United States Patent [19]

Green

[11] 3,849,019

[45] Nov. 19, 1974

[54] **APPARATUS FOR CUTTING HOLES IN PORCELAINIZED METAL**

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[73] Assignee: **Relton Corporation**, Arcadia, Calif.

[22] Filed: **Mar. 12, 1973**

[21] Appl. No.: **340,333**

[52] **U.S. Cl.** **408/142**, 408/1, 408/209, 408/228, 279/16

[51] **Int. Cl.** **B23b 51/04**

[58] **Field of Search** 408/142, 209, 228, 68; 279/16

[56] **References Cited**

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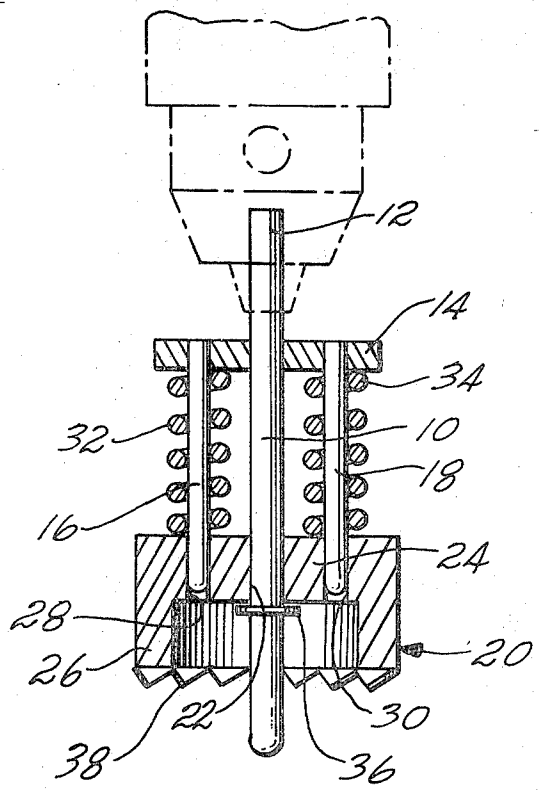
Primary Examiner—Francis S. Husar

Attorney, Agent, or Firm—Christie, Parker & Hale

[57] **ABSTRACT**

There is described a tool for scoring the procelain coating of a porcelainized metal object such as a sink or tub in which a plurality of V-shaped pointed teeth project from an annular rotating member. The annular rotating member is slidably supported on a rotating shaft and is spring-loaded to urge the rotating member in an axial direction corresponding to the direction of the pointed teeth. After the porcelain coating is scored by the tool, an opening is cut through the porcelain and metal to a diameter slightly smaller than the diameter of the groove scored by the teeth.

6 Claims, 4 Drawing Figures



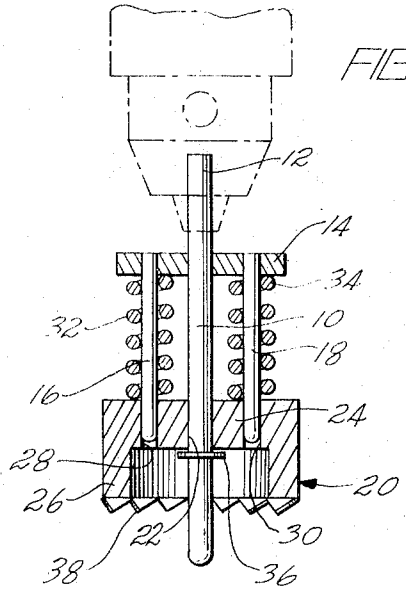


FIG. 1

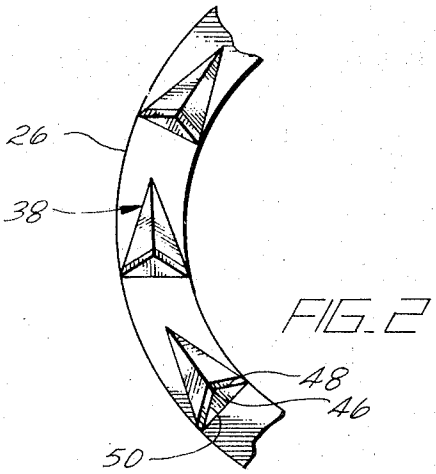
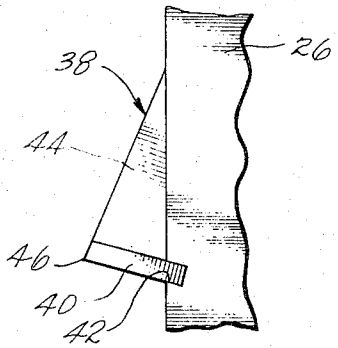


FIG. 2

FIG. 3



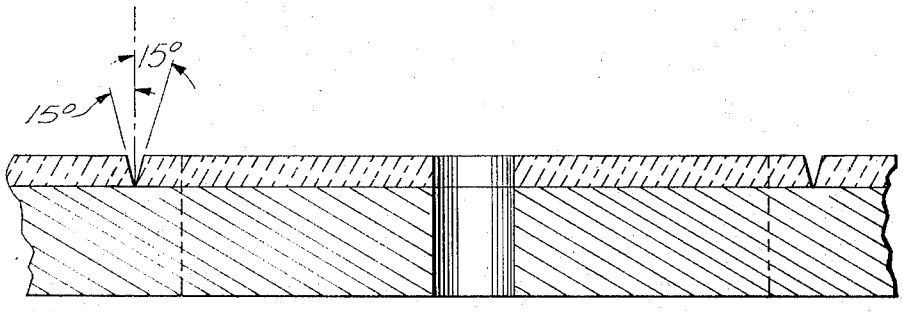


FIG. 4

APPARATUS FOR CUTTING HOLES IN PORCELAINIZED METAL

FIELD OF THE INVENTION

This invention relates to rotary cutting tools, and more specifically, is directed to a tool and method of using the tool for cutting holes in porcelain-coated metal objects.

BACKGROUND OF THE INVENTION

Cutting holes in porcelainized metal objects, such as the conventional cast iron kitchen sink, tub, or porcelainized sheetmetal cabinet frequently found in home appliances and the like, has always presented problems. Such holes may be needed to attach new plumbing fixtures, such as spray attachments, dishwashing devices, and the like. Because the porcelain is very hard and brittle, carbide or diamond cutting tools are required. The cutter usually must be operated from a portable drill or similar hand-held rotary equipment, which makes it difficult to align the tool with the surface of the object in which the hole is being drilled. Diamond fly-cutters, for example, have been used or diamond core bits. Unless the drill is held very steady and the thrust on the tool is maintained very constant, the tool tends to gouge and chip the porcelain surface. Because the porcelain is very hard and brittle, the porcelain tends to chip a substantial distance outwardly from the edge of the hole, leaving a ragged and disfigured opening.

SUMMARY OF THE PRESENT INVENTION

The present invention provides an improved tool and method of utilizing the tool to cut circular openings in porcelain-coated metal. The invention provides an arrangement for drilling large openings, eliminating or substantially reducing the opportunity for chipping of the porcelain away from the margin of the hole being made. This is accomplished, in brief, by utilizing a tool that can be driven by portable drill and which scores a circular V-shaped groove in the porcelain. The tool includes a guide shaft adapted to be gripped in the chuck of an electric drill, with the free end of the guide shaft being inserted into a small pilot hole initially drilled in the center of the location where the larger hole is to be formed through the metal. A cutter head is slidably positioned on the shaft for movement in an axial direction, but is keyed to rotate with the shaft. The cutter head has an annular flange which is slightly larger in diameter than the hole to be cut through the metal. A plurality of pyramid-shaped teeth are secured to the edge of the annular flange, the teeth being pyramidal in shape, each tooth providing a point formed by the apex of the pyramid which projects in a direction parallel to the axis of the shaft. The cutter head is spring-loaded to urge the teeth in a direction toward the pilot hole end of the shaft. The points of the pyramidal-shaped teeth are of a material sufficiently hard to score the porcelain and wear a V-shaped groove in the porcelain surface. The tool is then replaced with conventional metal cutter of slightly smaller diameter for cutting the desired hole through the metal within the area encircled by the groove.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention reference should be made to the accompanying drawings, wherein:

FIG. 1 is a sectional view of the scoring tool of the present invention;

FIG. 2 is an enlarged partial view showing the construction of the cutting teeth;

FIG. 3 is a large side view of one of the cutting teeth; and

FIG. 4 is a sectional view of part of a porcelaincoated metal object after the porcelain has been scored by the tool.

DETAILED DESCRIPTION

Referring to FIG. 1 in detail, the numeral 10 indicates the main shaft of the scoring tool. The upper end 12 of the shaft is adapted to be gripped in the chuck of an electric drill or other suitable drive means. A fixed flange 14 is pressed on the shaft 10 and brazed in position. The fixed flange 14 supports two guide posts 16 and 18 on either side of and parallel to the main shaft 10.

A cutter head 20 is slidably positioned on the shaft 10 by means of a central hole 22. The cutter head is cup-shaped with an end portion 24 through which the hole 22 extends, and an annular flange portion 26. A pair of guide holes 28 and 30 in the end portion 24 slidably receive the guide posts 16 and 18. A pair of coil springs 32 and 34 are positioned on the guide posts between the fixed flange 14 and the cutter head 20 which urge the cutter head 20 away from the flange 14 against a retaining ring 36 on the shaft 10.

The projecting edge of the annular flange 26 is provided with a plurality of teeth 38 which have projecting points extending in a direction parallel to the axis of revolution of the shaft 10. Details of the cutting teeth are shown in FIGS. 2 and 3. Each tooth includes a triangular-shaped carbide tip 40 which is anchored in a slot 42 cut in the edge of the annular flange 26. The carbide tip is brazed to a pyramid-shaped tooth member 44 which in turn is brazed or otherwise secured to the end of the annular portion 26 of the cutter head 20. The tooth 38 provides a sharp point 46 at the apex of a pair of cutting edges 48 and 50 formed by the triangular carbide tip.

The above-described tool with its floating cutter head has been found very effective when used with a relatively slowspeed rotary drill, e.g., less than 450 rpm, for cutting a V-shaped circular groove in a porcelain surface without chipping the porcelain. An angle of 30° between the cutting edges 48 and 50, with both edges being 15° from the normal, has been found to be most effective in scoring the porcelain without chipping. The cutting face of each tooth projects at an angle of less than 30° to the normal. This shape tool, however, is not effective for cutting cast iron, for example, and therefore the scoring tool is used only to score the groove in the porcelain down to the surface of the metal. A conventional cutter or boring tool is then substituted for the scoring tool to cut the hole through the metal. The diameter of the V-shaped groove formed in the porcelain coating is made slightly larger than the diameter of the hole to be cut through the metal. Any tendency of the metal cutter to chip the porcelain as it goes through the porcelain coating is thereby confined to the area

within the circular groove. In this manner, large chips radiating out from the edge of the opening are avoided which might extend beyond the edge of the usual metal facing inserted in the opening after it is drilled.

What is claimed is:

1. A tool for cutting holes in porcelain coated metal with a rotary drill, comprising a guide shaft adapted to be held at one end in the chuck of the drill, the other end of the guide shaft being adapted to extend through a pilot hole in the metal, a cutter head slidably engaging the shaft, slidable means locking the head to the shaft for rotating the head from the shaft while permitting the head to move freely lengthwise of the shaft, spring means connected between the shaft and the head, the spring means urging the head toward the pilot hole engaging end of the shaft, the head having an annular flange coaxial with the shaft and projecting toward the pilot hole end of the shaft, and a plurality of cutting teeth on the end of the flange, the teeth projecting in a direction parallel to the axis of rotation of the shaft.

2. The tool of claim **1** wherein each of the teeth is formed with a V-shaped cutting edge.

3. The tool of claim **2** wherein each of the teeth is formed from silicon carbide.

4. The tool of claim **2** wherein the angle of the V-shaped cutting edge is approximately 30°.

5. The tool of claim **2** wherein the cutting edge of each tooth extends at a small angle to the plane of the axis of rotation of the shaft.

6. The tool of claim **5** wherein the tip of the cutting edge of each tooth trails the base end of the cutting edge.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,849,019 Dated November 19, 1974

Inventor(s) MAX L. GREEN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Front page, change Appln. No. to read "340,339"

Signed and sealed this 11th day of March 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
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