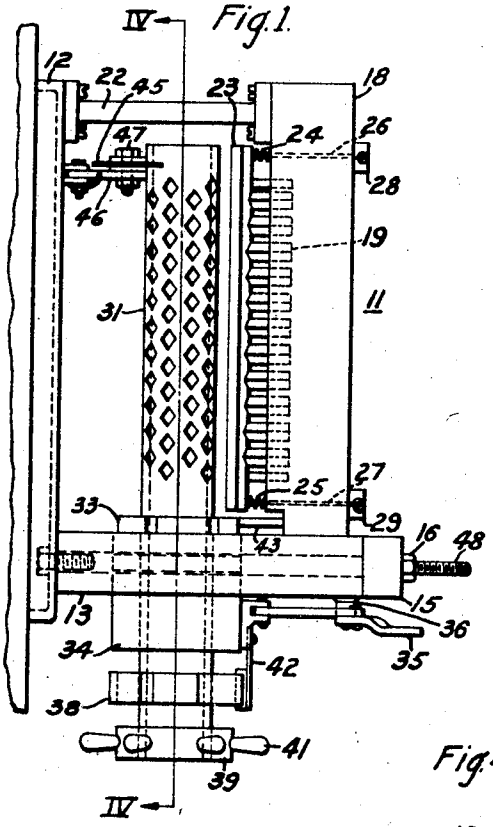


Fig. 2.

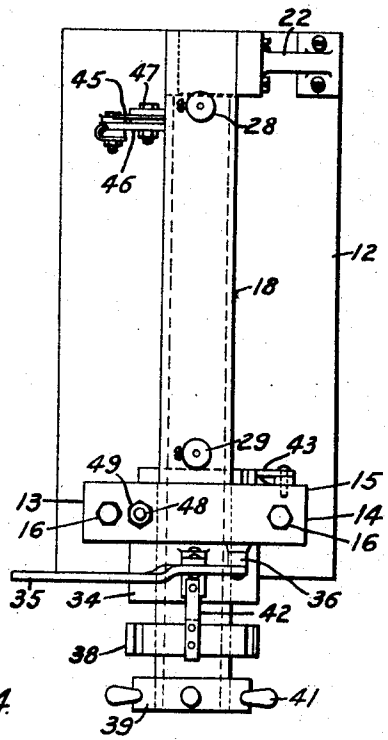


Fig. 3.

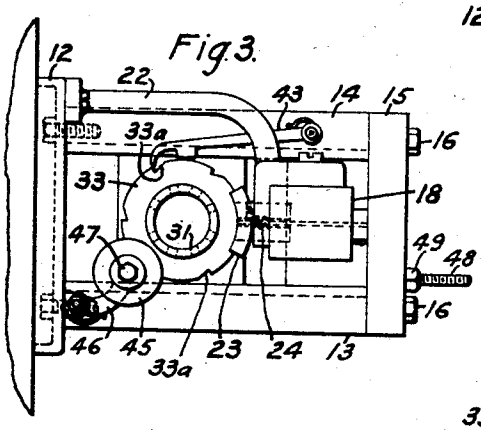


Fig. 4.

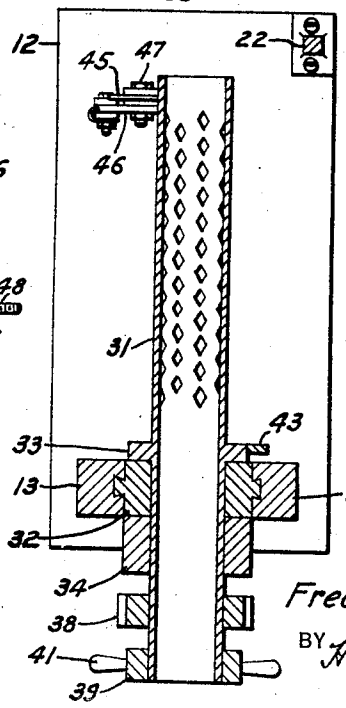
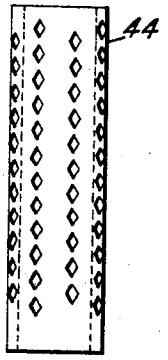


Fig. 5.



WITNESSES:

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UNITED STATES PATENT OFFICE.

FREDERICK E. OWEN, OF EAST PALESTINE, OHIO.

TUBE-PERFORATING DEVICE.

Application filed October 22, 1926. Serial No. 143,466.

My invention relates to the manufacture of ceramic tubes and particularly to devices for punching and trimming ceramic tubes.

An object of my invention is to provide a relatively simple, inexpensive, and manually operable device for punching openings or perforations in a ceramic tube and for trimming an end thereof.

Other objects will be apparent from the description of the device as given in the specification.

In practicing my invention I provide a stationary punching member embodying a plurality of alined punches, a yieldingly mounted platen associated with the punch member, a vertically extending hollow mandrel having a plurality of openings therein corresponding to the openings to be made in a ceramic tube located on said mandrel and also to the punches, a stationary trimming tool, a lever for moving the mandrel back and forth in a guide member and means for positioning said mandrel and for turning it on its support either manually or automatically.

In the single sheet of drawings,

Figure 1 is a view, in side elevation, of a device embodying my invention,

Fig. 2 is a view, in front elevation, of the device shown in Fig. 1,

Fig. 3 is a top plan view thereof,

Fig. 4 is a vertical section therethrough, taken on the line IV—IV of Fig. 1, and,

Fig. 5 is a view, in front elevation, of a ceramic tube which has been perforated, shown on a slightly larger scale than those of the other figures of the drawings.

A device 11 for punching and trimming ceramic tubes comprises a base member 12 which is adapted to be secured against any desired supporting means and in a substantially vertical position. Two parallel extending metal base and guide members 13 and 14 extend forwardly of the base member 12 and have their inner ends suitably secured thereto, while their outer ends have secured thereto a cross member 15 which may be held in its proper operative position thereagainst by bolts 16.

A punch member 18 extends vertically upward from the member 15 and comprises a substantially square or rectangular metal bar, the inner surface of which is provided with a plurality of solid and rigidly mounted punches or perforating members 19 extending laterally therefrom. While I have illustrated punch members and perforations of substantially lozenge shape, I do not desire to be limited thereto as any suitable shape, in lateral section, of punches may be used. The lower end of the member 18 is held in any desirable manner against the cross bar 15, and the upper end of the member 18 is held rigidly by a bar 22, one end of which is suitably bolted against the base member 12, and the outer end of which, of substantially L-shape, is bolted against the top portion of the member 18.

A perforated platen 23 is provided in substantially the position shown in Figs. 1 and 3 of the drawings, so that it normally fits over the outer end of the solid punches 19. It is obvious that the perforations in the platen 23 are of substantially the same contour as are the punches 19, it being necessary only that the platen 23 move freely along the punches. The platen 23 is yieldingly held in its outermost position by springs 24 and 25 located over rod members 26 and 27 which act also as guides, stop members 28 and 29 being mounted on the respective rods 26 and 27 to limit the outward movement of the platen.

A hollow mandrel 31 extends in a substantially vertical position and is mounted in a block 32 which interfits with the guide members 13 and 14 so that it may move relatively thereto toward and away from the punch member hereinbefore described. While I have illustrated a dovetail fit between the guide members 13 and 14 and the block 32, it is obvious that any suitable design may be employed so long as relative movement of the two members is permitted and so that any wear may be compensated for. The tubular mandrel 31 has its upper portion perforated in substantially the same manner as it is desired that a ceramic tube to be located thereon shall be perforated or punched by the punches 19. An integral flange portion 33 is provided on the mandrel 31 intermediate its ends in such position that it will rest upon the block 32 in order to provide a suitable bearing surface and prevent any tilting of the mandrel relatively to its supporting block and to the guide members and its outer surface is provided with a plurality of ratchet teeth 33a. A lower block 34 is also provided around the tubular mandrel 31 immediately below the block 32. The block 34 may be either circular or square in its outer periphery.

Means for effecting movement of the mandrel 31, the blocks 32 and 34 in the guide members 13 and 14 comprises a manually operable

lever 35 having one end pivotally mounted against a lug 36 secured to the guide member 14. A link member 37 is pivotally connected at one end to the lever 35 intermediate its ends, and has its other end pivotally connected to the block 34.

Means for holding the tubular mandrel 31 in any one of a number of predetermined positions and for turning the same manually comprises a substantially circular collar 38 which is rigidly secured on the mandrel 31 adjacent to the lower end thereof and a second collar 39 which is provided with a suitable number of handles 41 in accordance with the number of punching operations which it is desired to effect on a ceramic tube. The collar 38 is provided with a number of recesses in its outer peripheral surface corresponding to the number of punching operations to be effected and a resilient latch member 42 has one end thereof secured to the block 34 and the other end thereof yieldingly engaging the recesses in the collar 38.

Automatic means for turning the mandrel during either its forward or its backward movement comprises a resilient pawl 43, one end of which is pivotally mounted on the side bar 14, and the other end of which co-operates with the recesses 33^a to turn the member 33 and the mandrel 31 as they are moved forward by the lever 35. The construction of the pawl 43 is such that the turning movement is completed before the mandrel is in such position that a tube of ceramic material located thereon engages the platen 23. The resilient latch 42 holds the mandrel in the proper operative position during the punching operation. While I have shown the pawl 43 as effecting a turning movement of the mandrel during its forward movement, I may so locate and arrange the pawl 43 that it will effect the turning movement during the backward movement.

Means for trimming the upper end of a ceramic tube 44 (see Fig. 5) comprises a cutting disc 45 which is yieldingly held in a substantially horizontal position at the upper end of the base plate 12 against which it may be mounted by means of a supporting member 46, of substantially L-shape. The disc 45 is preferably made circular in contour in order that a fresh cutting surface may easily be obtained by turning the disc if it is found that a portion thereof has become dull or worn from use. The disc 45 may be secured on the supporting member 46 by means of a bolt 47 and a nut co-operating therewith.

The operation of the device is substantially as follows: A ceramic tube as illustrated generally in Fig. 5 of the drawing, but without the perforations therein, is manufactured in any desired manner or by any suitable method. The ceramic tubes which I have manufactured on a device of this kind are approximately 10 inches long, 3 inches in diameter, and one eighth inch in thickness. These dimensions are given merely as an illustration of the size of tube, and are not intended to limit the application of the device embodying my invention. After the tube 44 has been dried a predetermined amount it is placed upon the hollow mandrel 31, the mandrel being in a position intermediate its two limiting positions, substantially that shown in Figs. 1 and 3 of the drawings. If the latch member 42 is in engagement with one of the recesses on the collar 38, the operator can move the lever 35 to effect a movement of the hollow mandrel 31 and the tube mounted thereon toward the punches 19. After a relatively short movement the outer surface of the tube 44 is operatively engaged by the yieldingly mounted platen 23, which platen is then forced backwardly on the punches against the supporting member 18, until the punches 19 have perforated the tube 44 and have forced the punched-out material through the corresponding openings in the hollow mandrel 31, and into the hollow central portion thereof through which it may then fall into a suitable box located therebelow but not shown in the drawing. A stop member 48 in the form of a threaded stud and a locking nut 49 thereon are provided to limit the forward movement. The operator now actuates the lever to move the mandrel 31 away from the punches, the platen 23 following the tube until prevented from further movement by the rods 26 and 27. The platen thus prevents any pulling out of the wall of the tube being perforated by the punches as they are being withdrawn, and is in engagement with the outer surface of the tube during the punching and withdrawing operations only. The operator actuates the lever 35 to the limit of its movement in a direction toward the base 12, at which time the disc 44 will cut into the ceramic tube and will engage the outer surface of the mandrel 31 in order to provide a clean cut upper edge of the tube. As the mandrel and the tube thereon are moved forwardly again the pawl 43 will cause a turning movement of the mandrel and the tube, whereby the disc 45 trims the upper edge of the tube. This turning movement is effected during a part only of the forward movement of the mandrel, the latch 42 holding the mandrel and tube in a predetermined position during the second punching operation. Repeated forward and backward movements will effect the trimming of the upper edge of a tube in successive peripheral portions and the punching of the desired sets of openings in the tube, spaced uniformly around the tube.

As hereinbefore noted, while I have shown openings or perforations of lozenge shape, any desired openings may be made in the tube in the same manner as described above, by the use of suitable punches. In the particular

tube shown two vertically alined sets of perforations are made at one time, this requiring of course, two alined sets of punches. If six recesses are provided in the collar member 38 a total of twelve rows of perforations will therefore be obtained in the tube 44.

While I have illustrated and described a device in which the punch member is stationary and the mandrel and tube are movable, I do not desire to be limited thereto, as I may make the hollow mandrel and the tube stationary and move the punches toward and from the mandrel and tube.

The device embodying my invention thus provides a relatively simple, easily constructed, and easily operated device for providing perforations of any desired number and shape in a ceramic tube, and for trimming the free end thereof in peripheral sections or portions.

The device embodying my invention provides also an automatic means for effecting a turning movement of predetermined peripheral extent during a portion only of the relative movement between the mandrel and the punches.

While I have illustrated and described a specific device embodying my invention, I do not desire to be limited thereto, as changes may be made therein without departing from the spirit and scope of my invention, and I desire that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:—

1. In a tube perforating device, in combination, a vertically-extending hollow mandrel for supporting a tube to be perforated, a punch, an opening in said mandrel corresponding to and alined with said punch, means for effecting relative movement between the mandrel and the punch, and a platen yieldingly mounted on, in continuous engagement with, and movable longitudinally of the punch for pressing against the outer surface of a tube being operated on, during the punching and retracting movements only of said device.

2. In a tube perforating and trimming device, in combination, a stationary punch member comprising a plurality of alined solid punches, a movable mandrel for supporting a tube to be operated on, a manually operable lever for moving said mandrel toward and from said punch member, means for holding said mandrel in a fixed position during the punching operation, means for turning said mandrel, and a cutting-off means effective to trim one end of a tube located on the mandrel during the time that the mandrel and tube are being turned.

3. In a tube perforating and trimming device, in combination, a stationary punching means comprising a plurality of alined solid punches, a vertically extending hollow mandrel having a plurality of openings therein corresponding to and alined with said solid punches, means for holding said mandrel in any one of a plurality of predetermined positions, means for turning said mandrel to a predetermined position, a cutting-off tool for trimming one end of a tube located on said mandrel, and a lever for moving said mandrel toward said punching member to cause the punches to perforate a tube located on the mandrel, the punched out material dropping through the bottom portion of the hollow mandrel, and to move the mandrel away from the punch member and toward the cutting-off tool, the cutting-off tool being operative to trim the upper end of a tube on said mandrel during its movement from one predetermined position to another.

4. In a tube perforating and trimming device, in combination, a punch member comprising a plurality of punches, a mandrel for supporting a tube to be operated on, a lever for effecting relative movement between the punches and the mandrel, means for holding the mandrel in a fixed position during the punching operation, means for turning the mandrel, and a cutting-off means effective to trim one end of a tube located on the mandrel during the time that the mandrel and tube are being turned.

In testimony whereof, I have hereunto subscribed my name this 18th day of October, 1926.

FREDERICK E. OWEN.