Feb. 14, 1956 G. E. RYCKMAN 2,734,247

CUP FINISHING MACHINE

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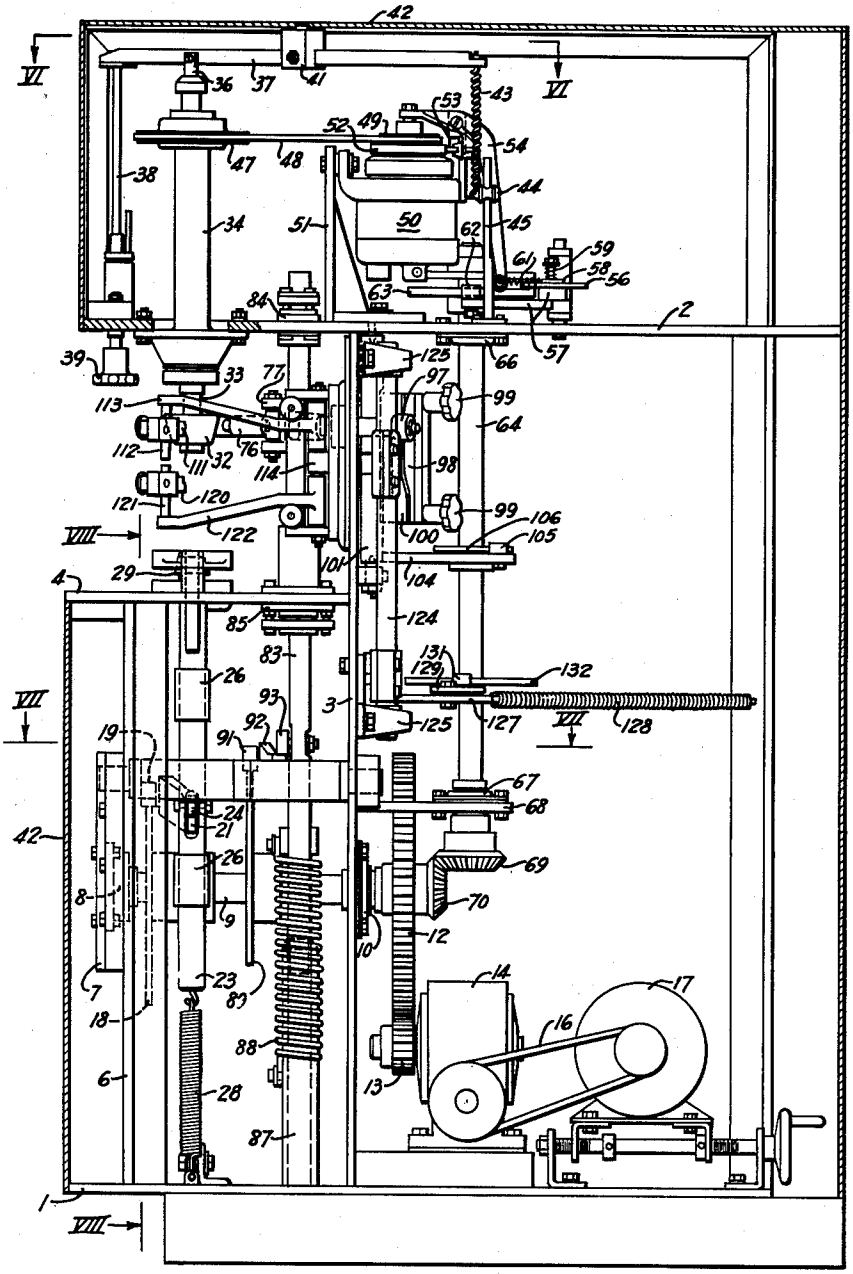

Fig. 1

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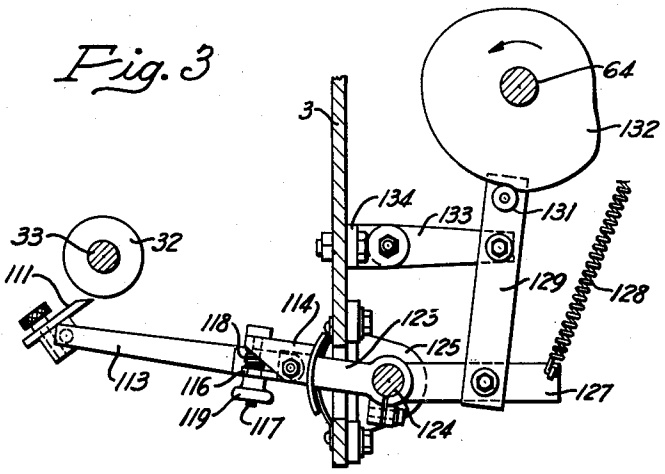
Fig. 3



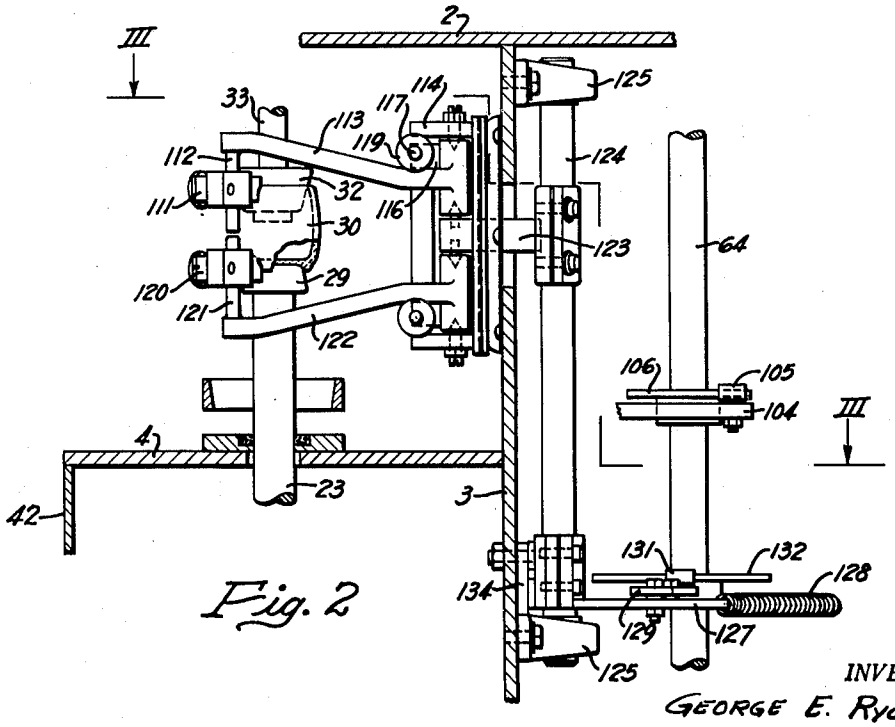


Fig. 2

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CUP FINISHING MACHINE

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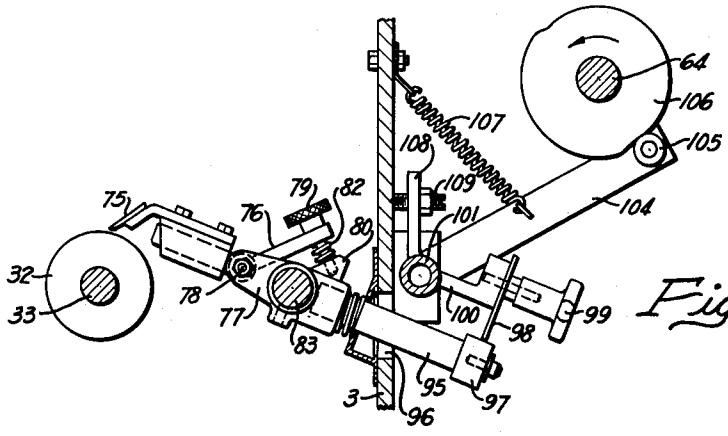

Fig. 5

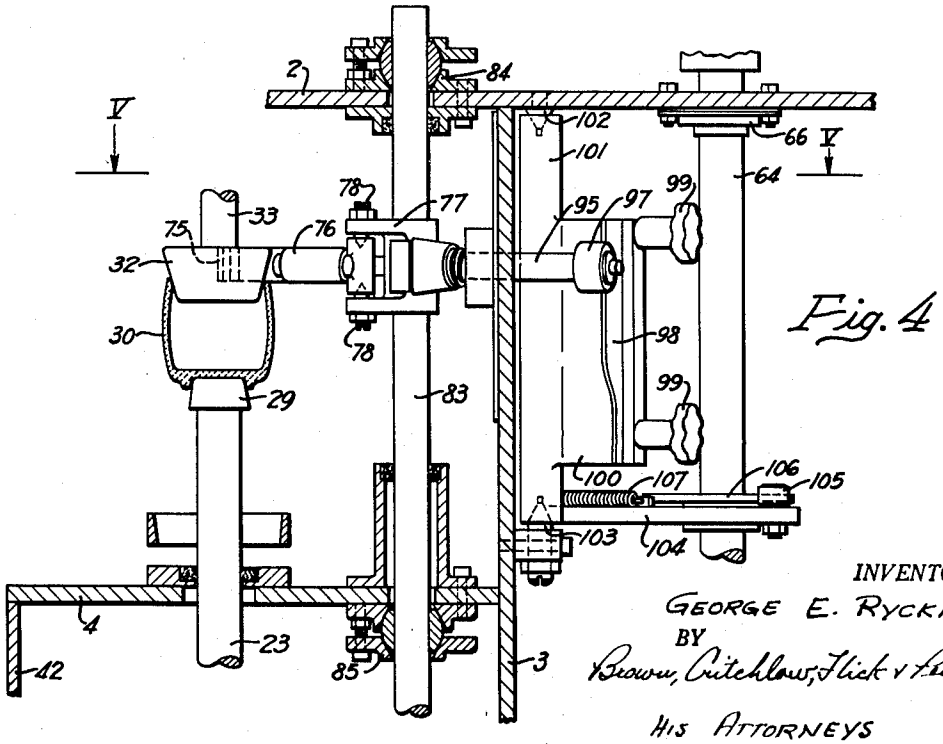

Fig. 4

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CUP FINISHING MACHINE

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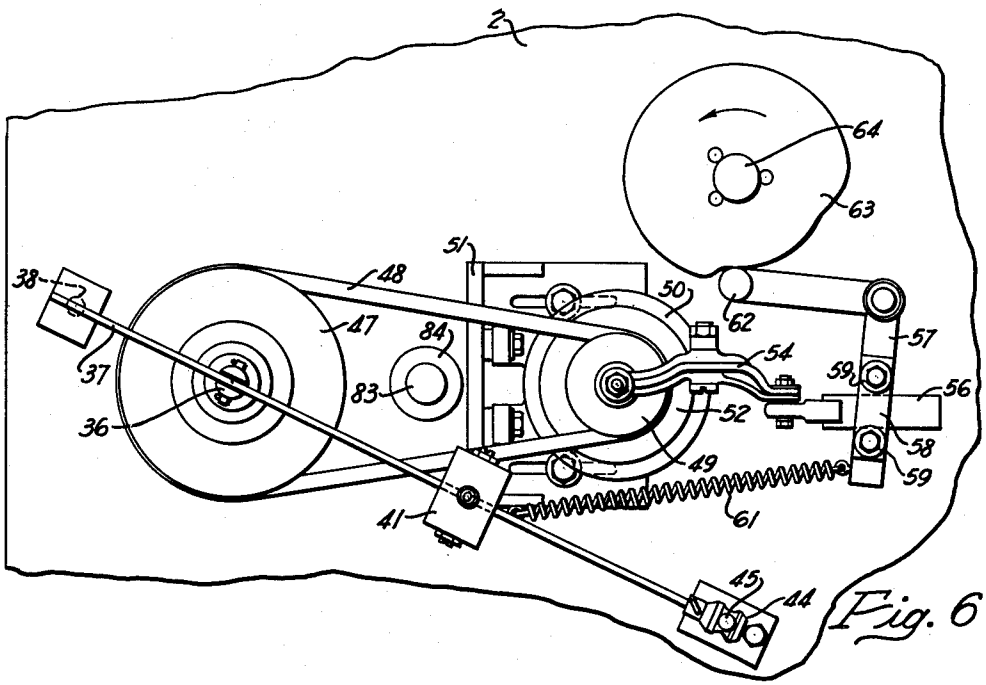

Fig. 6

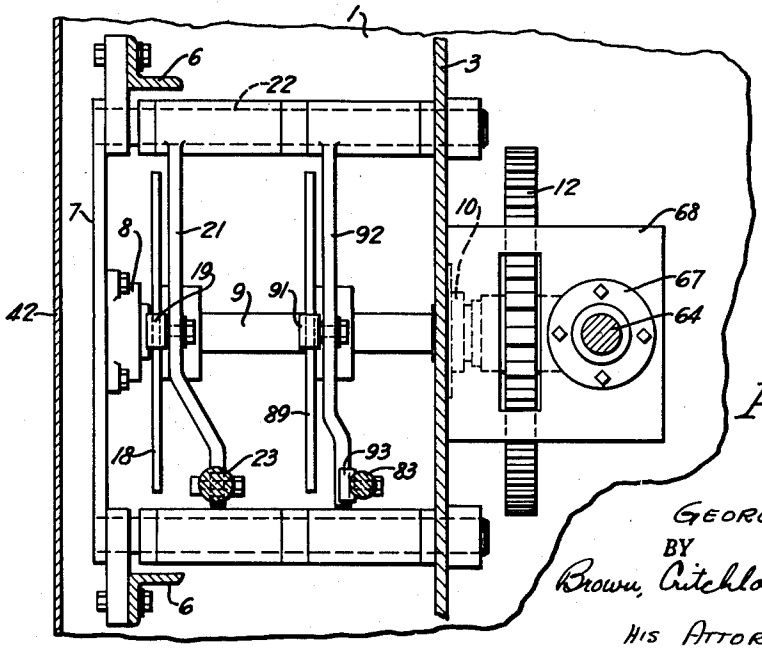

Fig. 7

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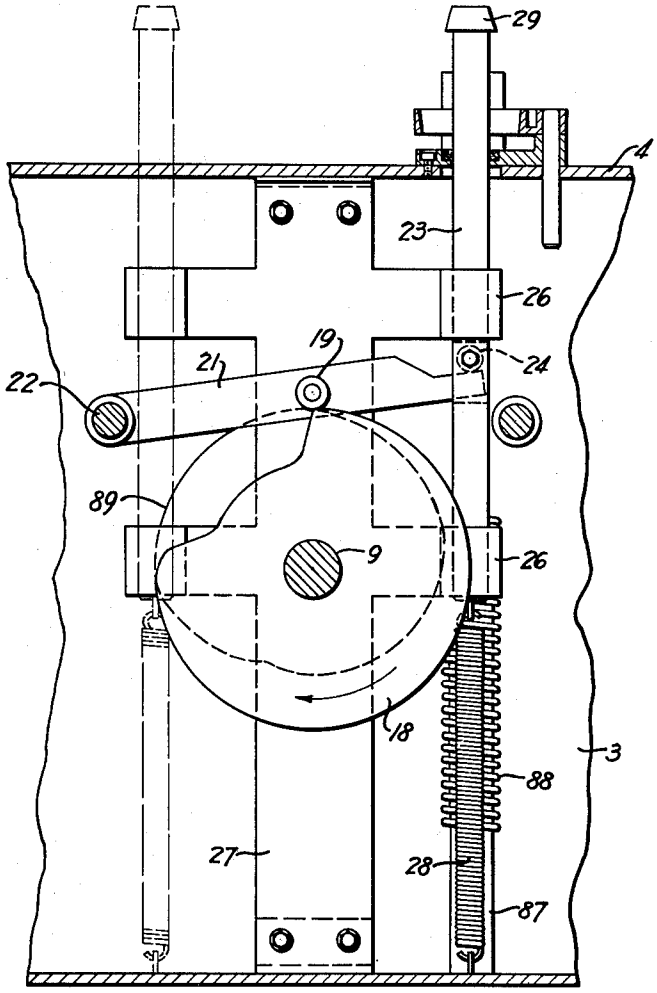

Fig. 8

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United States Patent Office 2,734,247 Patented Feb. 14, 1956

2,734,247

CUP FINISHING MACHINE

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Application June 1, 1953, Serial No. 358,820

10 Claims. (Cl. 25—24)

This invention relates to cup finishing machines, and more particularly to a machine in which cups have their tops and feet formed and their outer surfaces finished automatically before the cups are completely dry.

It is among the objects of this invention to provide a cup finishing machine which tops a cup and forms its foot while its outer surface is being finished, which is entirely automatic, and which is easy to adjust for cups of different configurations.

In accordance with this invention, a turning tool is mounted on a support projecting laterally from a vertical shaft rotatably and slidably mounted beside a chuck which is rotatable on a vertical axis. The shaft may be reciprocated by a cam mounted on a horizontal drive shaft. As the shaft moves vertically in one direction and then in the reverse direction, the tool support follows a template that causes the tool to make a rough cut followed by a finish cut. During this operation topping and footing tools are moved into engagement with the cup by means of cams on a continuously driven shaft. After all of the tools leave the cup it can be removed from the chuck. Preferably, the chuck raises the cup into finishing position, where the tools act on it and then lowers it again for removal from the chuck. By equipping the machine with a second set of many of the elements, two cups can be finished simultaneously or alternately.

The preferred embodiment of the invention is illustrated in the accomyanying drawings, in which

Fig. 1 is a side view of the machine, with the outer casing in section;

Fig. 2 is a fragmentary enlarged side view of the topping and footing mechanism;

Fig. 3 is a fragmentary horizontal section taken on the line III—III of Fig. 2;

Fig. 4 is a fragmentary enlarged side view of the turning tool mechanism;

Fig. 5 is a fragmentary horizontal section taken on the line V—V of Fig. 4;

Fig. 6 is an enlarged fragmentary plan view taken on the line VI—VI of Fig. 1;

Fig. 7 is an enlarged horizontal section taken on the line VII—VII of Fig. 1; and

Fig. 8 is an enlarged fragmentary vertical section taken on the line VIII—VIII of Fig. 1, but showing the lower chuck raised.

Referring to Fig. 1 of the drawings, the machine frame includes a base plate **1** and a top plate **2** connected by a vertical back wall **3**. Projecting from the front of this wall some distance below the top plate is a table **4**. The front part of the table is supported by a pair of laterally spaced legs **6** which rest on the base plate. The central portions of these legs are connected by a front plate **7**, the rear surface of which supports a central bearing **8**. Journaled in this bearing is the front end of a horizontal cam shaft **9** that extends through a bearing **10** in the back wall. Rigidly mounted on the projecting rear end of this shaft is a large gear **12** that is driven

by a pinion **13** on the shaft of a gear reducer **14** mounted on the base plate. The reducer is driven through a belt and pulley drive **16** from an electric motor **17** that is adjustable along the base plate.

The front portion of the cam shaft carries a large cam **18**, on which a roller **19** rests as shown in Figs. 7 and 8. This roller projects from the front side of the central portion of a rocker arm **21**, one end of which is oscillatably mounted on a horizontal shaft **22** located at one side of and above the level of the drive shaft. The opposite ends of this shaft are mounted in the front plate **7** and the back wall **3**. As the cam rotates, it causes the free end of the rocker arm to swing up and down. This end of the arm extends through a slot in a post **23**, and engages the bottom of a roller **24** that is journaled in the slot. The post is slidable up and down in a pair of vertically spaced bearings **26** on the outer ends of lateral extensions of a vertical center plate **27** which is connected to the table and the base plate. The post is pulled downward by a coil spring **28** fastened to its lower end and to the base plate. The upper portion of the post extends up through an opening in the table and has a chuck **29** rotatably mounted on its upper end in any suitable manner. This chuck is designed to support a cup **30** (Figs. 2 and 4) in leather hard condition and to raise it to a predetermined elevation when cam **18** lifts the post. If it is desired to work on two cups at the same time or alternately with this machine, it can readily be provided with a second post at the opposite side of center plate **27**, as indicated in broken lines in Fig. 9.

The post and chuck raise the cup into frictional engagement with an upper chuck **32** rigidly mounted on the lower end of a rotatable shaft **33**, as shown in Fig. 1. This shaft is movable vertically and journaled in a sleeve **34** that is bolted to the top plate **2**. The shaft extends above the sleeve and is supported by a bearing **36** suspended from a horizontal lever **37**. The adjacent end of the lever normally is supported by the upper end of a vertical rod **38** that can be adjusted vertically by a hand wheel **39** below the top plate. The central portion of the lever is fulcrumed in a block **41** attached to the top of the casing **42** that encloses most of the machine. The opposite end of the lever is connected by a coil spring **43** to a bracket **44** adjustable vertically on a vertical rod **45** mounted on the top plate. The spring counterbalances most of the weight of the upper chuck and its shaft, so that a rising cup will lift the chuck instead of being split open by it.

Splined on shaft **33** above sleeve **34** is a pulley **47** which is driven intermittently by a belt **48** from another pulley **49** mounted on the upper end of the shaft of an electric motor **50**. The motor is supported by a bracket **51** mounted on the top plate. As shown in Figs. 1 and 6, mounted on the rotor shaft directly below pulley **49** there is a brake wheel **52** that is engaged by a shoe **53** carried by a curved lever **54**. The lower end of the lever is pivotally connected to a rearwardly extending bar **56** that extends across one arm of a bell crank **57** pivotally mounted on top plate **2**. The bar is pressed against this arm by a plate **58** which is pressed down by a pair of coil springs **59**. The outer end of the crank arm is connected by a coil spring **61** to the motor bracket. The other end of the crank carriers a roller **62** that engages a cam **63** mounted on the upper end of a vertical cam shaft **64**. This shaft extends down through a bearing **66** (Figs. 1 and 4) in the top plate behind the back wall **3** and has its lower end journaled in a bearing **67** (Fig. 1) carried by a bracket **68** projecting from the back side of the back wall. This bracket is provided with a slot through which the upper part of gear **12** extends. Mounted on the lower end of the vertical cam shaft is

a bevel gear **69** that meshes with a like gear **70** on the rear end of the horizontal cam shaft **9**, so that shaft **64** is rotated continuously. Cam **63** is shaped to cause the brake to be released as soon as a cup has been elevated into engagement with chuck **32**, whereupon the chuck will be driven by motor **50** and the cup will be rotated until the brake is applied again at the conclusion of the finishing operation. The finished cup then can be lowered away from the stationary upper chuck.

During rotation of the cup by the upper chuck, the outer surface of the cup is turned by a tool **75**, shown in Figs. 4 and 5, that first makes a rough cut and then a finish cut. To do this, the tool moves vertically along the cup in one direction to make the rough cut, and then the tool is moved inward and vertically in the opposite direction to make the finished cut. The tool is mounted on one end of an angular arm **76** that has a central portion disposed in a bifurcated bracket **77** where is is held by upper and lower pivot pins **78**. The other end of the arm loosely supports a screw **79** that extends back into a lateral projection **80** on the bracket. A coil spring **82** on the screw pushes the arm away from the projection. The bracket is clamped on a vertical shaft **83** which is slidably and rotatably mounted in bearings **84** and **85** supported by top plate **2** and table **4**, respectively. The shaft extends down below the table and into a sleeve **87** rigidly mounted on the base plate, as shown in Fig. 1. The lower part of the shaft and the upper part of the sleeve are encircled by a torsion spring **88** which is attached to both in order to pull the shaft downward and also rotate it in a counterclockwise direction.

The shaft **83** is raised periodically by a large cam **89** mounted on cam shaft **9**, as shown in Figs. 1, 7 and 8. The top of this cam is engaged by a roller **91** projecting from the side of a rocker arm **92**, one end of which is oscillatably mounted on shaft **22** beside the cam shaft. The opposite end of the arm engages the bottom of a roller **93** projecting from the side of shaft **83**. The cam raises the shaft, and gravity and spring **88** lower the shaft when the cam permits it.

Projecting from the rear end of the turning tool bracket **77** is an arm **95** that extends through a vertical slot **96** in the back wall **3**. The rear end of this shaft carries a roller **97** that engages one edge of a vertical template **98** of the particular contour that the cup is supposed to have. The template is removably mounted by means of hand screws **99** on a bracket **100** projecting rearwardly from a hollow vertical shaft **101**. The opposite ends of this shaft are supported by pivot pins **102** and **103** connected to top plate **2** and the back wall, as shown in Fig. 4. Also projecting rearwardly from the hollow shaft, at its lower end, is an arm **104** that supports a roller **105** which engages a cam **106** on vertical cam shaft **64**. The roller is held against the cam by a coil spring **107** connected to the back wall. A short arm **108**, projecting laterally from the hollow shaft, is provided with an adjustable set screw **109** that engages the back wall to limit the distance that the other arm can be pulled toward the cam. The torsion spring on the turning tool shaft **83** keeps roller **97** in engagement with the template. The cam **106** preferably is formed so that when shaft **83** moves downward the turning tool makes a rough cut along the outside of the cup. When the shaft starts back up, a relieved portion of the cam permits coil spring **107** to swing the arm **104** forward slightly. This retracts the template so that torsion spring **88** moves the turning tool in toward the axis of the cup to make a finished cut as the tool travels upward.

As the outside of the cup is being finish turned, the cup is topped and the foot is formed or shaped. This topping and footing are done by a pair of vertically spaced tools that are swung into engagement with the spinning cup. As shown in Figs. 2 and 3, the topping tool **111** is adjustably mounted on a vertical pin **112**, the upper end of which is joined to the front end of an

arm **113**. The rear end of the arm is pivotally supported in the upper part of a bracket **114**. The rear end of the arm has an upper forward projection **116**, through which an adjusting screw **117** extends. The screw also extends through the side of the bracket, and a spring **118** on the screw urges projection **116** away from the side of the bracket when a nut **119** on the screw is turned counterclockwise, thereby swinging arm **113** away from the sides of the bracket and chuck. The footing tool **120** is supported in a similar way. It is mounted on a pin **121** on the front end of an arm **122**, the rear end of which is adjustably mounted in the lower part of bracket **114**.

Projecting from the back of the bracket is an arm **123**, the rear end of which is clamped on a vertical shaft **124** journaled in bearings **125** fastened to the back of the back wall **3**. Clamped on the lower portion of this shaft is the front end of an arm **127** that extends rearwardly. The rear end of the arm is pulled toward vertical cam shaft **64** by a spring **128** connected to the machine frame. Pivotally connected to this arm is one end of a strut **129** that carries on its other end a roller **131** which engages a cam **132** on shaft **64**. Between its ends the strut is pivotally connected to the rear end of a supporting link **133**, the front end of which is pivotally connected to a bracket **134** on the back wall. When the cam moves the roller away from the cam shaft, the topping and footing tools are swung toward the chucks to top and foot the cup held by them. Thereafter, when the cam permits it, the spring **128** swings the tools away from the finished cup.

In using this machine the operator stands in front of it, and when the lower chuck **29** is in its lower position (Fig. 1) he places a cup on the chuck. Rotating cam **18** then raises the chuck and cup to engage the cup snugly around upper chuck **32** which is stationary at that time, due to the brake being applied to motor **50**. As soon as the cup is on the upper chuck the brake is released and the chuck rotates the cup rapidly. The turning tool **75**, which was in its upper and outer position, then starts to move downward as cam **89** allows shaft **83** to descend. As roller **97** moves along template **98**, the cup is rough cut. When cam **89** starts to move shaft **83** and the turning tool upward, cam **106** allows spring **107** to swing the template back slightly, whereupon torsion spring **88** turns shaft **83** and thus moves the turning tool in toward the chucks. Consequently, a finishing cut is made by the tool as it rises. Figs. 4 and 5 show cam **106** at the completion of the finishing cut, just as the cam is about to swing the tool away from the cup and back to rough cut position for the next cup.

As soon as the finishing cut on a cup starts, cam **132** springs the topping and footing tools **111** and **120** into engagement with the spinning cup. This cam is shown in Fig. 3 in the position it occupies at the completion of the topping and footing operation.

As soon as all of the tools are withdrawn from the finished cup the brake is applied to motor **50** to stop the rotating cup, and then the lower chuck is lowered as it is about to be in Fig. 8. The finished cup is removed and an unfinished one is placed on the lower chuck. The cycle just described then is repeated. This machine is fully adjustable for cups of various sizes and shapes. It also is fully automatic from the time a cup is placed on the lower chuck until it is removed.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a turning tool disposed beside the chuck, actuating means for reciprocating the

turning tool vertically, the turning tool being in a position to rough turn the outside of a cup on the chuck as the tool moves vertically in one direction, and means for swinging the turning tool horizontally inward toward said axis when it moves in the opposite vertical direction, whereby to finish the outside of the cup.

2. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a turning tool disposed beside the chuck, actuating means for reciprocating the turning tool vertically, a template, means connected to the turning tool and engaging the template for holding the turning tool in a position to rough turn the outside of a cup on the chuck as the tool moves vertically in one direction, and means for moving the template bodily to swing the turning tool horizontally inward toward said axis when the tool moves in the opposite vertical direction, whereby to finish the outside of the cup.

3. A cup finishing machine comprising a cup-receiving chuck rotatble on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a tool support projecting laterally from the shaft, a turning tool mounted on said support, means for reciprocating the shaft, the tool being in a position to rough turn the outside of a cup on the chuck when the shaft is moved vertically in one direction, and means for turning the shaft slightly when it moves in the opposite vertical direction, whereby to swing said support horizontally toward said axis to move the tool inward to finish the outside of the cup.

4. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a tool support mounted on the shaft and projecting in two directions therefrom, a turning tool mounted on one end of said support, a vertical template engaged by the opposite end of the support, means for reciprocating the shaft, the template being in a position to cause the tool to rough turn the outside of a cup on the chuck as the shaft moves vertically in one direction, and means for moving the template laterally when the shaft moves in the opposite vertical direction to cause the tool to move inward toward said axis to finish the outside of the cup.

5. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a bracket rigidly mounted on the shaft, an arm pivotally mounted on a vertical axis in the bracket and projecting therefrom, means for adjusting the arm on said axis, a turning tool mounted on the outer end of the arm, a second arm rigidly mounted in said bracket, a roller on the outer end of the second arm, a vertical template beside said roller, means holding the roller against the template, means for reciprocating the shaft, and means for periodically moving the template laterally to change the position of the tool.

6. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a tool support mounted on the shaft and projecting in two directions therefrom, a turning tool mounted on one end of said support, a vertical template engaged by the opposite end of the support, on the side opposite to the chuck, means for reciprocating the shaft, a spring for turning the shaft and holding said support against the template, the template being in a position to cause the tool to rough turn the outside of a cup on the chuck as the shaft moves vertically in one direction, and means for retracting the template when the shaft moves in the opposite vertical direction to permit said spring to swing the tool inward toward said axis in order to finish the outside of the cup.

7. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a tool

support mounted on the shaft and projecting in two directions therefrom, a turning tool mounted on one end of said support, a template engaged by the opposite end of the support, means for reciprocating the shaft, and a rotating cam for periodically moving the template horizontally to swing the tool between rough turning and finishing positions.

8. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, topping and footing tools disposed beside the chuck, means supporting said tools for swinging in a horizontal plane, a turning tool disposed beside the chuck, actuating means for reciprocating the turning tool vertically, a template, means swingable in a horizontal plane and rigidly connected to the turning tool and engaging the template for holding the turning tool in a position to rough turn the outside of a cup on the chuck as the tool moves vertically in one direction, a vertical shaft, means for rotating the shaft, and cams mounted on the shaft and operatively connected with said tool-supporting means for swinging the topping and footing tools and for moving the template to swing the turning tool horizontally.

9. A cup finishing machine comprising a cup-receiving chuck rotatable on a vertical axis, a vertical shaft rotatably and slidably mounted beside the chuck, a tool support projecting laterally from the shaft, a turning tool mounted on said support, a horizontal cam shaft, a cam on the cam shaft for reciprocating said vertical shaft, a vertical template engaging said tool support for holding the tool in a position to rough turn the outside of a cup on the chuck as the tool moves vertically in one direction, a second vertical shaft, means operatively connecting the cam shaft with the second vertical shaft to rotate it continuously, topping and footing tools disposed beside the chuck, movable supporting means for the topping and footing tools, and cams mounted on said second vertical shaft for moving said supporting means and template to swing the topping and footing tools into engagement with the top and foot of the cup and to swing the turning tool horizontally outward away from said axis.

10. A cup finishing machine comprising a table, a vertical wall behind and above the table, a post extending through the table in front of said wall, a cup-receiving chuck rotatably mounted on the upper end of the post, a driven chuck above the first chuck, a shaft behind the post extending through the table and rotatable therein, a tool support rigidly mounted on the shaft above the table and extending from in front of that shaft back through a vertical slot in said wall, a turning tool mounted on the front end of said support, a vertical template engaged by the rear end of said support behind the wall, means below the table for reciprocating said post and shaft to move a cup on the lower chuck up into engagement with the driven chuck and to move said tool vertically, the template being in a position to cause the tool to rough turn the outside of a cup on the chuck as said shaft moves vertically in one direction, topping and footing tools disposed beside the chuck on the side opposite to the turning tool, supporting means for the topping and footing tools extending through said wall and supported thereby on a vertical axis, a vertical shaft mounted behind the wall, means for rotating said vertical shaft, and cams mounted on said vertical shaft for swinging the rear end of said supporting means and for moving the template horizontally to swing the turning tool support.

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