Nov. 11, 1958 C. V. KNELL 2,859,507

STEREOTYPE FINISHING MACHINE

Original Filed Nov. 16, 1945 8 Sheets-Sheet 1

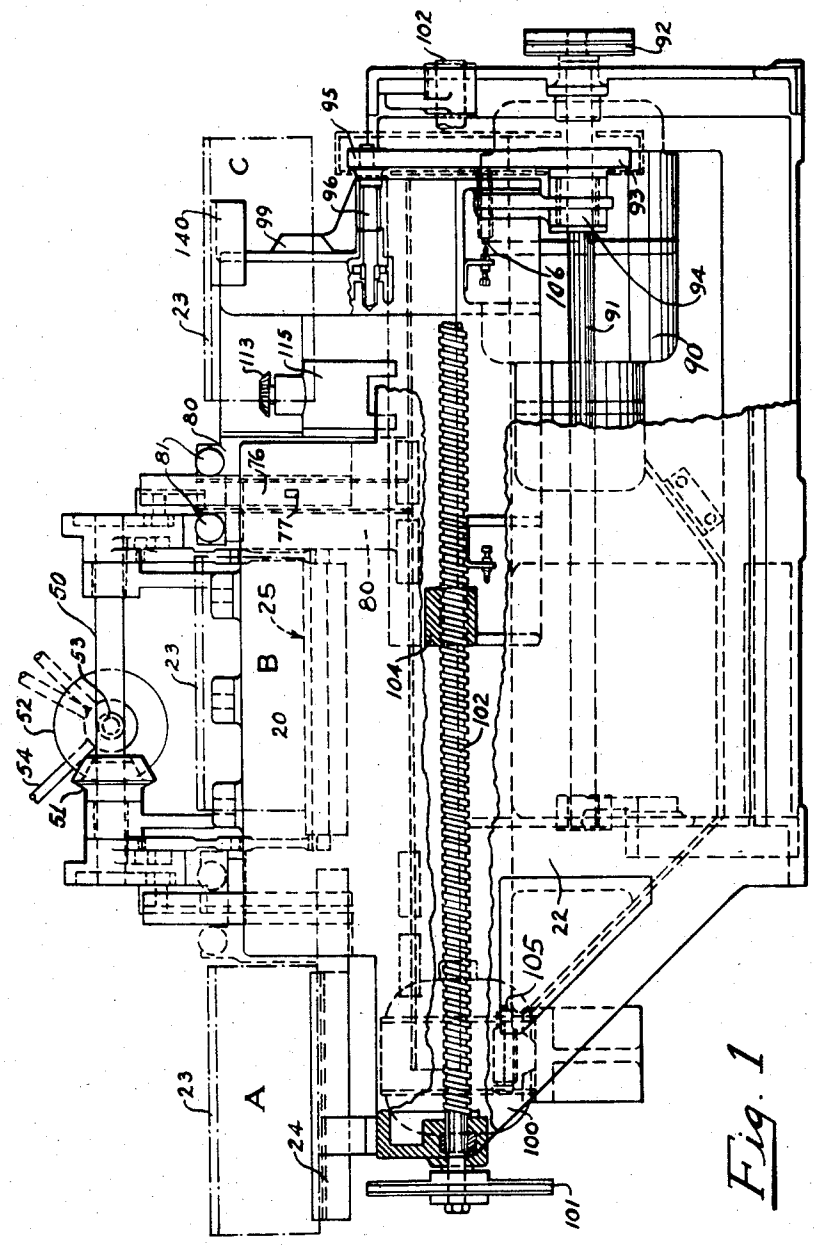


Fig. 1

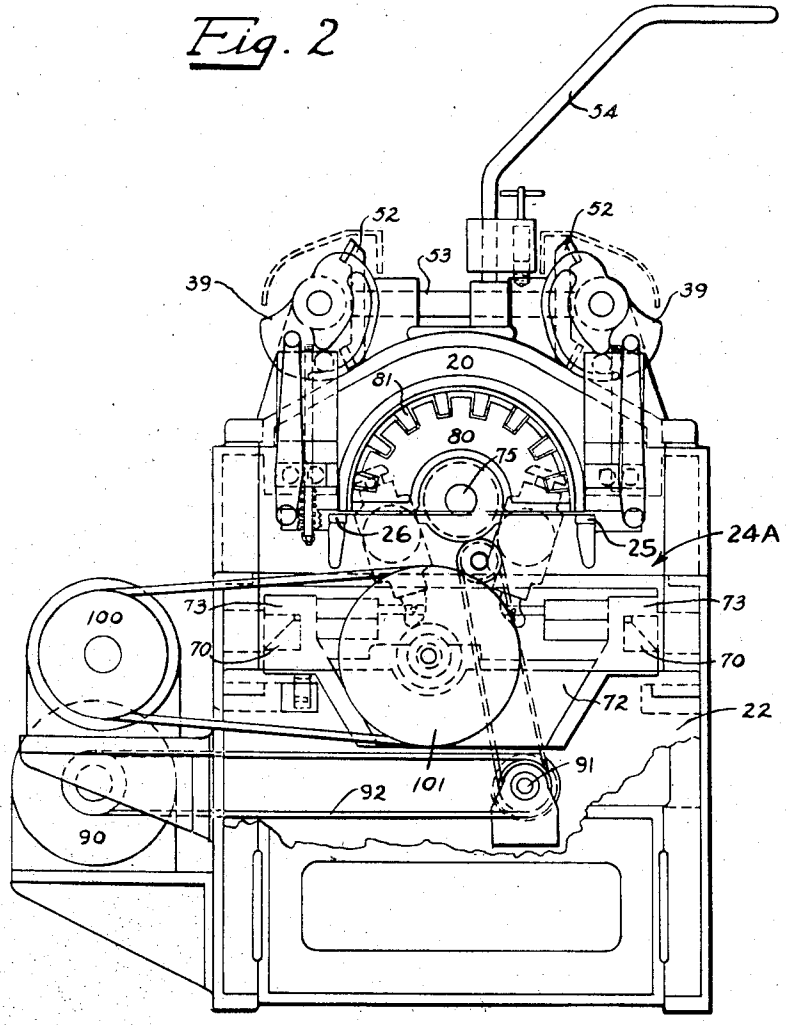
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Fig. 2



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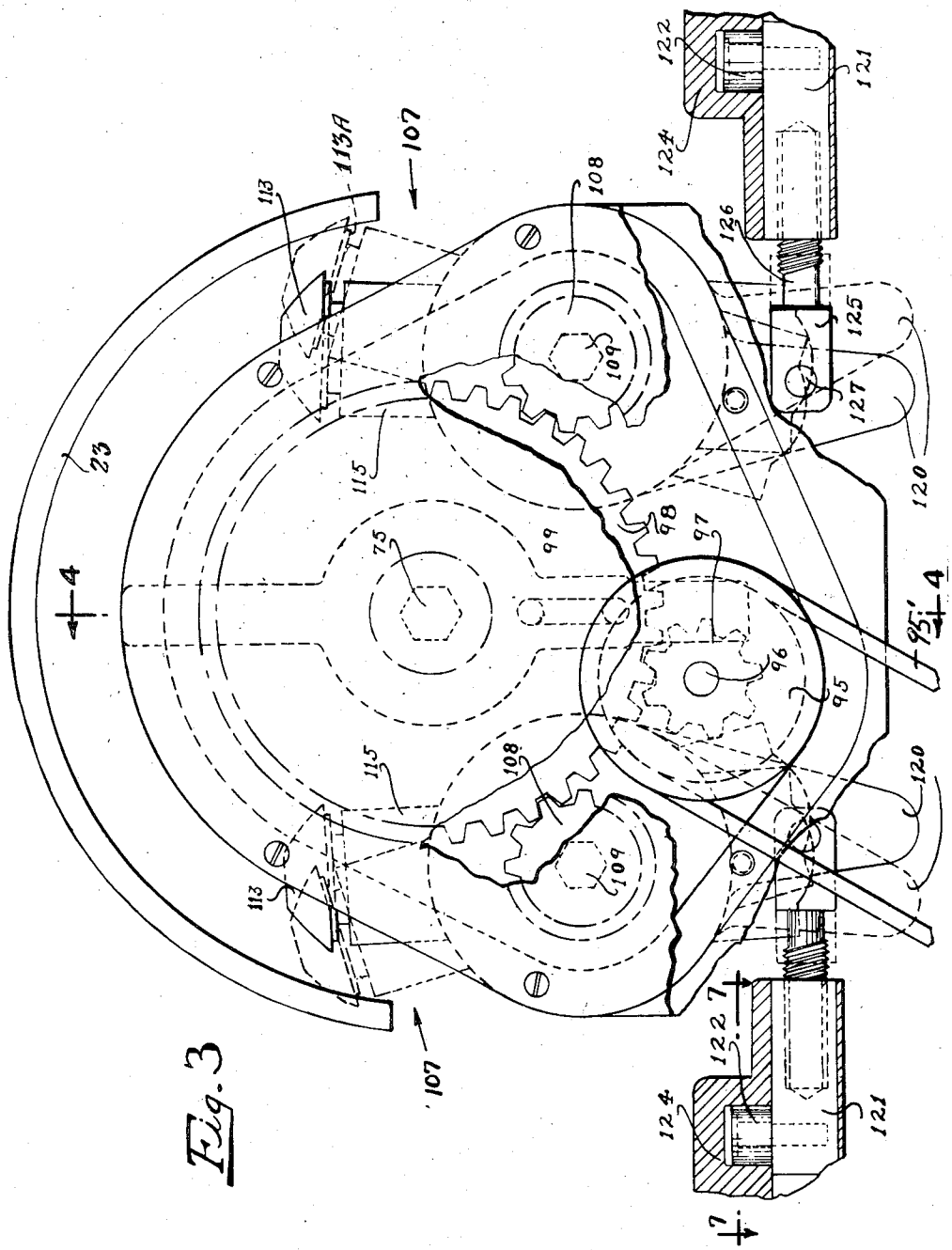


Fig. 3

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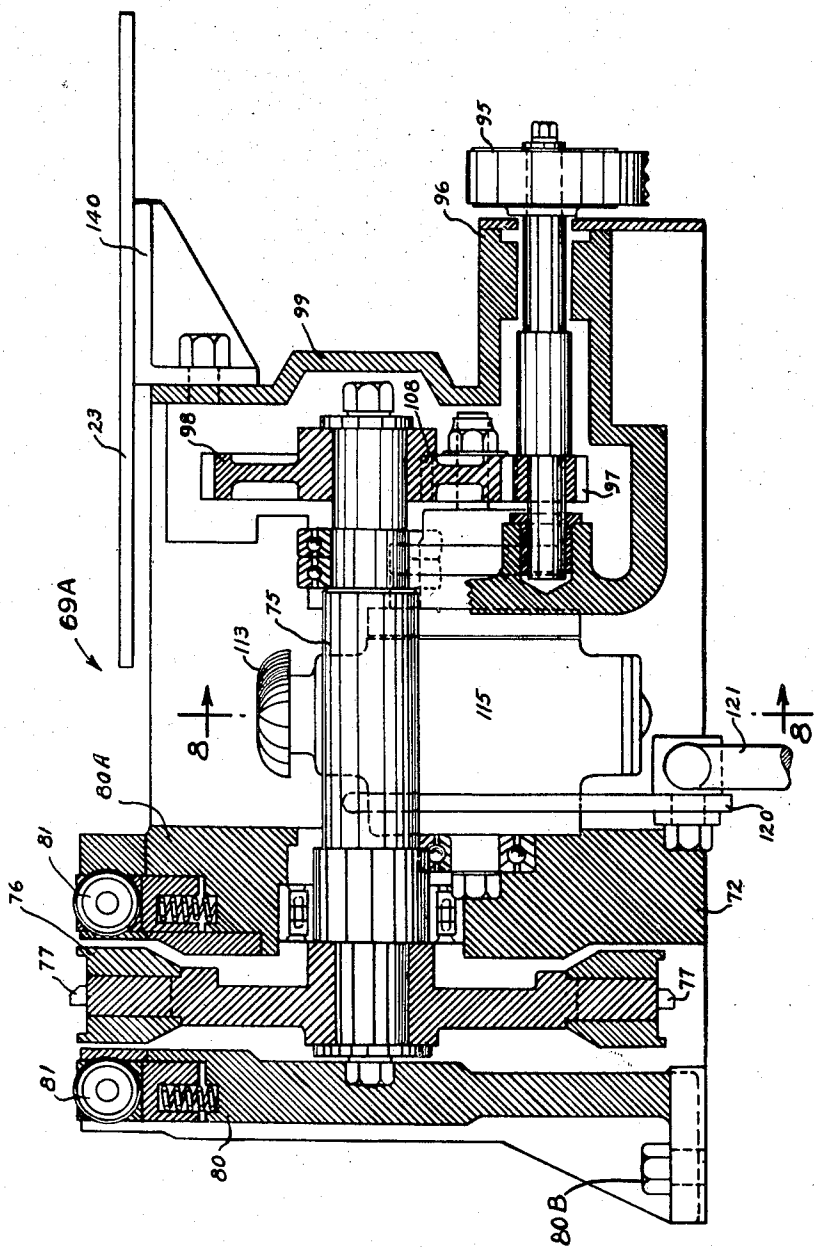
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Fig. 4



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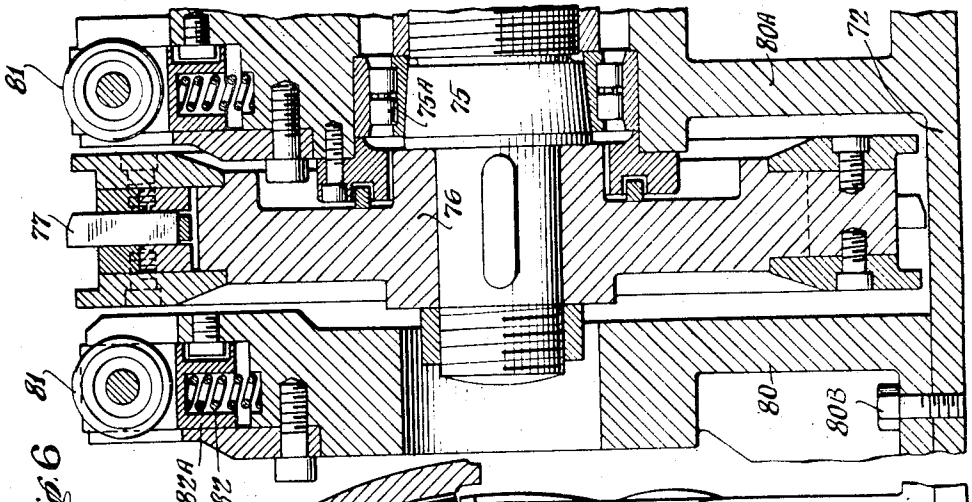


Fig. 6

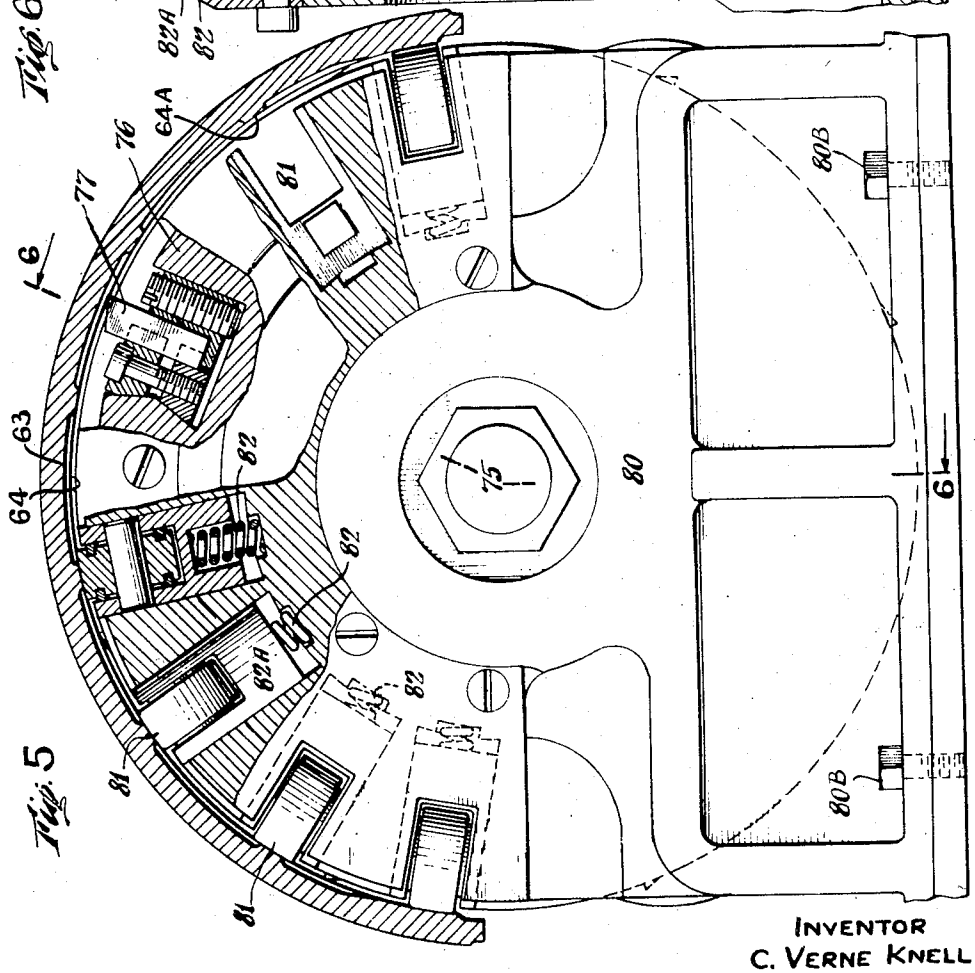


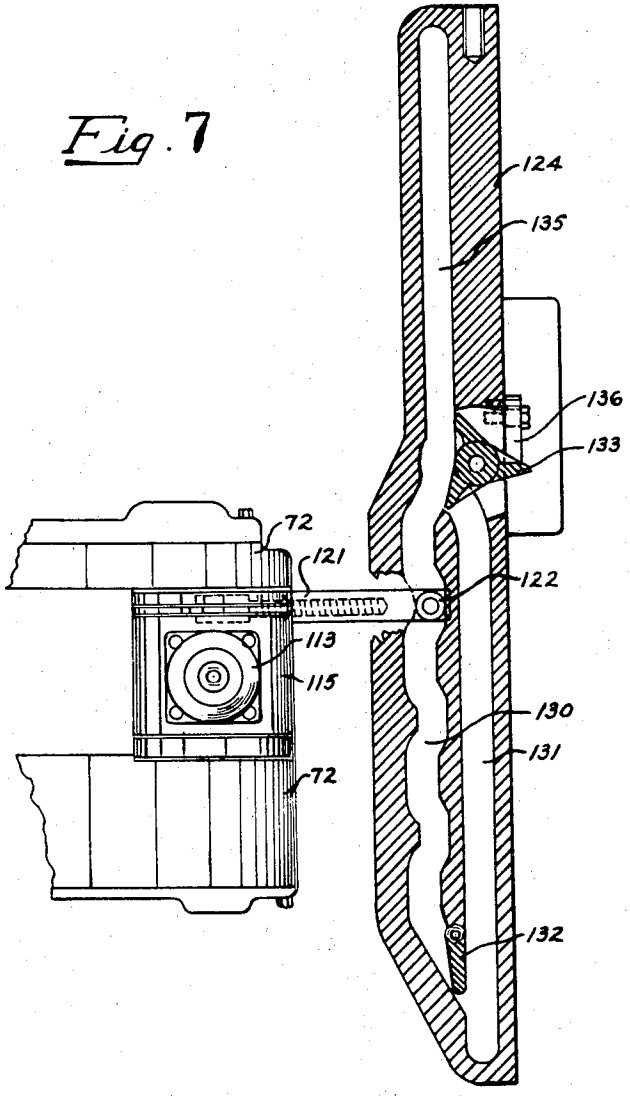
Fig. 5

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Fig. 7



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Fig. 10

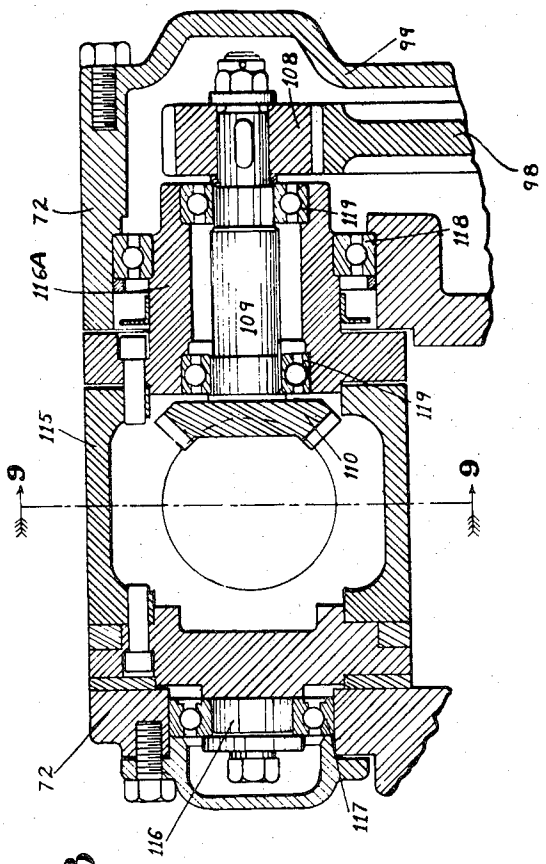


Fig. 9

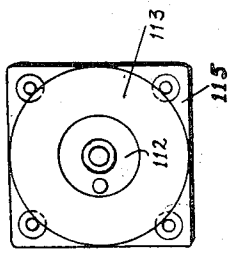
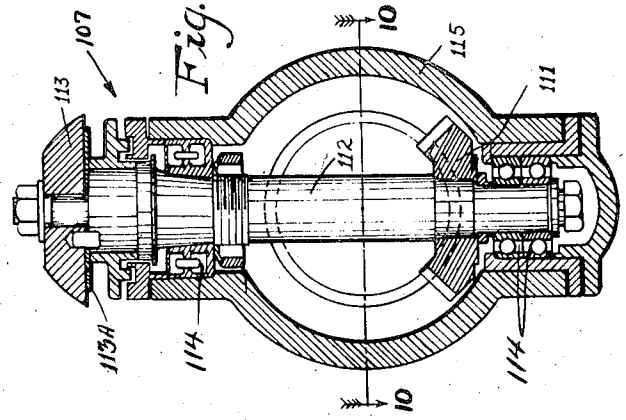


Fig. 8



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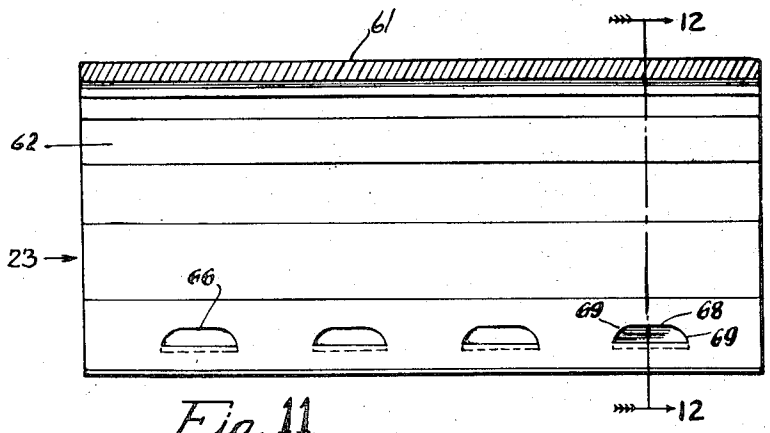


Fig. 11

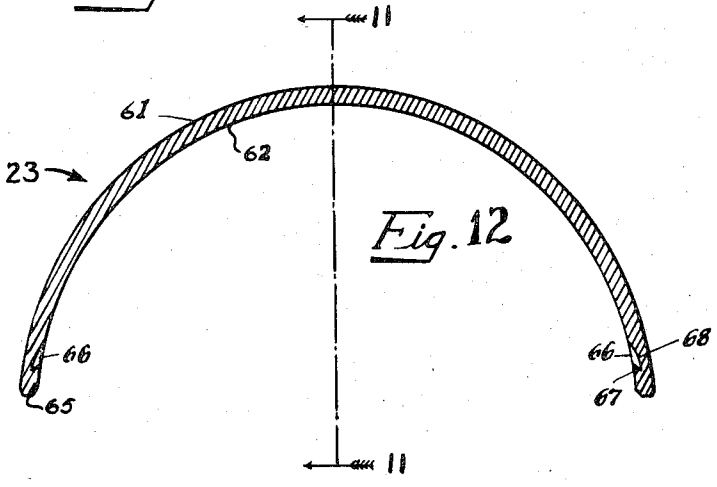


Fig. 12

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United States Patent Office 2,859,507
Patented Nov. 11, 1958

2,859,507

STEREOTYPE FINISHING MACHINE

Christopher Verne Knell, North Canton, Ohio, assignor, by mesne assignments, to Miehle-Goss-Dexter, Incorporated, Wilmington, Del., a corporation of Delaware

Original application November 16, 1945, Serial No. 629,122, now Patent No. 2,664,788, dated January 5, 1954. Divided and this application December 30, 1953, Serial No. 401,210

4 Claims. (Cl. 29—21)

This invention relates to a novel and improved machine for finishing or machining cylindrically curved printing plates, particularly stereotype plates adapted to be locked up under tension on the plate cylinders of a printing press.

This application is a division of my copending application Serial No. 629,122, filed November 16, 1945, now U. S. Patent No. 2,664,788, issued January 5, 1954.

An object of the invention is to finish the interior surface of a printing plate into true cylindrical form and to form axially spaced tension lockup pockets in the underside of the plate adjacent its straight edges, while the plate is mounted on a plate holder, the pockets being adapted to be engaged by plate tensioning hooks of the type employed on the plate cylinders of printing presses. A further object of the invention is to bore the interior surface of a plate and to form tension lockup pockets while the plate is mounted on a single work holder. Another object of the invention is to press a plate firmly against a work holder while finishing the cylindrically curved inner surface of the plate and forming tension lockup pockets in the plate.

Still another object of the invention is to provide a machine of improved construction for carrying out the foregoing objectives. Further objects and advantages of the invention will appear from the following description, taken with the accompanying drawings, in which:

Figure 1 is a general side elevational view, with certain parts broken away and others shown in section, of an illustrative embodiment of the invention, taking the form of an exemplary plate-finishing machine.

Fig. 2 is a general end elevational view of the exemplary plate-finishing machine, with certain parts broken away.

Fig. 3 is an enlarged end elevational view showing boring and pocket milling mechanisms embodied in the machine of Fig. 1, certain parts being broken away and others being shown in section.

Fig. 4 is an elevational sectional view taken generally along the line 4—4 in Fig. 3.

Fig. 5 is a fragmentary enlarged end elevational view of the machine, particularly the boring mechanism, with certain parts broken away and others shown in sections.

Fig. 6 is an elevational sectional view taken generally along a broken line 6—6 in Fig. 5.

Fig. 7 is a fragmentary plan view of the pocket milling mechanism, with certain parts shown in section along line 7—7 in Fig. 3.

Fig. 8 is a fragmentary enlarged elevational sectional view taken generally along line 8—8 in Fig. 4, and showing a milling head embodied in the illustrative embodiment of Fig. 1. The section line for Fig. 8 is also shown in Fig. 10.

Fig. 9 is a fragmentary plan view of the milling head shown in Fig. 8.

Fig. 10 is a fragmentary horizontal sectional view taken generally along line 10—10 in Fig. 8.

Fig. 11 is a side elevational sectional view, taken

generally along a line 11—11 in Fig. 12, and showing a printing plate after being finished on the illustrative plate-finishing machine.

Fig. 12 is a transverse sectional view of the printing plate taken generally along a line 12—12 in Fig. 11.

While the invention is susceptible of various modifications and alternative constructions, there is shown in the drawings and will herein be described in detail the preferred embodiment, but it is to be understood that there is on intention to limit the invention to the form disclosed, but it is intended to cover all modifications, equivalents, and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

The exemplary plate-finishing machine shown in the drawings is adapted to finish plates of the general type shown in Figs. 11 and 12. Certain features of such plates are disclosed and claimed in the Curtis S. Crafts Patent No. 2,474,889, issued July 5, 1949, to the assignee of the present application. Reference may be had to this patent and also to the above-mentioned copending application for a complete description of this plate. For the present, however, it will suffice to note that Figs. 11 and 12 disclose a semi-cylindrical plate 23 having an external cylindrically curved printing surface 61. The illustrative plate-finishing machine is adapted to finish an accurately cylindrical interior surface 62 on the plate 23. This interior surface 62 is adapted to be seated on and to conform closely to the outer surface of a plate cylinder of a printing press. The plate thus provides a printing member of a predetermined size and having an accurately cylindrical printing surface, so that the printed impressions from the plate will be of a high quality.

To reduce the weight of the plate 23 the interior surface 62 may be formed with a series of circumferentially extending recesses or grooves 63 alternating with ribs 64 (Fig. 5). At intervals, the circumferential ribs 64 are intersected by longitudinally extending ribs 64A. These recesses 63 and ribs 64 and 64A have been omitted from Figs. 11 and 12 for the sake of clarity. Formed on the plate 23 are straight, longitudinal edges 65 which are somewhat thinner than the main body of the plate. The recesses 63 are formed over the entire inner surface 62 except for unbroken areas adjacent the edges of the plate, the largest of these unbroken areas being adjacent the straight edges.

In addition to finishing the interior plate surface 62 so that all of the ribs 64 and 64A will lie in a uniform cylindrical surface, the illustrated plate-finishing machine is adapted to form two parallel series of axially spaced tension lockup pockets 66 closely adjacent the straight edges 65. These pockets or grooves 66 are adapted to be engaged by plate-tensioning hooks mounted on the plate cylinders of printing presses, each pocket having a flat undercut side 67 and an oppositely facing smoothly curved or arched side 68 terminating in rounded ends 69.

To hold the plate 23 while the cylinder inner surface 62 and the pockets 66 are being finished, the plate-finishing machine is equipped with a plate supporting member in the form of a concave, cylindrically curved arch 20 (Fig. 2) of a diameter and length corresponding to the desired printing surface of the stereotype plate, and of such strength that it will not yield appreciably as the plate is firmly pressed into the arch and finished on its inner side. The arch 20 is heavily ribbed, securely bolted or otherwise secured to a main frame 22. Preferably the arch 20 is located substantially midway between the longitudinal ends of the main frame so as to provide a plate-receiving station A (Fig. 1) at one end of the frame, a finishing station B under the arch 20 and a plate-delivering station C at the opposite end of the frame. In actual practice, the arch 20 generally has a diameter of from

16 to 20 inches and an axial length of from 15 to 20 inches, the interior surface of the arch corresponding accurately to the printing surface which is desired on the printing plates.

To receive the plate **23** at the receiving station A, the plate-finishing machine is equipped with a pair of spaced ledges **24** (Fig. 1) adapted to receive and support the two straight, diametrically opposed edges **65** of the plate.

At the finishing station B, the plate-finishing machine is provided with a plate-supporting mechanism **24A** (Fig. 2) adapted to clamp the plate against the arch **20**. Plate-supporting mechanisms of this general type are well known to those skilled in the art. Moreover, the illustrated mechanism is disclosed and claimed in my copending application Serial No. 629,122, to which reference may be had for a complete disclosure. However, for the purposes of the present invention, it will suffice to note that the plate-clamping mechanism **24A** includes a pair of longitudinal supports or rails **25** and **26** which normally are alined with the plate-receiving ledges **24** so that the plate may be slid from the latter to the former. The plate supports **25** and **26** are movable both vertically and horizontally under the control of cams **39**. Four such cams **39** are provided, two for each of the supports **25** and **26**. The cams **39** are mounted on a pair of longitudinal shafts **50** which are connected to a common cross shaft **53** by means of bevel gears **51** and **52**. An operating lever **54** is mounted on the cross shaft **53** to provide for simultaneous operation of all of the cams **39**.

The plate-clamping mechanism **24A** is arranged so that rotation of the cams **39** will raise the plate supports **25** and **26** and at the same time will move the plate supports toward each other so as to compress or pinch the plate diametrically as it is raised into engagement with the arch **20**. This diametrical compression of the plate eliminates any wiping action between the plate and the arch, and thereby prevents damage to the printing surface of the plate. The arrangement of the clamping mechanism **24A** is such that the plate support **25** is raised slightly ahead of the support **26**, so that the support **25** will reach the upper limit of its travel before the support **26**. When the support **25** reaches its upper limit, it is retracted outwardly so that the right-hand longitudinal edge of the plate will move into engagement with the arch by the time that the left-hand support **26** has reached its upper limit. The left-hand support **26** is then retracted outwardly, whereupon the plate will seat progressively from right to left against the arch **20**. With the supports **25** and **26** fully raised and retracted outwardly, the plate will be held immovably against the arch **20**.

In accordance with the invention, the interior surface of the plate **23** is finished and the tension lockup pockets **66** are formed in the plate while the plate is held in the supporting arch **20**. In the illustrative embodiment, these operations are carried out by means of a combination boring and milling mechanism **69A**.

To provide for relative linear feeding movement between the plate-supporting arch **20** and the boring and milling mechanism **69A**, the plate-finishing machine frame **22** is formed with a pair of guideways **70** (Fig. 2) extending horizontally and parallel to each other on opposite sides of the machine for the greater part of the length of the machine. The guideways **70** are arranged in parallel relation to the cylindrical axis of the arch **20**. Support for the boring and milling mechanism **69A** is provided by a tool carriage or movable frame **72** having guides **73** in slidable engagement with the guideways **70**.

For the purpose of finishing the cylindrically curved inner surface **62** of the plate **23**, the tool carriage **72** is equipped with a boring head **76** mounted on a heavy shaft **75** (Fig. 4) journalled in an anti-friction bearing **75A** and extending in a direction such that its axis will coincide with the cylindrical axis of the arch **20**. Several radially extending adjustable boring bits **77** are mounted in the boring head **76**.

The plate **23** is pressed against the arch **20** at points axially in advance of and just behind the boring head **76**, by means of two roller heads **80** and **80A** (Fig. 4), one at either side of the boring head. Each roller head is fitted with a plurality of spherically curved rollers **81** which are spaced apart angularly so as to engage the longitudinally extending ribs **64A** on the printing plate **23**. Each of the rollers **81** is biased radially outwardly by a heavy spring **82** engaging a pillow block **82A** in which the roller is journalled. The outward pressure exerted by the rollers acts to smooth out any irregularity in the plate **23**. The roller head **80A** is supported integrally with the frame **72**, but the roller head **80** is secured to the frame by means such as cap screws **80B**.

The boring head **76** is preferably driven at a high speed so that a fine finish will be obtained on the interior surface **62** of the plate **23**. For this purpose, a motor **90** (Fig. 1) is mounted at one side of the frame **22** and is arranged to drive a longitudinal shaft **91** by means of a belt **92** (Fig. 2) and suitable pulleys. Means are provided for driving the boring head shaft **75** from the shaft **91**, regardless of the axial position of the boring head **76**. To this end, the shaft **91** is splined or otherwise slidably connected to a pulley **93** which is slid along the shaft **91** by a bracket **94** (Fig. 1) depending from the movable carriage **72**. A belt **95'** is employed to connect the pulley **93** to a pulley **95** mounted on a shaft **96** which is journalled in the carriage **72**. Fixed to the shaft **96** is a pinion **97** meshing with a gear **98** fixed to the boring head shaft **75**. A housing **99** encloses the gears **97** and **98**.

The movable frame or carriage **72** may be fed axially by means of a motor **100** (Fig. 2) mounted on the machine frame **22** and belted to a pulley **101** carried by a longitudinally extending feed screw **102** which is journalled in the frame **22**. A nut or internally threaded sleeve **104**, fixed to the frame **72**, is in threaded engagement with the feed screw **102** so that rotation of the screw will move the frame **72** axially along the guideways **70**. The motor **100** is reversible and thus may be employed to drive the frame or carriage **72** in either axial direction. Limit switches **105** and **106** (Fig. 1) may be provided in the circuit of the motor **100** to limit the range of axial movement of the tool carriage **72**.

To cut the tension lockup pockets **66** in the plate **23** the tool carriage **72** is equipped with milling means in the form of a pair of milling heads **107** (Fig. 3), which are movable in a direction transverse to the direction of feeding movement. In this instance, each of the milling heads **107** comprises a housing **115** having a pair of trunnions or stub shafts **116** and **116A** (Fig. 10) mounted in respective anti-friction bearings **117** and **118** so that the milling heads **107** will be swingable laterally of the direction of feeding movement. The trunnion **116A** is hollow and serves as a support for a drive shaft **109** journalled on an anti-friction bearing **119**. Fixed to the shaft **109** is a gear **108** meshing with the boring head gear **98**. The opposite end of the shaft **109** carries a bevel gear **110** which meshes with a bevel gear **111** fixed to a milling spindle **112** (Fig. 8), mounted on anti-friction bearings **114** in the housing **115** and extending radially relative to the axis of the drive shaft **109**. The outer end of the milling spindle **112** extends beyond the housing **115** and is adapted to receive a main milling cutter **113** and an auxiliary chamfering cutter **113A**. In cross section, the main cutter **113** matches the profile of the tension lockup pockets **66**.

To provide for moving the milling heads **107** outwardly and inwardly as an incident to the linear feeding movement between the tool carriage **72** and the arch **20**, the housing **115** on each milling head **107** is provided with a depending arm **120** adapted to be rocked back and forth by means of a cam **124** (Fig. 7) fixed to the frame **22**. The cam **124** is engaged by a follower roller **122** mounted on a slide **121**, which is connected

to the arm 120 by means of a clevis 125 carrying a screw rod 126 threaded into the slide. A pivot 127 is employed to connect the clevis 125 to the arm 120. It will be evident that the screw rod 126 provides an adjustment of the position of the milling head 107.

In the illustrated construction, the cam 124 comprises a main slot or cam track 130 and a return track 131 adapted to control the follower roller 122 and thereby to rock the milling head 107 so that the axially spaced pockets 66 will be formed in the plate. As the tool carriage 72 is fed forwardly (downwardly in Fig. 10), the follower roller 122 will be advanced along the track 130 and, by virtue of the shape of the track, will be moved laterally to form axially spaced pockets of the required depth and at the desired longitudinal points along the axial length of the plate 23. Near the end of the range of feeding movement of the tool carriage 72, the follower 122 will displace a pivoted switch 132 and thereby enter the end of the return track 131, whereupon the switch will be spring-returned to its normal position as shown in Fig. 7. During the reverse axial movement of the tool carriage 72, the follower 122 will travel in the return track 131 until the follower reaches a star switch 133, which will be rotated as the follower enters the main track 130 and progresses into a common extension 135 of the tracks 130 and 131. By means of a detent spring 136, the star switch 133 is held against retrograde movement so that the follower 122 will enter the main track 130 when the tool carriage 72 is again fed forwardly.

The milling heads 107 are located immediately adjacent the roller head 80A so that the plate will be pressed firmly against the arch 20 as the tension lockup pockets 66 are being milled by the cutters 113 and 113A. It will be noted that the milling heads 107 and the boring head 76 are on opposite sides of the roller head 80A.

The pitch of the lead screw 102 and the rotary speed of the cutter bits 77 may be so related that the interior surface 62 of the plate 23 will be accurately finished on a single pass of the boring head 76. During this pass, all of the plate hook recesses 66 are formed in the plate 23. Thereafter, the boring head and the milling heads may be idly withdrawn in the opposite axial direction.

When the interior of the plate 23 has been fully finished, the plate clamping lever 54 may be returned to its original position so as to drop the plate 23 to its lowermost position, whereupon the plate may be removed from the arch 20. Means are preferably provided for automatically removing the plate 23 from the arch 20 on the return movement of the tool carriage 22, thus putting to use the otherwise idle movement of the carriage 72. For this purpose, the carriage 72 is equipped with an arcuate saddle 140 (Figs. 1 and 4) shown as being mounted on the gear housing 99, and shaped to fit the interior of the finished plate 23. The height of the saddle 140 is such that it will carry the plate 23 clear of the supports 25 and 26, after the cams 39 have been rotated so as to return the supports 25 and 26 to their normal inoperative position. Thus, the finished plate will be deposited on the arcuate saddle 140 and will be carried to the unloading station C when the carriage 72 is returned to its original position.

While the specific control circuits do not form a part of the present invention, it will be understood by one skilled in the art that suitable switches are provided for starting, stopping and reversing the feed motor 100 to cause the forward and reverse travel of the axially movable carriage 72, as well as starting and stopping the motor 90 which drives the boring and milling heads. In addition, suitable signal devices such as signal lights, may be provided for indicating that the plate is securely held for finishing, has been finished, and that the machine is ready to receive another plate.

While the operation of the plate-finishing machine will be apparent from the foregoing description, the following brief summary will be helpful. A stereotype plate to be finished is deposited at the receiving station A with the straight edges of the plate resting on the plate-supporting ledges 24. Next, the plate 23 is slid onto the plate supports 25 and 26 at the finishing station B, with the plate supports being in their lowered position. To clamp the plate 23 against the arch 20, the lever 54 is swung manually so as to raise the plate supports 25 and 26. The plate-clamping mechanism 24A is arranged so that the plate supports 25 and 26 are moved inwardly toward each other at the same time as they are being raised. In this way, the plate is pinched or compressed diametrically so that it may freely enter the arch 20 without scuffing action on the printing surface.

With the plate 23 held against the arch 20, the tool carriage 72 may be fed axially of the arch by starting the feed motor 100, which will rotate the feed screw 102 and thereby advance the feed nut 104.

As the carriage 72 is fed axially of the plate, the interior plate surface 62 will be finished to a true cylindrical shape by the boring head 76. During the boring operation, the plate will be pressed radially against the arch 20 by the rollers 81 on the roller heads 80 and 80A. The boring head 76 is driven by the motor 90. More specifically, the motor 90 drives the spline shaft 91 through the medium of the belt 92, and the sliding pulley 93 on the spline shaft in turn drives the pulley 95 on the shaft 96, the pulley 93 being moved along the spline shaft by the bracket 94 on the carriage 72. The pinion 97 on the shaft 96 drives the gear 98 on the boring head shaft 75. As the boring head 76 finishes the interior surface 62 of the plate, the tension lockup pockets 66 are cut in the interior surface of the plate by the milling heads 107. These heads 107 are driven by the gears 108 which mesh with the gear 98 on the boring head shaft 75. The gears 108 drive the milling cutters 113 and 113A on the milling spindle 112, through the medium of the shaft 109 and the bevel gears 110 and 111.

The length and axial spacing of the pockets 66 are determined by the conformations of the main cam tracks 130 in the cams 124. As the follower rollers 122 are fed along the cam tracks 130, the milling heads 107 are alternately rocked outwardly and inwardly on the trunnions 116 and 116A. Accordingly, the milling cutters are moved into stock removing engagement with the interior of the plate 23 during successive portions of the axial feeding movement. During the subsequent return movement of the carriage 72, the follower rollers traverse the return tracks 131 so that the milling cutters will be withheld from the plate 23. The roller heads 80 and 80A cooperate with the milling heads 107 by holding the plate 23 closely against the arch 20 so that the pockets formed by the milling heads will be accurately formed and located.

When the boring and milling heads have completed their finishing operations, the clamping lever 54 is swung so as to lower the plate supports 25 and 26 and thereby disengage the plate 23 from the arch 20. The plate comes to rest on the saddle 140, mounted on the carriage 72, and hence is carried axially out of the arch to the delivery station C, when the carriage 72 is retracted to its initial position. The plate may then be removed manually from the saddle 140 so that finishing operations on another plate may be commenced.

The plate-finishing machine is fully capable of finishing stereotype plates at a rate well in excess of two plates per minute. The exact rate will depend upon the skill of the operator. This unusual speed of operation, as well as the high accuracy of the final product, is the direct result of boring the plate and milling the tension lockup pockets in a single pass, while the plate is held in a single plate support.

I claim as my invention:

1. A machine for finishing cylindrically curved print-

ing plates, comprising, in combination, plate-supporting means for holding a plate, tool-supporting means adjacent said plate-supporting means for effective relative linear feeding movement between said plate-supporting and tool-supporting means in a direction parallel to the cylindrical axis of the plate, boring means mounted on said tool-supporting means for rotation about the longitudinal axis of the plate for progressively finishing the interior surface of the plate during said feeding movement, milling means mounted on said tool-supporting means for rotation about an axis perpendicular to the axis of the plate, a source of motive power, common means on said tool supporting means coupled to said power source for simultaneously rotating said boring means and said milling means about their respective axes, and means operative as an incident to said feeding movement for moving said milling means laterally relative to the direction of said feeding movement into and then out of milling engagement with the plate adjacent its straight edges to cut axially spaced tension lockup pockets therein.

2. A machine for finishing the undersides of cylindrically curved printing plates, comprising, in combination, a concave cylindrically curved plate-supporting member, means for holding a printing plate with its outer surface engaging said plate-supporting member, tool-supporting means adjacent said plate-supporting member, means for effecting relative linear feeding movement between said plate-supporting member and said tool-supporting means in a direction parallel to the axis of said plate-supporting member, a roller head mounted on said tool-supporting means and including a plurality of movable rollers biased radially outwardly for pressing the plate against said plate-supporting member during said linear feeding movement, a boring head adjacent said roller head on one side thereof and journalled on said tool-supporting means about a rotary axis coinciding with the cylindrical axis of said plate-supporting member for progressively finishing the inner surface of the plate during said linear feeding movement, said roller head insuring substantially true concentricity between the inner surface finished by said boring head and the outer surface of the plate, a milling head mounted on said tool-supporting means adjacent said roller head on the other side thereof, said milling head having a milling cutter mounted for rotation about an axis of which is perpendicular to the axis of the plate, and means operable as an incident to said linear feeding movement for moving said milling head transversely relative to the direction of feeding movement into and then out of milling engagement with the plate adjacent a straight edge thereof for cutting axially spaced tension lockup pockets therein, said roller head insuring accurate location of the pockets.

3. A machine for finishing the undersides of cylindrically curved printing plates, comprising, in combination, plate-supporting means for holding a printing plate, tool-supporting means, means for effecting relative linear feeding movement between said plate-supporting member and said tool-supporting means in a direction parallel to the cylindrical axis of the plate, a boring head having a shaft journalled on said tool-supporting means with the axis of said shaft coinciding with the cylindrical axis of the plate, so that said boring head will progressively finish the interior of the plate during said linear feeding movement, a pair of drive shafts journalled on said tool-supporting means and extending parallel to said boring head shaft on opposite sides thereof, said drive shafts being symmetrically arranged below the edges of the plate, means for driving said boring head shaft and said drive shafts in common including a gear mounted on said boring head shaft and meshing with a pair of gears mounted on said drive shafts, a pair of milling heads swingable about the axes of said respective drive shafts and including milling spindles extending at right angles thereto, bevel gears connecting said spindles to said respective drive shafts, and means operable as an incident to said linear feeding movement for swinging said milling heads outwardly and then inwardly into and out of stock removing engagement with the plate to cut axially spaced tension lockup pockets in the underside of the plate adjacent its straight edges.

4. A machine for finishing the undersides of cylindrically curved printing plates comprising, in combination, plate-supporting means for rigidly holding a printing plate with its underside exposed, a carriage and means to drive the carriage along a path adjacent the underside of said plate, a shaft journalled on said carriage in alinement with the plate axis, means including a milling cutter for cutting tension lockup pockets into the underside of said plate along the straight edges thereof, said cutter being mounted on said carriage for rotation about an axis which is perpendicular to and spaced from said shaft, common driving means on said carriage for rotating both said shaft and said cutter, a boring arm fixed to said shaft and supporting a boring cutter at its end, and means operable as an incident to axial movement of the carriage for moving said cutter into and out of milling engagement with the plate so that movement of the carriage past the plate is effective both to cut tension lockup pockets and to progressively finish the inner plate surface to a true cylindrical form.

References Cited in the file of this patent

UNITED STATES PATENTS

1,858,670	John	May 17, 1932
2,031,173	Miller	Feb. 18, 1936
2,187,444	Behrens	Jan. 16, 1940
2,188,456	Galber	Jan. 30, 1940
2,213,110	Strang	Aug. 27, 1940
2,305,338	Barber	Dec. 15, 1942
2,604,017	Crafts et al.	July 22, 1952