Aug. 19, 1969 B. A. SCHNEPP 3,461,613

HELICAL GROOVE FINISHING DEVICE

Filed May 23, 1966

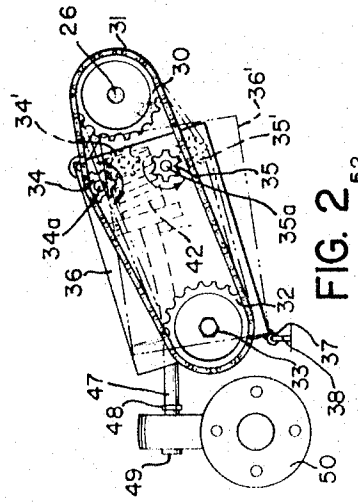

FIG. 2

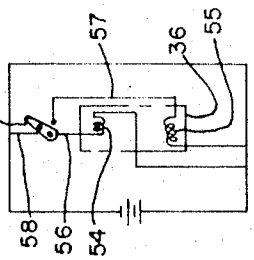

FIG. 6

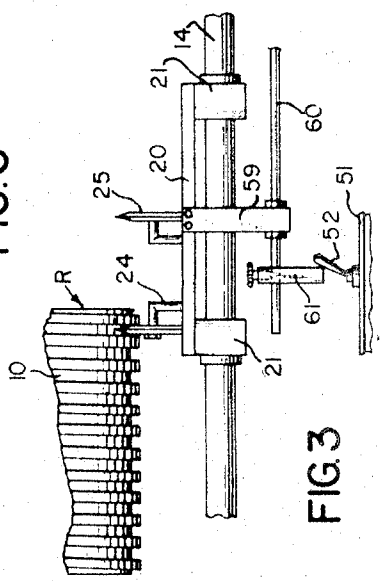

FIG. 3

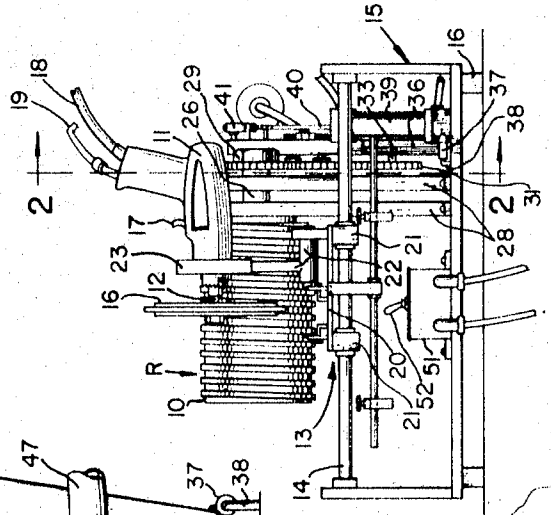

FIG. 1

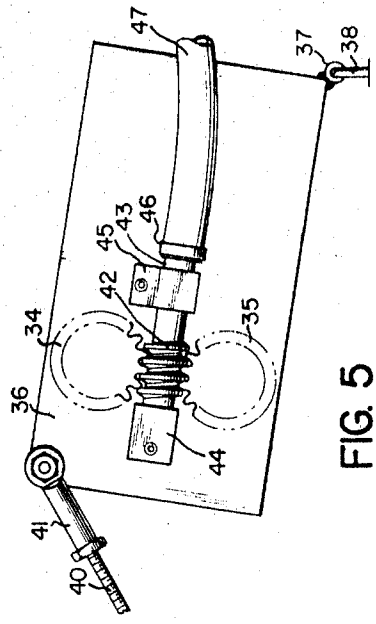

FIG. 5

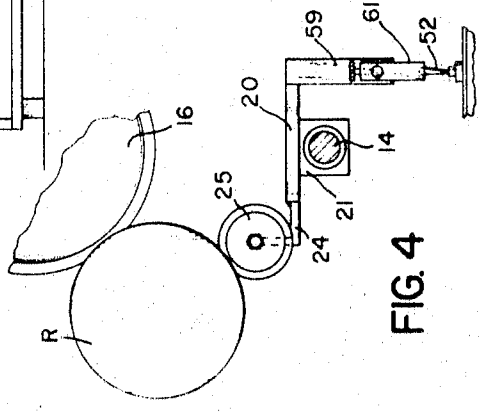

FIG. 4

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HELICAL GROOVE FINISHING DEVICE

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U.S. Cl. 51—50 9 Claims

ABSTRACT OF THE DISCLOSURE

A machine for polishing a groove formed on the outer surface of a cylinder. A polishing wheel automatically moves back and forth over the groove in response to a groove engaging guide attached to the wheel. Reversing means are provided to automatically reverse the direction of rotation of the cylinder when the polishing wheel reaches the end of the groove or groove portion being finished.

This invention relates to helical groove finishing machines and more particularly to automatically operating mechanism for polishing or lapping the helical groove of a forming roll used for curling the rims of thermoplastic containers.

One of the prime objects of the invention is to provide relatively simple yet reliable apparatus for polishing such a groove in a continuous, rather than intermittent, manner so that the polishing is automatically continued over the length of time needed to accomplish the objective.

Briefly, the invention is concerned with means for supporting and revolving the roll at a relatively slow speed, means for supporting a tool member which extends into the groove, and means for supporting the cylinder supporting means and tool member supporting means for relative axial movement as required by the revolution of the forming roll.

In the drawings,

FIGURE 1 is a side elevational view of the machine;

FIGURE 2 is a transverse sectional view taken on the line 2—2 of FIGURE 1, the chain lines indicating another position of the drive elements shown;

FIGURE 3 is an enlarged, fragmentary, side elevational view illustrating the switch mechanism for reversing the direction of rotation of the forming roll;

FIGURE 4 is an enlarged, fragmentary, end elevational view further illustrating the mechanism shown in FIGURE 3;

FIGURE 5 is an enlarged, fragmentary, elevational view of the drive mechanism for revolving the forming roll shown in FIGURE 2, but from the opposite side;

FIGURE 6 is a typical electrical control circuit which may be employed.

Referring now more particularly to the accompanying drawings, a letter R generally indicates a container rim curling roll which is helically grooved from one end to the other, as at 10. The configuration of the continuous helical groove 10 may be as described in the present assignee's copending application Ser. No. 366,389, filed May 11, 1964, for a lip curling method and machine. In manufacturing such forming rolls R, the helical groove 10 is initially machined in the roll or cylinder but it is desired that the groove surfaces be lapped to a high degree of polish, such highly polished surfaces being necessary to the efficient forming or curling of thermoplastic container rims such as the plastic cottage cheese and coffee containers in common use.

To accomplish the polishing or lapping operation, an air gun 11 having a drive shaft 12 is supported adjacent the roll R on a slide generally designated 13 which is

mounted for reciprocating travel on a rod or shaft 14 on a U-shaped frame generally designated 15, the slide 13 being supported for travel along the shaft 14 on a slide axis which is parallel to the axis of the roll R.

Mounted on the revolving shaft 12 of the air gun 11 is a felt wheel 16 having a peripheral edge which is shaped to the configuration of the groove 10. The wheel 16 is used with a suitable lapping compound such as pumice stone and the speed of rotation maintained is relatively high, compared with the speed of rotation of the roll R. For example, while the revolution of roll R may be maintained in the neighborhood of two or three revolutions per minute, the speed of rotation of the wheel 16 is maintained in a range such as 900 to 1500 r.p.m. Preferably, the air gun 11, which is connected with a suitable source of air such as a standard compressor, is trigger actuated to turn it on and off, as at 17, and has air supply and exit hoses 18 and 19, respectively, connecting with it.

The slide 13, which has been only generally mentioned, includes a platform 20 supported by spaced apart slide bearings 21 on rod 14, and mounted on platform 20 is a support post structure 22 including a clamp ring 23 which supports the air gun 11. Fixed on the slide platform 20 by angular supports 24 (see FIGURE 3) are spaced apart, non rotatable disks 25 which guide in the groove 10 and, as the roll R is revolved, move the slide 13 and air gun 11 axially on the shaft 14 in a manner which will be explained. The roll R is revolved in one direction until the wheel 16 has traveled to the one end of groove 10, and thence is revolved in the opposite direction so that the wheel 16 returns to the opposite end of groove 10. In this way, the machining operation is continuously maintained over a period of hours until the high degree of polish desired is attained.

Extending from the roll R is a drive shaft 26 by which it is mounted on frame 15, the shaft 26 extending through bearing openings in spaced apart vertical support plates 27 and 28 and being secured in place by a nut 29. Mounted on the shaft 26 to revolve it in first one direction and then the other is a sprocket 30, and a chain 31 is trained around sprocket 30 and around a sprocket 32 supported on a stub shaft 33. The chain 31 is driven first in one direction and then in the other by either one or the other of a pair of sprockets 34 and 35 (see FIGURE 2) mounted on shafts 34*a* and 35*a*, respectively, which are journaled for rotation on a pivotally supported plate 36. Fixed to one corner of plate 36, which also supports shaft 33, is a bearing 37 which is pivotally mounted on a U-shaped pivot 38 fixed to frame 15. A double-acting solenoid operated, pneumatic cylinder 39 is utilized to pivot the plate 36 upwardly and downwardly about pivot 38 and has a piston rod 40, connected by a coupling 41 to the opposite upper corner of plate 36. When the piston rod 40 is in extended position, as shown in FIGURES 1 and 2, the plate 36 is in raised position and it is sprocket 34 which is in engagement with the chain 31. However, when the piston rod 40 is retracted, the plate 36 is pivoted to the chain line position shown in FIGURE 2 at 36' and it is the sprocket 35 which is in driving engagement with the chain 31. As FIGURE 5 indicates, the sprockets 34 and 35 are driven by a worm gear 42 mounted on a shaft 43 which is supported by bearings 44 and 45. A coupling 46 connects the shaft 45 with a flexible shaft 47 which is connected by coupling 48 to a shaft 49 which is driven by motor 50.

In order to operate the pneumatic cylinder 39 and reverse the direction of drive of the roll R, a toggle switch generally designated 51 is employed which has a toggle member 52. In FIGURE 6 is shown an electric circuit for the toggle switch 52 and pneumatic cylinder 36, and the advance and retract solenoids 54 and 55, respectively,

thereof. The switch **52**, dependent on its position, either electrically connects the line **56** or the line **57** with a line **58**.

In operation, the motor **50** continuously drives the flexible shaft **47** and the sprockets **34** and **35**. At the same time, felt wheel **16** is continuously driven by the air gun **11** but at a considerably greater rate of speed. Wheel **16** is continuously revolving and polishing the groove **10** and as roll R revolves the slide **13** is continuously moved axially, due to the engagement of the nonrotatable guide disks **25** in the groove **10**. The guide disks **25** are not rotated, because it is desired to avoid packing the compound into the groove **10** and interfering with the polishing operation. With two spaced apart guide disks **25** provided as indicated, one will always be in engagement with the groove **10**, even though the felt wheel **16** has run slightly beyond the groove **10**.

Provided on the platform **20** is a dependent support **59** mounting a rod **60** on which an actuator finger **61** is adjustably located to reverse the position of toggle actuator **52** at the proper time. As shown in FIGURE 3, the finger **61** has just actuated the toggle actuator **52** as the wheel **16** has finished polishing the terminal end portion of groove **10**, and the direction of drive of chain **30** has just been reversed through pneumatic cylinder **39**. When the plate **36** is moved downwardly to the diagrammatic line position shown at **36'**, the sprockets **34** and **35** are moved to their diagrammatic line positions **34'** and **35'** and it will be seen that sprocket **35** is then in driving engagement with the chain **31** and the direction of drive has been reversed.

It is to be understood that the drawings and descriptive matter are in all cases to be interpreted as merely illustrative of the principles of the invention, rather than as limiting the same in any way, since it is contemplated that various changes may be made in the various elements to achieve like results without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Apparatus for finish machining a helical groove or groove portion which has been formed in the peripheral surface of a cylinder member or generally cylindrical member comprising: means supporting said member for rotation about its axis; drive means for rotating said member; a finishing tool extending into said groove; mount means mounting said member and tool for relative to and fro axial movement; means for reversing the direction of drive of said member rotating means; and actuating means for operating said reversing means when the tool has reached the ends of the groove or groove portion being finished.

2. Apparatus as set forth in claim **1** wherein said mount means further includes a pair of axially spaced apart groove engaging guides mounted on axially opposite sides of said tool.

3. The apparatus of claim **1** in which said actuating means is supported on said mount means.

4. The apparatus of claim **2** in which said means for reversing the direction of drive is connected with said drive means.

5. Apparatus as set forth in claim **1** wherein said tool means is a rotary wheel, and the mount means includes: wheel support means, mounted on an axially extending slide, and axially movable along said member in response to rotary movement of said member.

6. Apparatus as set forth in claim **5** wherein said wheel support means includes a pair of axially spaced apart groove engaging guides mounted on said slide on axially opposite sides of said wheel.

7. Apparatus as set forth in claim **5** further including means for revolving said wheel at a greater speed of rotation than said member.

8. Apparatus as set forth in claim **1** further including electrical circuit means for operating said reversing means, and including switch means in the path of said actuating means.

9. Apparatus for finishing a helical groove which has been cut in the peripheral surface of a cylinder comprising: means for supporting said cylinder; wheel support means mounting a polishing wheel which extends into said groove for rotation on an axis substantially parallel to the axis of said cylinder, said wheel support means being mounted on an axially extending slide; means for rotating said cylinder about its axis; means supporting said cylinder supporting means and wheel support means for relative axial movement by the rotary movement of said cylinder; means for reversing the direction of drive of said cylinder rotating means including: an endless chain having upper and lower runs driving said cylinder, and drive sprocket means mounted for movement between said runs to engage and drive first one run and then the other; and actuating means on said slide for operating said reversing means when the wheel has reached the end of the groove being finished.

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U.S. Cl. X.R.

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