United States Patent [19]

Montgomery et al.

[11] 3,882,641

[45] May 13, 1975

[54] **CABOCHON GEM GRINDER**

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[73] Assignee: **The American Standard Corporation**, Trevose, Pa.

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[52] **U.S. Cl.** ..... **51/73 R**; 51/283; 51/317

[51] **Int. Cl.** **B24b 7/00**; B24b 9/00; B24b 1/00

[58] **Field of Search** ..... 51/73 R, 317, 318, 283

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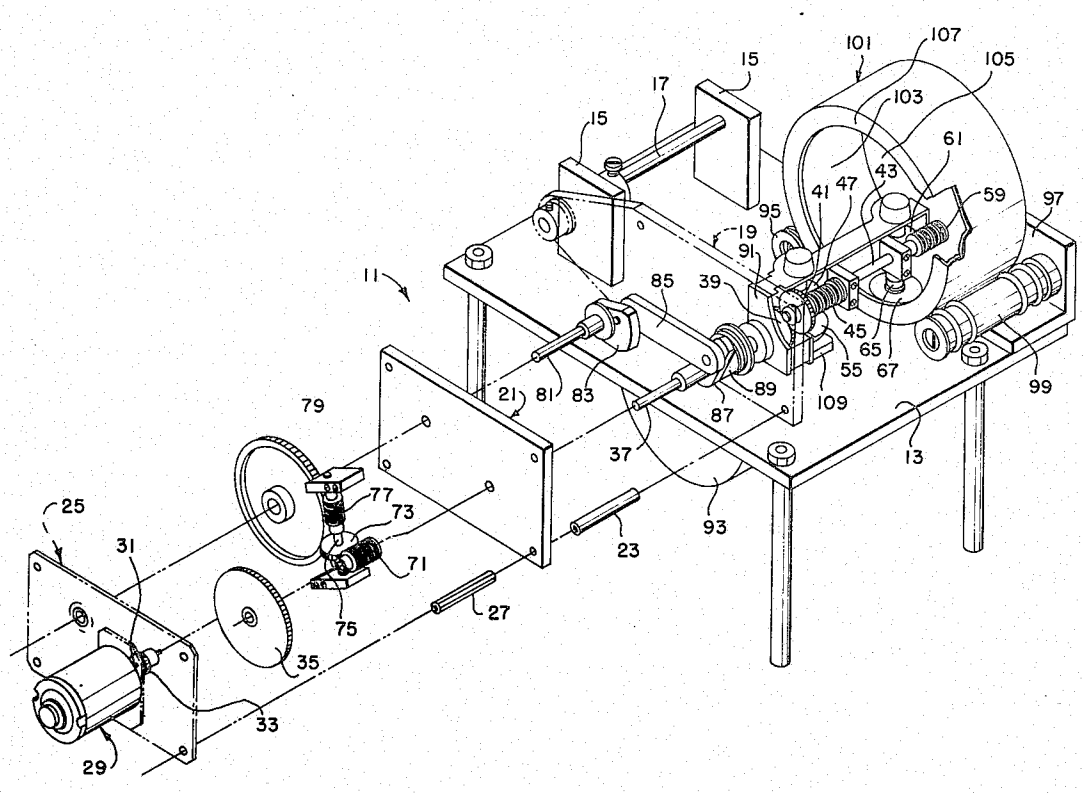
Primary Examiner—Othell M. Simpson

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[57] **ABSTRACT**

A cabochon gem grinding machine comprising a drum having a cylindrical wall and a lip extending inwardly from the sides of the wall for retaining a slurry of abrasive grain or grit, a pair of rollers which support and rotate the drum to distribute and maintain the slurry against the inner wall of the drum by centrifugal force, a dop for holding a gem to be ground in contact with the slurry at a desired angle to the vertical to grind a desired area of the gem, a pattern for indicating the desired shape of the gem, and a drive mechanism for rotating the gem and the pattern and for moving them toward a vertical position to grind new areas of the gem. Also, sensing and actuating apparatus is provided for detecting when a gem area has been ground to the desired size and for rotating the gem and pattern and for moving them toward vertical position to grind new areas of the gem. Also, sensing and actuating apparatus is provided for detecting when a gem area has been ground to the desired size and for rotating the gem and pattern and for moving them toward vertical position to grind new areas of the gem. A method of grinding cabochons and the like, comprising maintaining a slurry of abrasive material inside a rotating drum, holding a gem to be ground in contact with the slurry at a desired angle to the vertical to grind a desired area of the gem, rotating the gem and moving it toward the vertical when said gem area has been ground to the desired size, and repeating said steps until the gem has been ground to the desired pattern.

5 Claims, 8 Drawing Figures



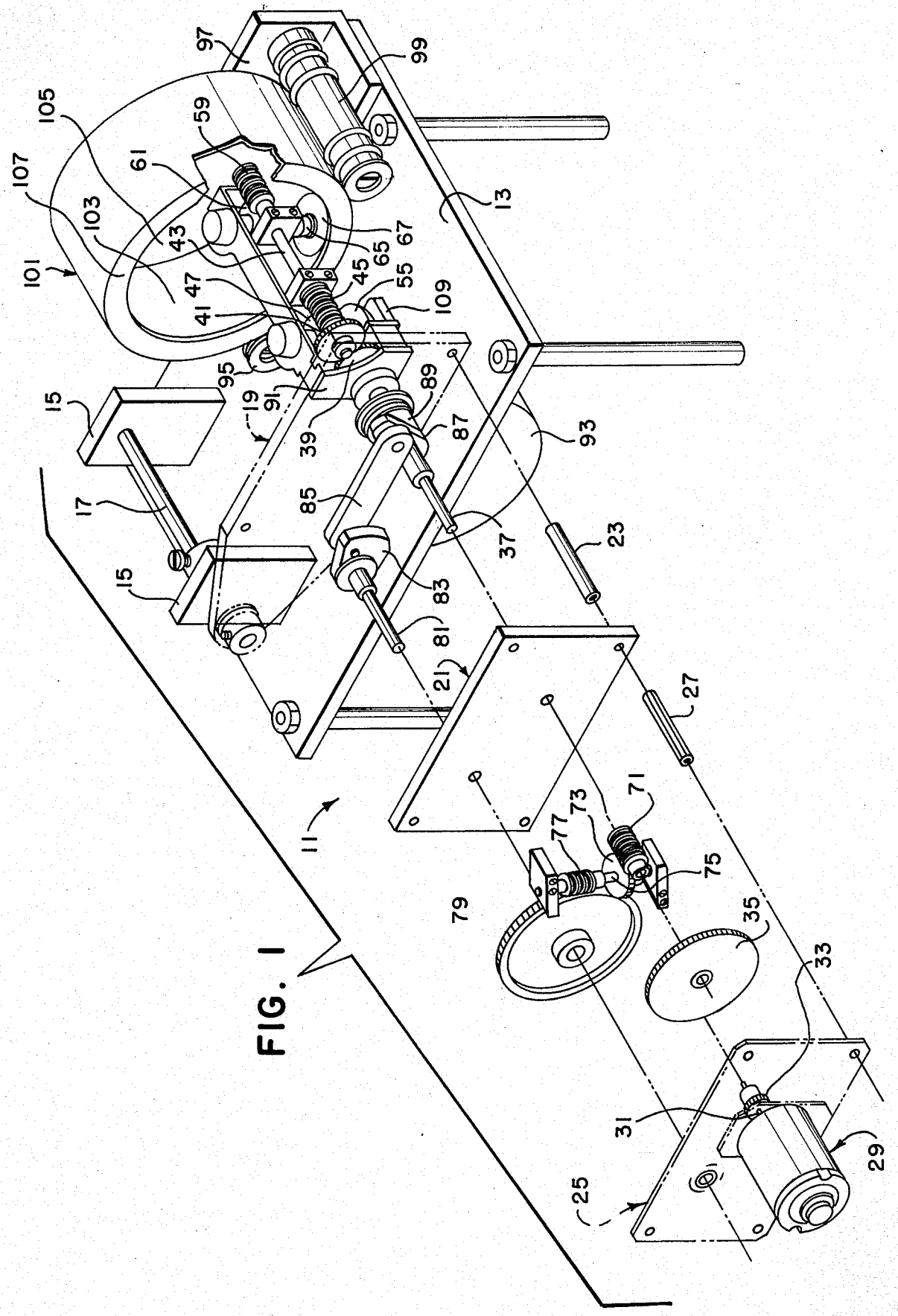

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FIG. 1

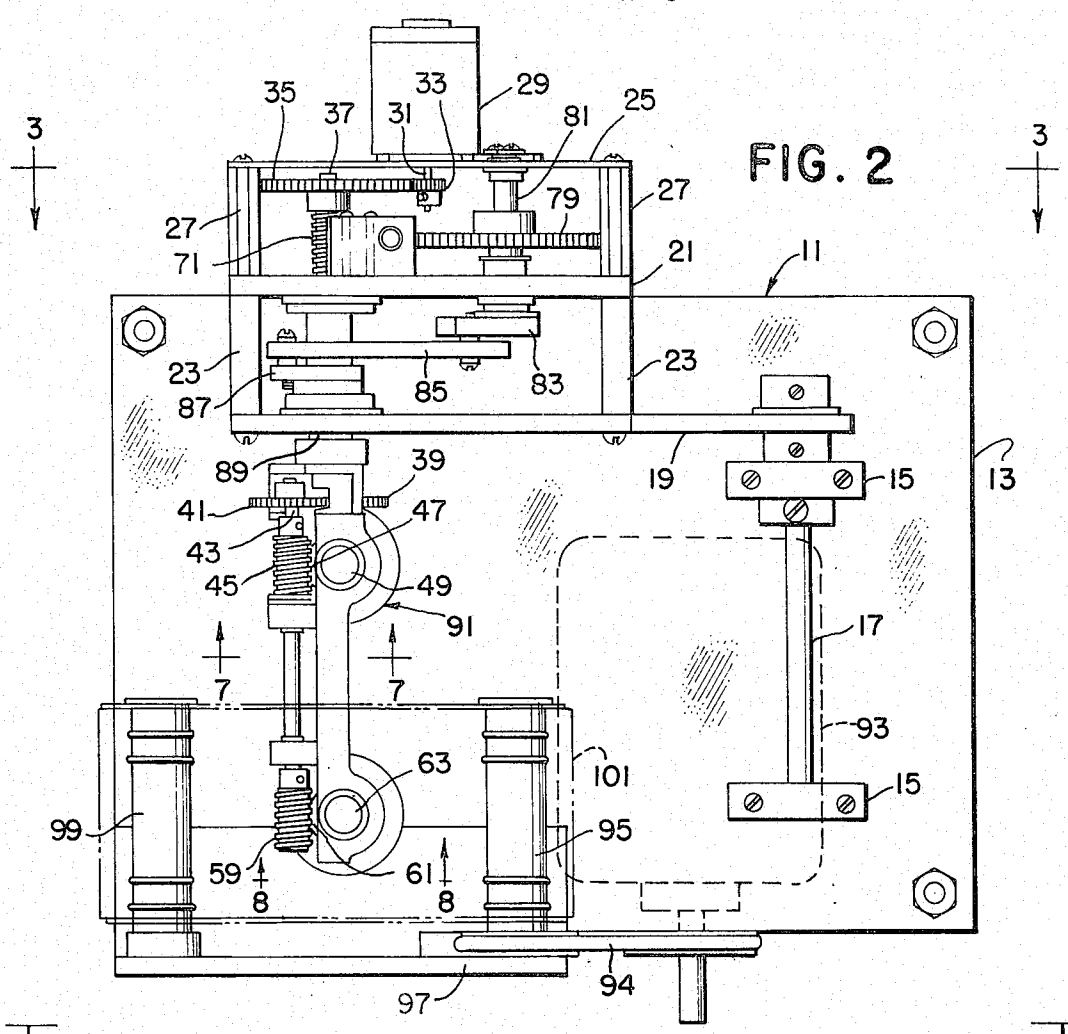


FIG. 2

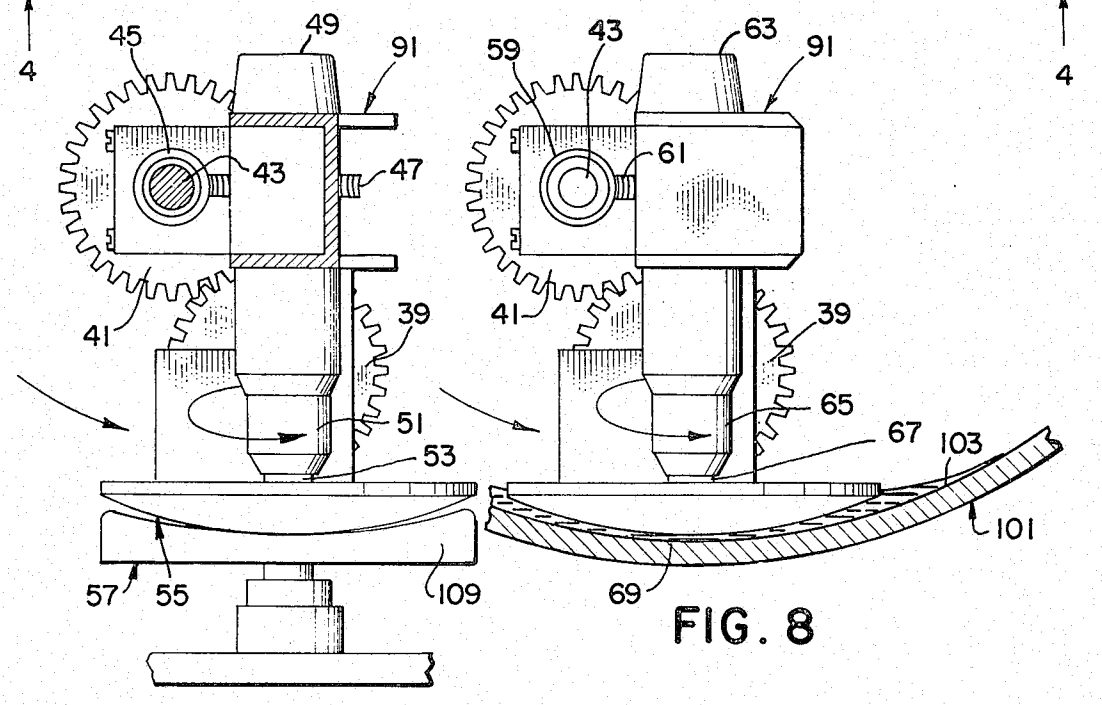


FIG. 8

FIG. 7

FIG. 3

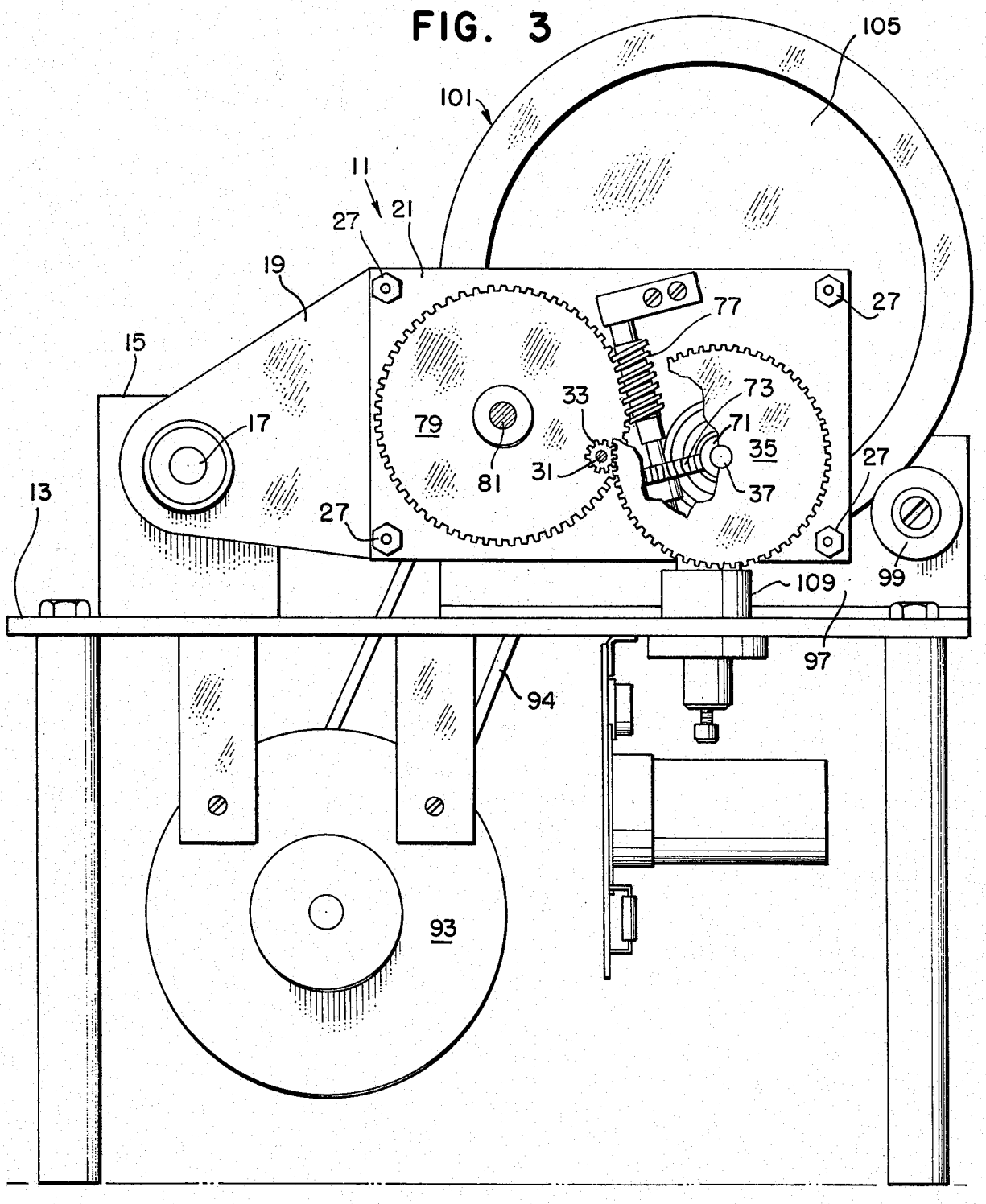

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FIG. 4

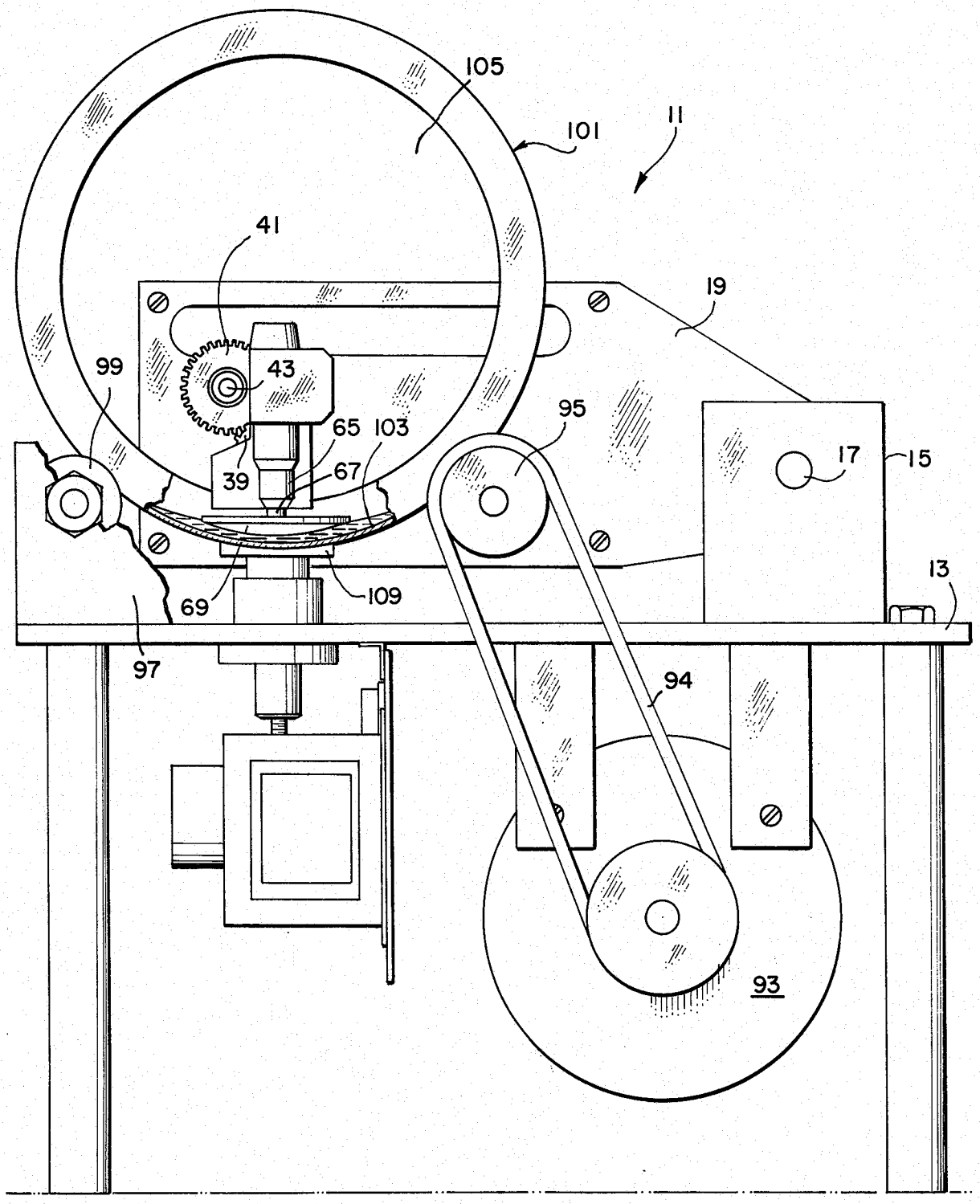
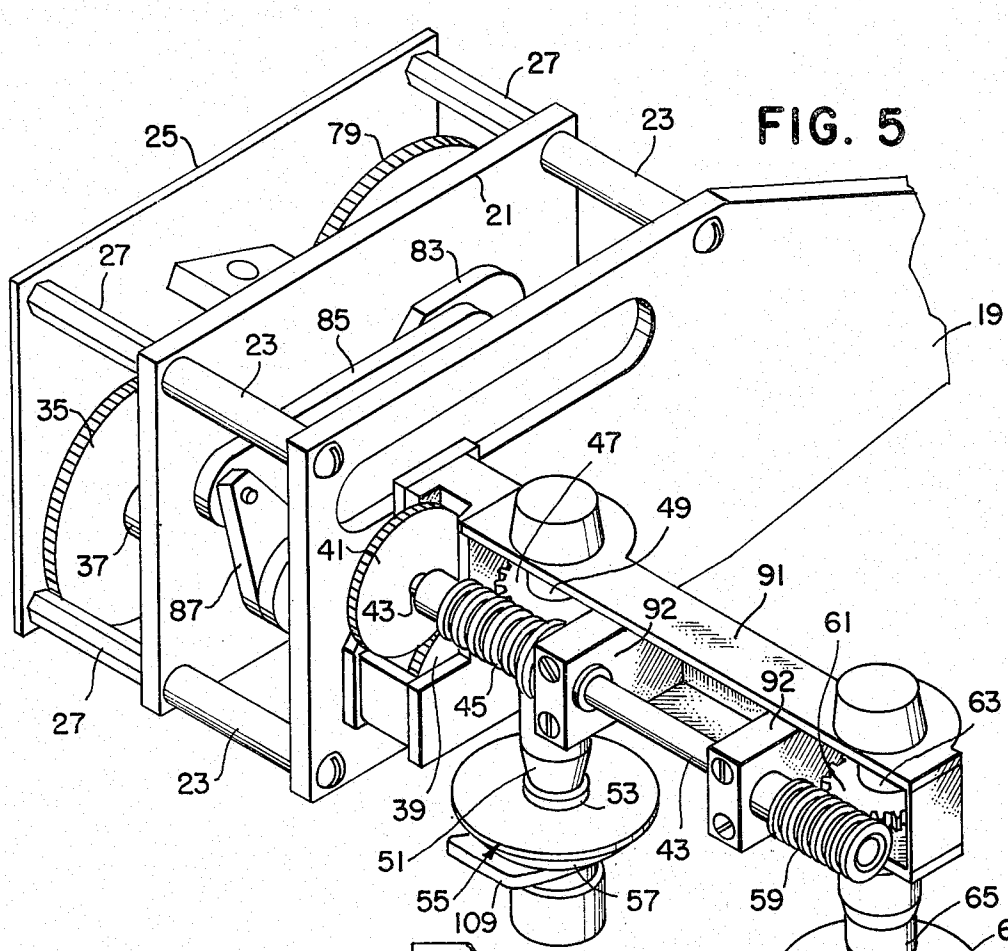


FIG. 5


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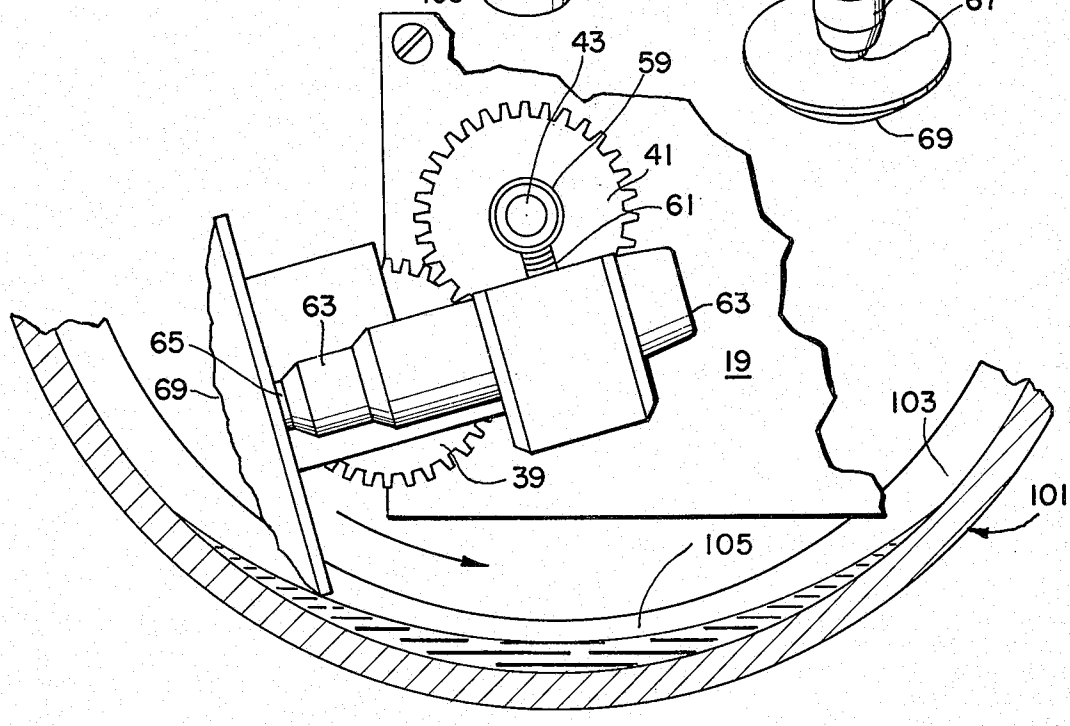

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FIG. 6

CABOCHON GEM GRINDER

BACKGROUND OF THE INVENTION

The automatic grinding of gem stones to desired shapes and sizes, such as cabochons, is conventionally performed by a positioning device that places a stone in contact with either a grinding wheel or a flat lap charged with diamond powder. The stone is caused to follow a pattern or template which contacts a wear plate when the stone is ground down to the desired size to stop further grinding. Such prior art template-controlled grinding machines for grinding cabochons of semiprecious gems are illustrated by U.S. Pat. No. 3,568,369 which issued on Mar. 9, 1971.

Such machines have certain draw-backs. As a stone is abraded by a grinding wheel, the wheel also wears, requiring frequent dressing of the wheel. This dressing causes the surface of the grinding wheel to be positioned at a greater distance from the stone, so the wear plate must be repositioned accordingly to maintain the calibration accuracy of the pattern. Further, diamond laps cut well when new, but become less and less efficient as diamond particles break away from the surface or are driven into the lap material by the impact of cutting or grinding. Moreover, lap replacement cost is high.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide an automatic cabochon gem grinding machine which overcomes the problems of the prior art machines by eliminating the grinding wheel and the flat lap.

This object is accomplished by providing a gem grinder which utilizes a slurry of abrasive grains to grind stones automatically. The abrasive grains are dispersed and maintained in a lipped drum and maintained against the inner wall of the drum by centrifugal force. The stone is held against the slurry by a dop which is rotated about its axis in unison with a pattern and is also progressively moved along the wall of the drum from an initial angle of about 75° from the vertical to the vertical (0°) as the stone is ground in accordance with the pattern.

As the grinding proceeds, material is removed from the abraded area of the stone, allowing the pattern to contact a wear or contact plate which causes a motor and gearing to turn a worm shaft to rotate both stone and pattern about their axes and about the worm shaft at right angles thereto to present an uncut area of the stone to the lap. For example, the initial grinding of a stone may start with the dop and pattern axes at 75° from the vertical. As grinding proceeds the dop and pattern axes rotate and also move toward the vertical. When the dop and pattern axis reach the vertical, the gem grinding is complete.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view in perspective of a cabochon gem grinding machine constructed in accordance with this invention;

FIG. 2 is a view in top plan of the cabochon gem grinder of FIG. 1;

FIG. 3 is a view in elevation, partly in section, and partly cut-away taken as indicated by the lines and arrows 3—3 which appear in FIG. 2;

FIG. 4 is a view in elevation taken as indicated by the lines and arrows 4—4 which appear in FIG. 2;

FIG. 5 is a partial view in perspective of the template and gem holding mechanism;

FIG. 6 is a partial view of the gem holding mechanism at about the beginning of the grinding operation;

FIG. 7 is a partial view in elevation of the template mechanism taken as indicated by the lines and arrows 7—7 which appear in FIG. 2; and

FIG. 8 is a partial view in elevation of the gem grinding mechanism taken as indicated by the lines and arrows 8—8 which appear in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the specific embodiment of the invention shown in the drawings, there is illustrated a gem grinder **11** which includes a support frame **13**, brackets **15** mounted on frame **13** and supporting a pivot pin **17**, an assembly plate **19** mounted on pivot pin **17**, a mounting plate **21** connected to plate **19** by spacers **23**, and a mounting plate **25** connected to plate **21** by spacers **27**.

An electric motor **29** has a shaft **31** and a gear **33** that meshes with gear **35** on shaft **37**. A spur gear **39** is mounted on the other end of shaft **37** and meshes with a gear **41** mounted on worm gear shaft **43**.

A worm **45** (FIGS. **2**, **5** and **7**) on shaft **43** meshes with gear **47** of shaft **49** which is provided with a chuck or quill **51** that receives shaft **53** of a template **55** having a pattern **57** at the end of the shaft.

A worm **59** (FIGS. **2**, **6** and **7**) is also mounted on shaft **43** and meshes with a gear **61** on shaft **63** which is at right angles to shaft **43**. Shaft **63** has a quill or chuck **65** at one end which receives a dop or dop stick **67**. A gem or stone **69** is glued to the end of the dop stick in position to be ground to a smooth finish in a desired configuration which conforms to the configuration of the pattern **57**.

Motor **29** also drives another gear train which includes shaft **31**, gear **33**, gear **35** and shaft **37**. A worm **71** is mounted on shaft **37** and meshes with a gear **73** on shaft **75** on which is mounted a worm gear **77** that meshes with a gear **79** on a shaft **81**. A crank arm **83** on shaft **81** drives a connecting rod **85** that tilts rocker arm **87** which is mounted on a hollow shaft **89** that is rigidly connected to a housing **91** having mounting plates **92** which support worm gear shaft **43**. Housing **91** moves from its initial position, for example, 75° from the vertical, to the vertical, zero degree position, by means of the rotation of hollow shaft **89**.

Another motor **93** with a belt **94** drives a roller **95** mounted on support bracket **97** on frame **13**. A freely mounted roller **99** is also mounted on bracket **97**, and the two rollers are adapted to support and rotate a drum **101** having a cylindrical wall **103**, a sidewall **105** that completely encloses one side of the cylindrical wall **103**, and an inner lip **107** that projects inwardly from the other side of wall **103**.

A wear or a contact plate **109**, which conforms to the shape and contours of the inside of drum circumferential wall **103**, is mounted on frame **13** just below template **55**.

In operation, the drum **101** is rotated by rollers **95** and **99** so as to maintain a slurry of grinding grits or grains against the inside surface of cylindrical wall **103** by centrifugal force. The gem **69** to be ground to cabo-

chon shape is positioned inside the drum **101** at an angle of about 75° to the vertical and grinding begins on an area of stone **69** which is located at about 75° from the bottom of the stone. After this area is ground to the desired shape, it touches the inner surface of the drum wall **103**, and simultaneously the corresponding area on pattern **57** makes contact with wear or contact plate **109**. Pattern **57** and contact plate **109** are both made of electrically conductive material and are connected in an electrical circuit with a source of power and motor **29**. The contact between pattern **57** and contact plate **109** acts as an electrical switch to close the electrical circuit and energize motor **29**. In other words, the pattern **57** and contact plate **109** sense that the stone area has been ground to the desired size and actuate motor **29** to rotate worms **45** and **59** to rotate pattern **57** and stone **69**. The stone is thereby rotated to another high area which the grit slurry starts grinding to size, and the high area moves the pattern **57** away from contact plate **109**, breaking electrical contact, and stopping motor **29**.

Also, the actuation of motor **29**, in addition to rotating the pattern and gem, also actuates the gear train that moves housing **91** and shaft **49** to dop stick **67** incrementally toward vertical position.

As the successive areas of stone **69** are ground to size, the rotation of the stone and the incremental movement toward the vertical cause each successive stone area to be ground to size in a substantially spiral path on the stone, with ever decreasing spiral circumference.

It is to be noted that the stone **69** and pattern **57** are synchronized by means of identical worm and gear drives so as to move in identical fashion. The shape of the pattern constitutes and provides a program which the stone follows in the course of the grinding.

The drum **101** is easily removable for the purpose of changing the compound or for cleaning. Two drums are provided: the first drum is used for grinding the stone and washing, and the second drum may be used for polishing, and may advantageously be made from a transparent synthetic plastic.

Cabochons made from grinding with the inventive machine may have an oval, rounded top with a flat bottom for use in finger rings.

One of the important features of the invention is the internal lap of the stone within the drum **101** which permits grinding at less expense than grinding with the conventional diamond lap. The inventive machine is low in initial cost, and the grinding cost is low. The inventive machine is especially suitable for hobbyists because it is simple and automatic in operation, and because it is small and compact and adapted to be mounted in a room of a house or apartment.

A cabochon is defined as a gem cut in convex form, highly polished, but not faceted. It comes from the French word meaning cabbage or rounded head.

4 We claim:

1. A cabochon gem grinding machine comprising a drum having a cylindrical wall and a lip extending inwardly from the sides of the wall for retaining a slurry of abrasive material, means mounting the drum so that its axis is horizontal and for rotating the drum to distribute and maintain the slurry against the inner wall of the drum, dop means for holding a gem to be ground in contact with the slurry at a desired angle to the vertical to grind a desired area of the gem, and pattern means connected to the dop means for indicating the desired shape of the gem.

2. The gem grinder of claim **1** including means for rotating the gem and the pattern means and for moving them toward a vertical position to grind new areas of the gem.

3. The gem grinder of claim **1**, wherein said means for rotating the drum includes a drive roller and an idler roller which support the drum and rotate it, whereby said drum is easily removed for cleaning and easily replaced by other similar drums.

4. The gem grinder of claim **1**, including sensing means for detecting when the gem area being ground has been ground to the desired pattern.

5. The gem grinder of claim **4** including actuating means responsive to the sensing means for rotating the axes of the pattern means and gem and for moving said axis toward the vertical to present another gem area to be ground.

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