

March 14, 1950

F. M. CARROLL

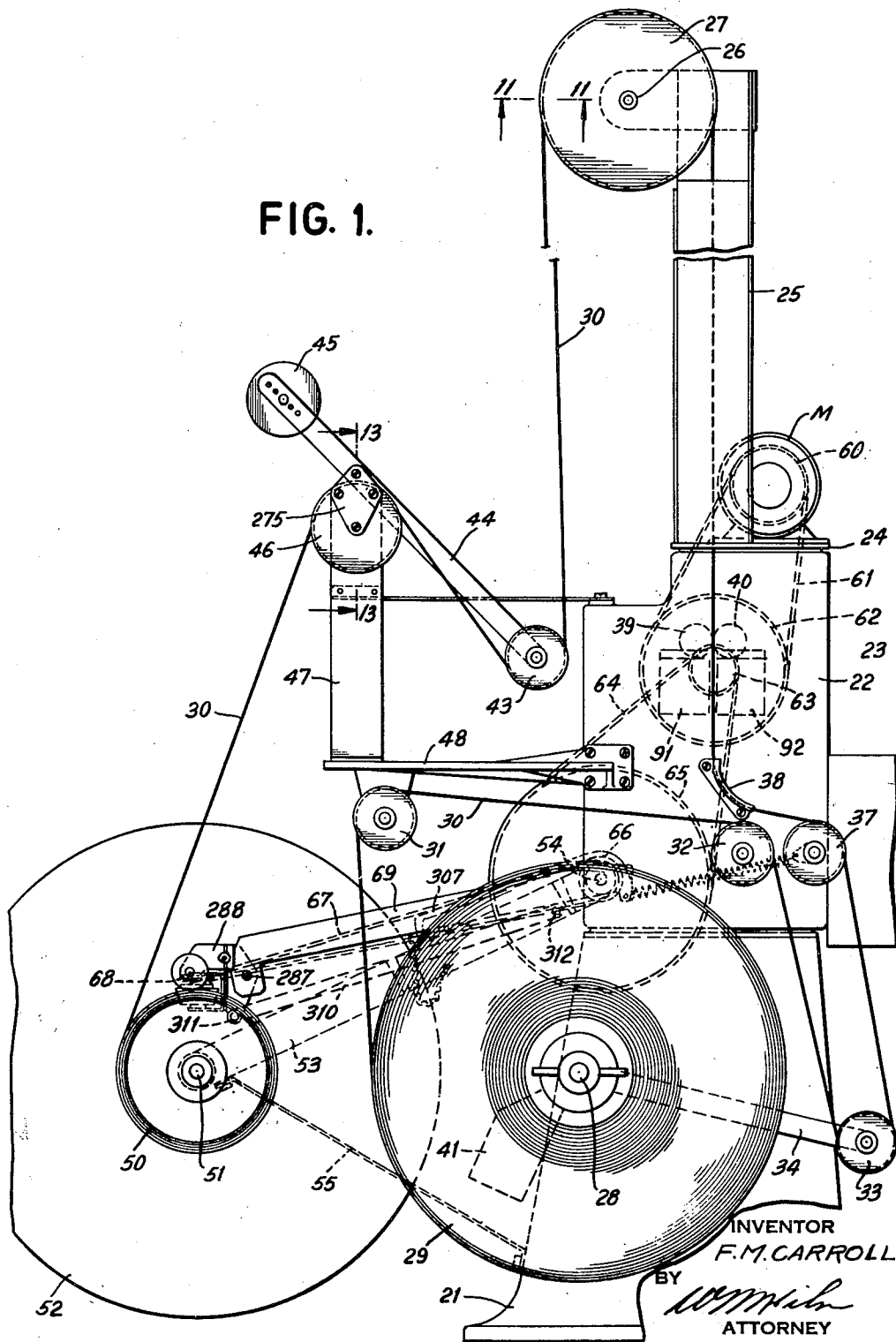
2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 1

FIG. 1.



March 14, 1950

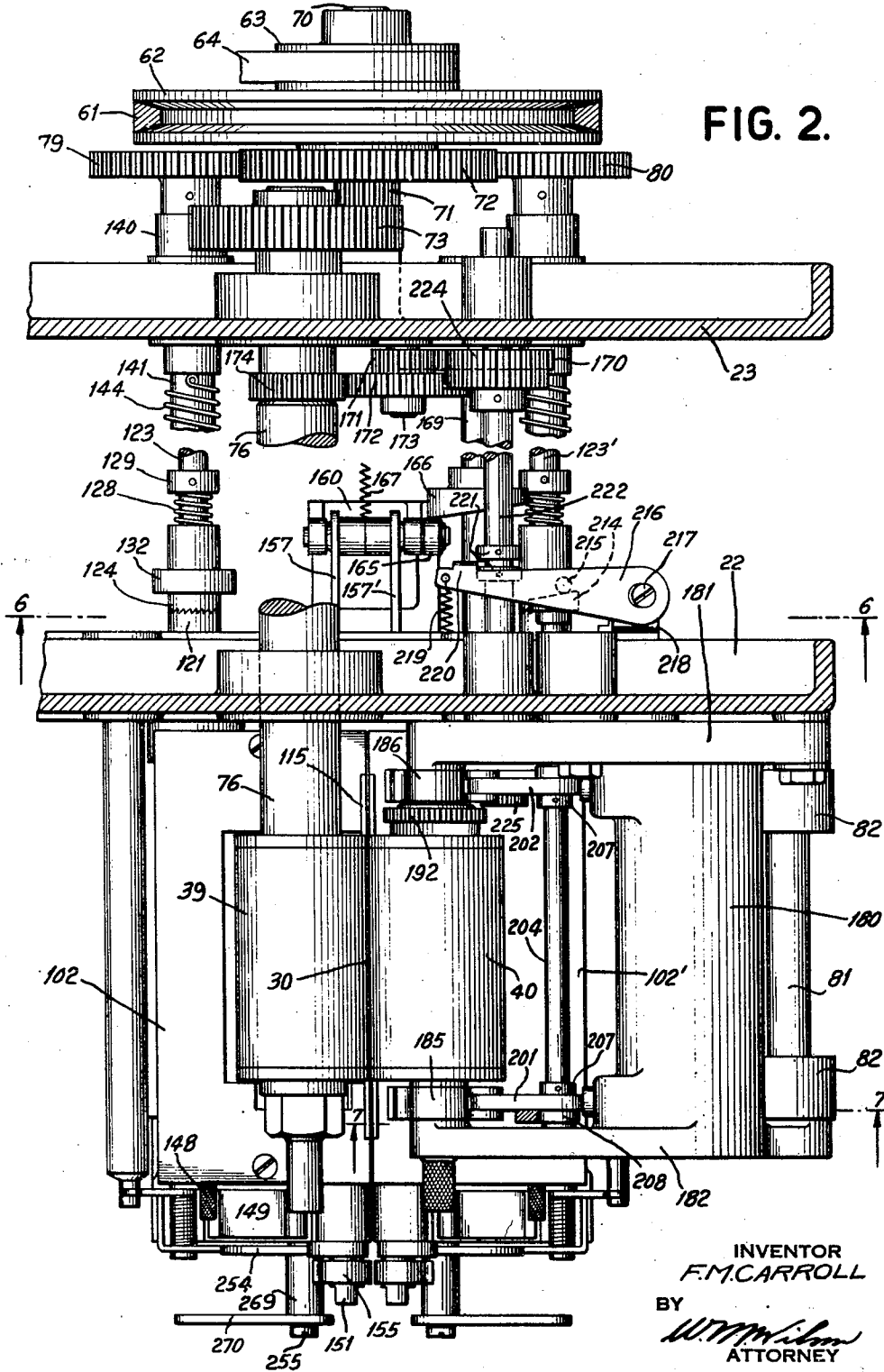
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 2



March 14, 1950

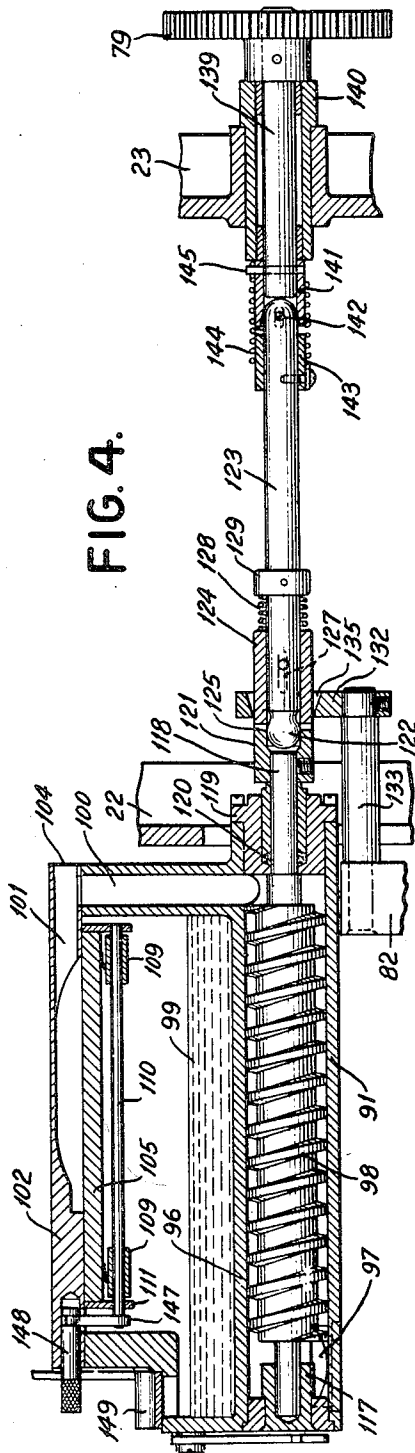
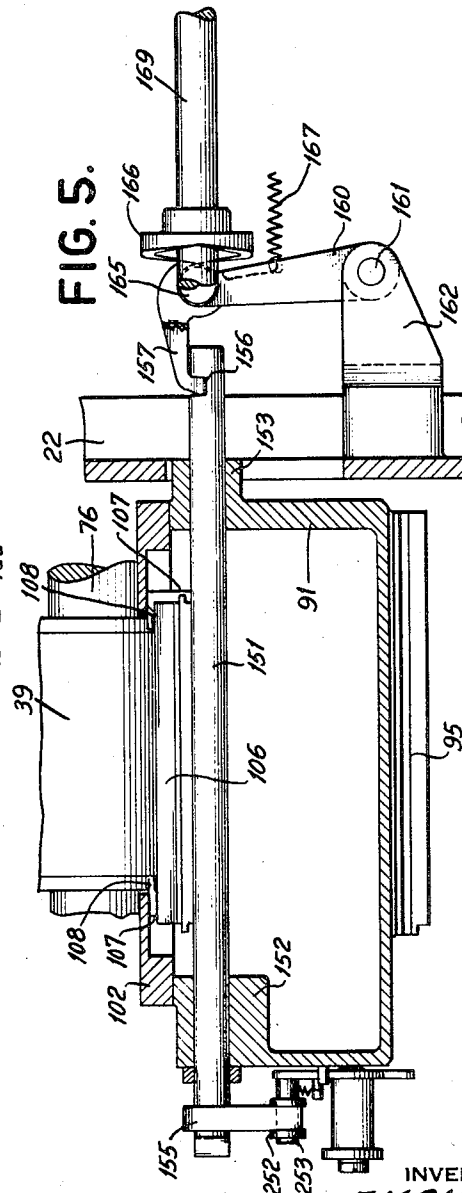
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 4



INVENTOR
F.M. CARROLL
BY *Wm. H. [Signature]*
ATTORNEY

March 14, 1950

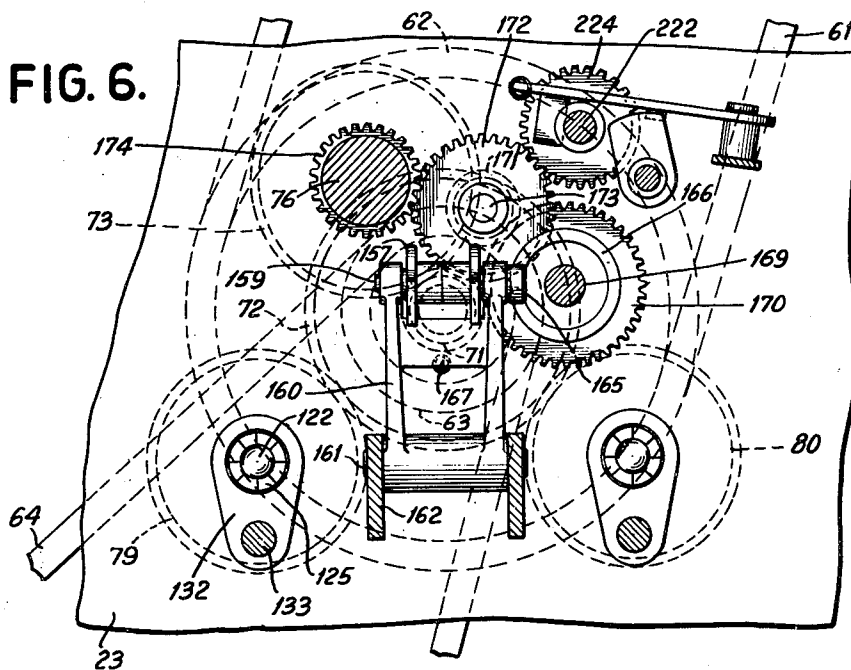
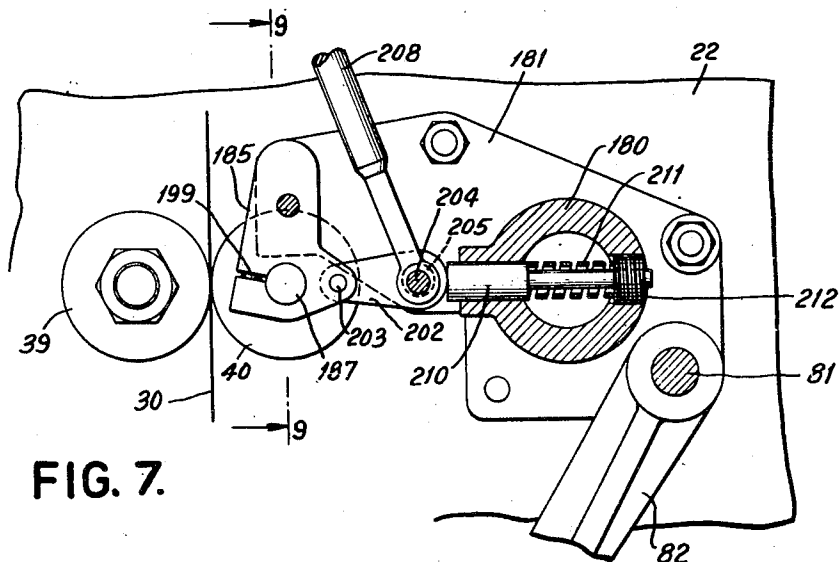
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 5



INVENTOR
F. M. CARROLL
BY
W. M. Milam
ATTORNEY

March 14, 1950

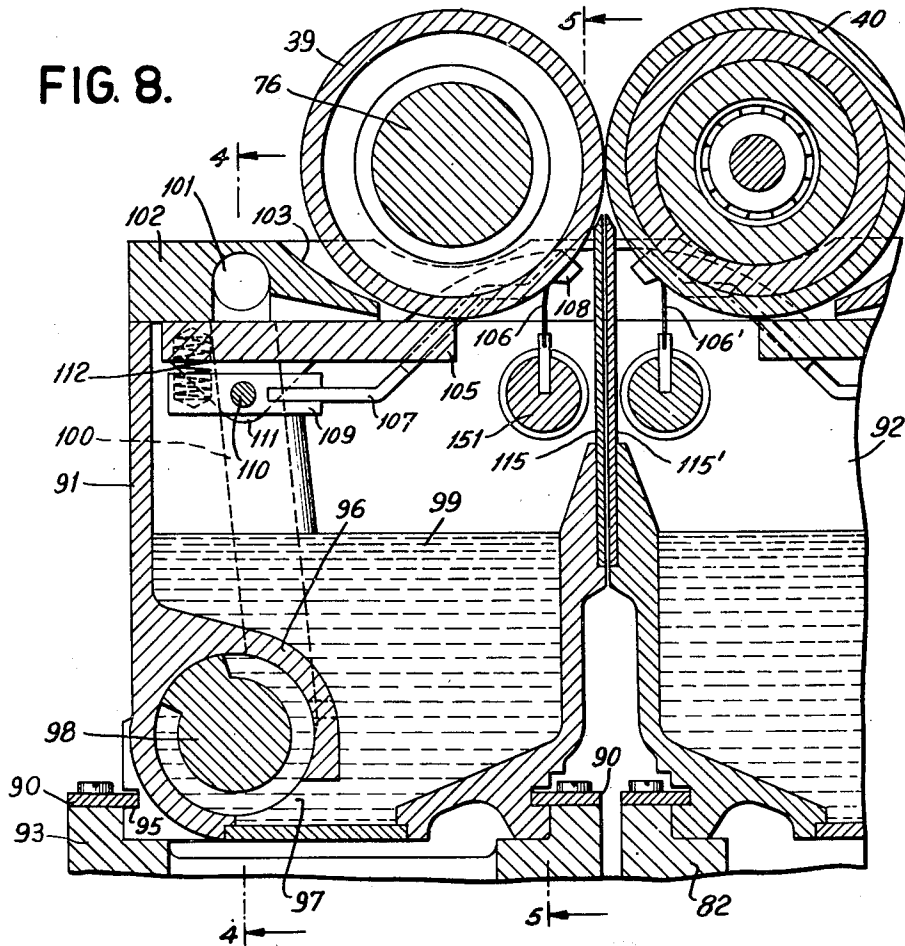
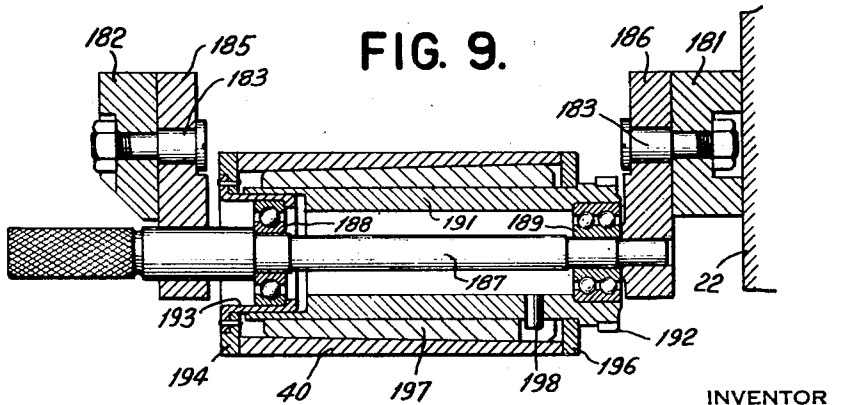
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 6



INVENTOR
F.M. CARROLL

BY
W. M. Wilson
ATTORNEY

March 14, 1950

F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 7

FIG. 10a.

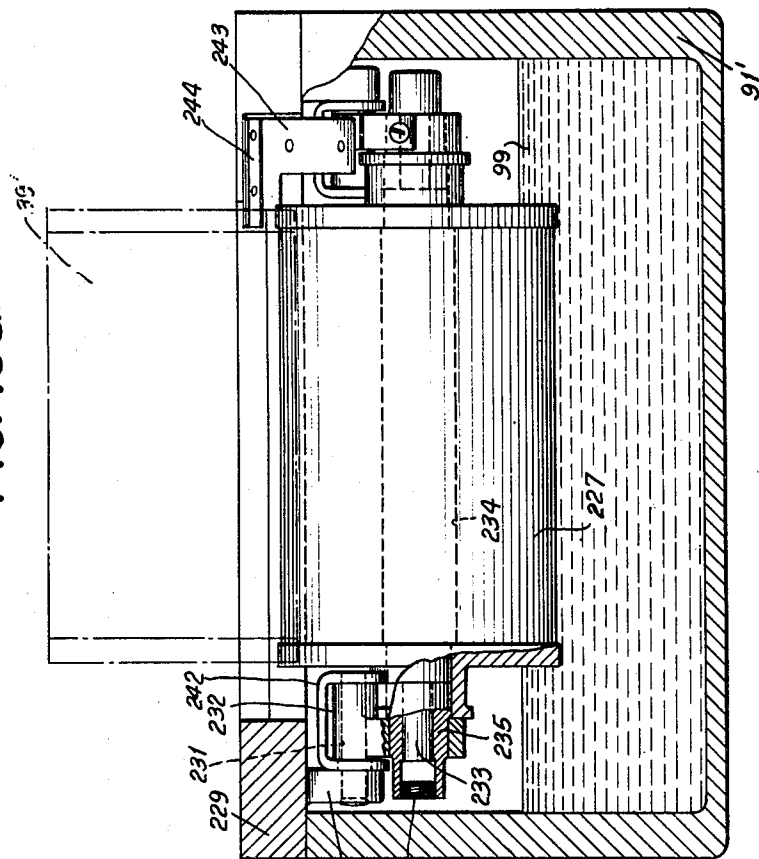
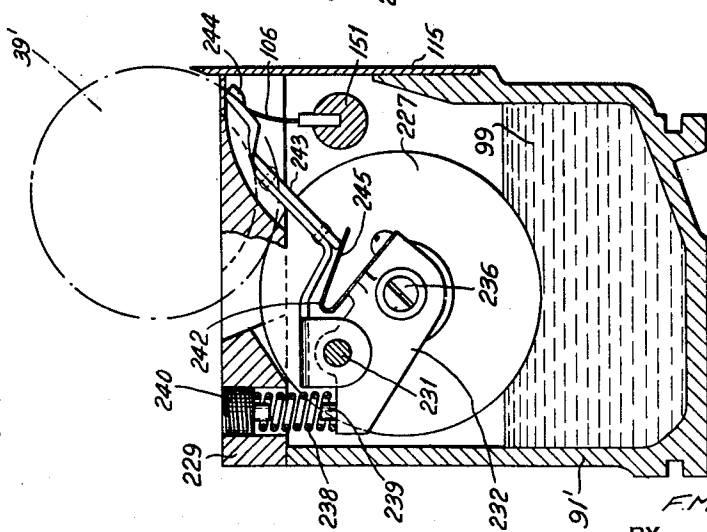


FIG. 10.



INVENTOR
F. M. CARROLL
BY
W. M. Wilson
ATTORNEY

March 14, 1950

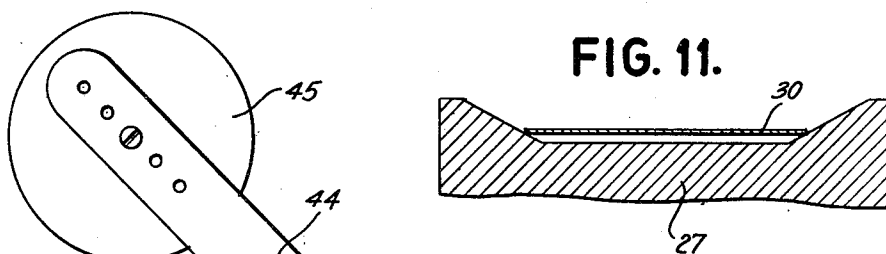
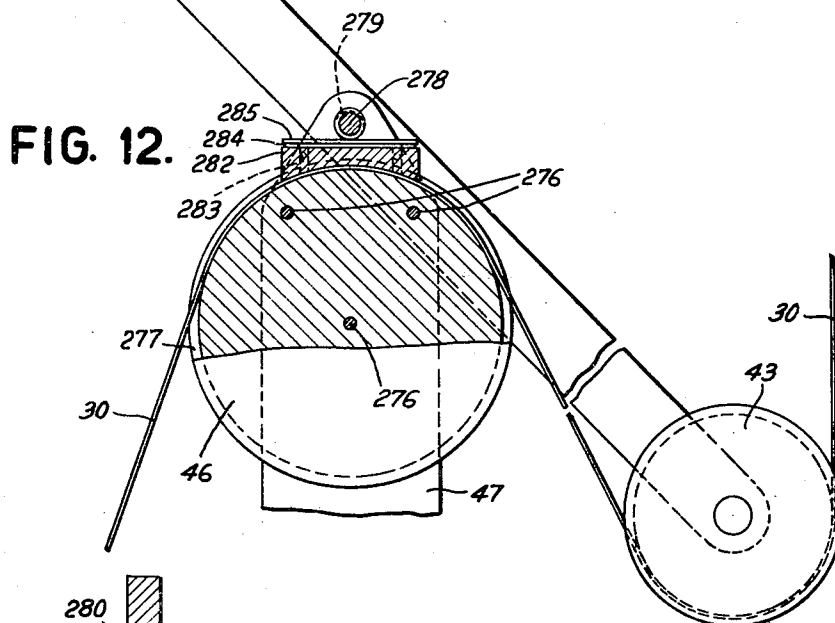
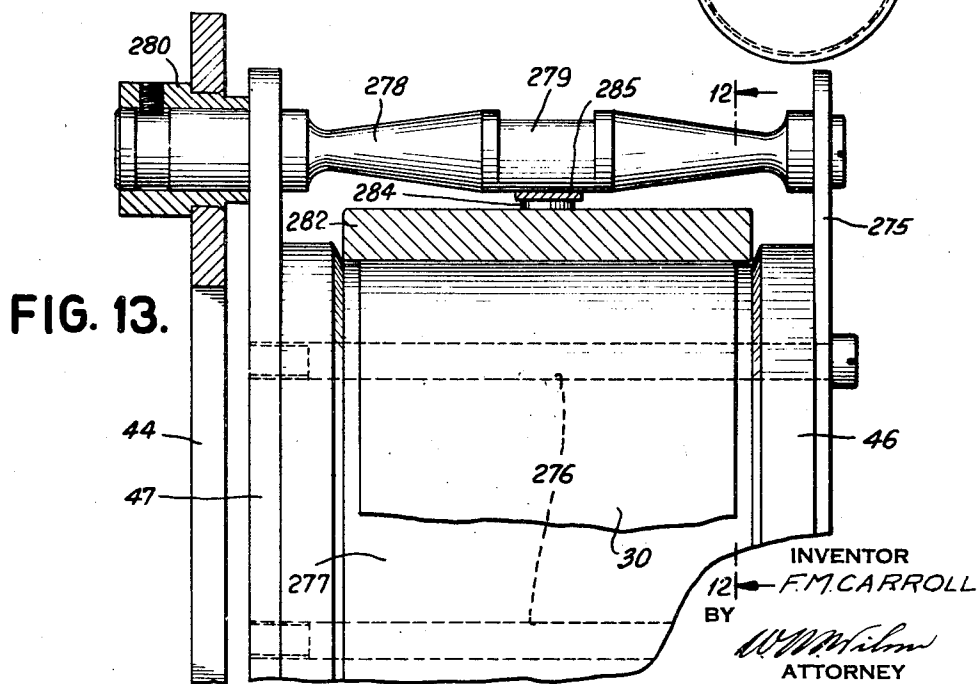
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 8



INVENTOR
F. M. CARROLL
BY
W. M. Wilson
ATTORNEY

March 14, 1950

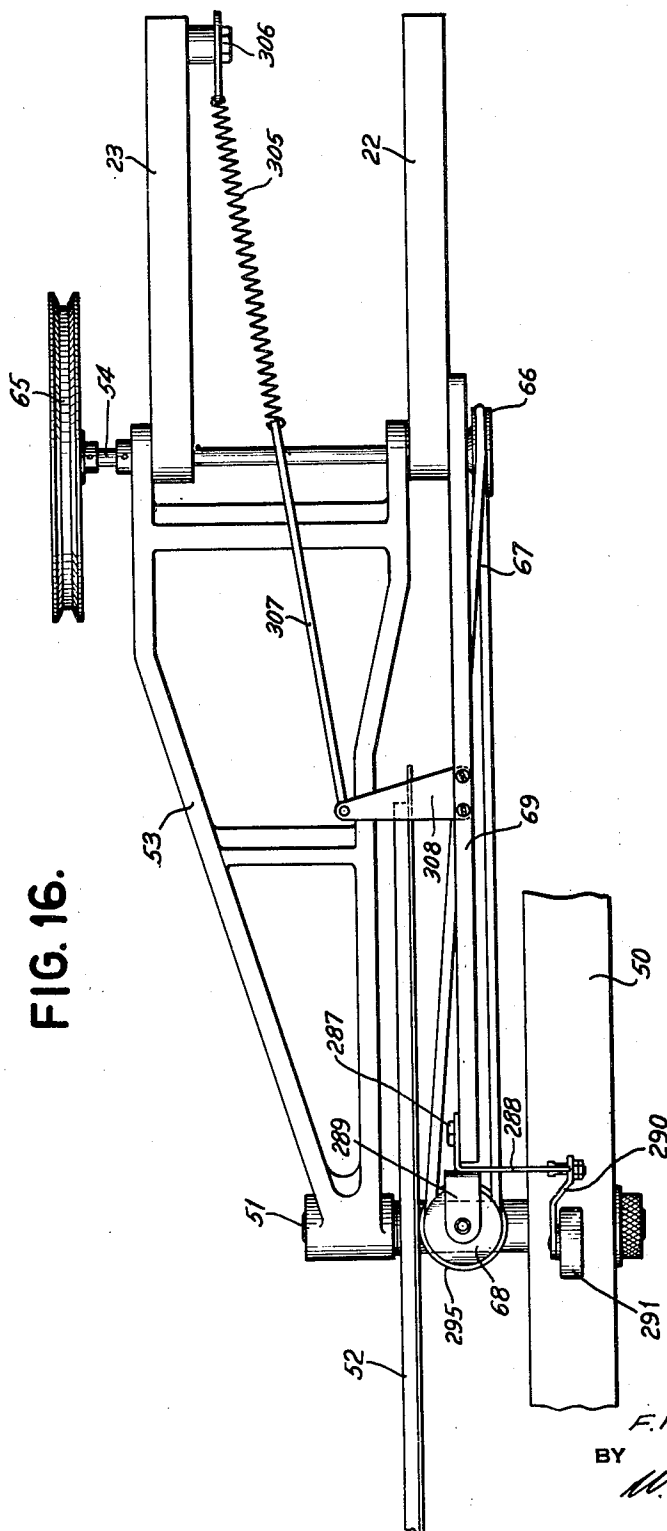
F. M. CARROLL

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Filed Feb. 27, 1945

10 Sheets-Sheet 10



INVENTOR
F.M. CARROLL

BY

ATTORNEY

UNITED STATES PATENT OFFICE

2,500,275

INKING DEVICE FOR PRINTING ROLLERS

Fred M. Carroll, Binghamton, N. Y., assignor to
International Business Machines Corporation,
New York, N. Y., a corporation of New York

Application February 27, 1945, Serial No. 579,979

8 Claims. (Cl. 91-49)

1

2

This invention relates to improvements in printing devices and more particularly to means for tinting both sides of a record strip which is to be used for making records such as checks or bond certificates.

An object of the invention is the provision of means for rapidly impressing an over-all safety design on both sides of a long blank strip which is unwound from a storage roll and rewound on a supply roll soon after receiving the impression.

Another object of the invention is the provision of a flexible mounting for one of a pair of co-operating electro printing cylinders or rollers for applying sufficient compression to a record strip passing between the two rollers, so that only one need be positively driven and the other follows along by frictional contact. Cooperating with said printing rollers are a pair of ink containers removably mounted and each carrying an inking system fed by a worm pump. A unique form of flexible drive connection is provided to clutch the worm and not only follow the lowering of the ink containers below the printing rollers but also allow removal of the containers and subsequent reinsertion and reestablishment of the drive connections. A clutch ring on the end of the inking feed worm is the socket receiver of a ball and socket joint formed on the end of the driving clutch, which is on a shaft pivoted for slanted motion as well as actuating rotation. As the ink containers are lowered, the clutch connections follow downward with the ball and socket connections carried along therewith to provide a point of driving reestablishment for the clutches.

Another object of the invention is the provision of means for calling in a positive driver for the frictionally driven inking roller as soon as the frictional contact is manually broken. A shaft which carries a lever for separating the two printing rollers also carries a cam for closing an auxiliary gear drive to the otherwise idle printing roller, so that the roller continues to turn and the ink thereon is continuously renewed and removed by a doctor blade even when the printing rollers are separated for the insertion of a new supply of record material. Cooperating with the printing rollers are doctor blades supported on end guides and reciprocated to distribute the supply of ink across the surface of the printing rollers and to remove all excess ink from the roller surface, so that ink is present only in the etched design areas.

Another object of the invention is the provision of an interlocking latch mechanism associated with the doctor blades to insure that they are out

of active position when the ink containers are elevated into cooperation with the printing rollers. As soon as the inking devices are lowered, the latches are automatically tripped to swing the doctor blades away from the periphery of the rollers, and the latching mechanism is so arranged that if it is restored before the inking devices are elevated, it is again tripped as the inking containers are elevated, so that the doctor blades do not dig into the periphery of the rollers but are placed into cooperation therewith manually after the inking devices are reassembled under the printing rollers. As the doctor blades are pressed against the surface of the printing rollers, the interlocking mechanism is relatched and held in normal place until the inking containers are again lowered for changing the printing rollers.

Another object of the invention is to provide an alternative inking structure wherein the ink is supplied by a conveying roller situated so as to run in a bath of ink carried by the container held under the printing roller.

A further object of the invention is the provision of an end wiping member pivotally mounted with the free end cooperating with the edge of the printer roller to perform two functions; one for wiping off excess ink from the end surface of the roller and the other to provide a platform or supporting surface for the edge of the reciprocating doctor blade.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a diagrammatic side elevation view showing the entire machine and the path followed by the record strip.

Fig. 2 is a sectional plan view taken along line 2-2 of Fig. 3 and showing the operating drive gear connections to the printing rollers.

Fig. 3 is a side elevation view showing the assembled ink containers and the latching mechanism for the doctor blade shafts.

Fig. 4 is a sectional elevation view taken through an ink container and along line 4-4 in Fig. 8 and showing the ink circulating mechanism and the drive connections thereto.

Fig. 5 is a sectional elevation view taken through an ink container along line 5-5 of Fig. 8 and showing the arrangement of a doctor blade and

the reciprocating mechanism associated therewith.

Fig. 6 is a sectional elevation view taken along line 6—6 in Fig. 2 and showing the drive connections to the printing rollers and the ink circulating worm shafts.

Fig. 7 is a sectional elevation view taken along line 7—7 in Fig. 2 and showing the pressure applying devices for holding one printing roller in frictional contact with the other roller which is the printer driving roller.

Fig. 8 is a sectional elevation view taken through the center of the pair of printing rollers and showing one of the cooperating ink containers.

Fig. 9 is a sectional elevation view taken along line 9—9 in Fig. 7 and showing the movable printing roller.

Fig. 10 is a sectional view showing the alternative form of inking device wherein the ink is applied by a conveying roll.

Fig. 10a is a side sectional view showing the alternative inking device of Fig. 10 as viewed from another angle.

Fig. 11 is a sectional detail view taken along line 11—11 in Fig. 1 and showing the manner in which the record strip is guided on the elevated guide pulley.

Fig. 12 is a sectional elevation view taken along line 12—12 in Fig. 13 and showing the tension regulating brake applied to relieve tension of the record strip around the elevated pulley, so that the strip maintains the position shown in Fig. 11.

Fig. 13 is a sectional elevation view taken along line 13—13 in Fig. 1 and also showing the braking mechanism of Fig. 12 which is applied to relieve tension on the record strip.

Fig. 14 is a plan view of the rewind regulator and drive mechanism.

Fig. 15 is a sectional elevation view taken along line 15—15 in Fig. 14 and showing the frictional driver for operating the rewinding disk carrying the roll of printed record strip.

Fig. 16 is a plan view showing the supporting means and the operating connections for the rewinding device.

In Fig. 1 there is shown a diagrammatic view revealing the path followed by the record strip in passing from a supply roll through the printing rollers and over to the rewind roll. The machine is supported on a base frame 21 carrying a pair of side plates 22 and 23 between which most of the drive gearing is suspended. Placed on top of the side frames is a platform 24 carrying a drive motor M. Also supported on platform 24 is a tall enclosed box 25, the upper end of which is formed with extending bearing 26 which acts as a fulcrum for the elevated guide pulley 27. The freshly printed strip is drawn upward through the warm air in box 25 and thus partly dried.

Pivoted at 28 on the base frame 21 is the supply roll 29 containing the unprinted portion of the strip and it is from this roll that the record supply is drawn to be passed through the printing rollers to be tinted on both sides. As the strip 30 is drawn off the side of the roll 29, it is drawn upward over a guide roller 31 and then pulled horizontally across the machine to curve around guide roller 32. From this point it is drawn downward around a tension regulating roller 33 mounted on a swinging arm 34 also pivoted at 28, which is the mounting center for the supply roll 29. Arm 34 is connected to a nut having a braking action on the mounting for the supply roll so that, whenever the tension arm

or lever 34 is raised or rocked counterclockwise, indicating that the tension is too great, the motion of the lever acts to loosen the braking nut and thereby free the supply roll for easier withdrawal of the record strip. This construction is described in greater detail in my Patent No. 2,181,935, issued December 5, 1939.

From tension roller 33, the strip is drawn upward and curved around another fixed guide roller 37 and then drawn a short distance horizontally before curving around a fixed guide 38 fastened to the side of frame 22. From the top of the guide 38, the strip is led in a vertical path between the pair of ink containers 91, 92 and the pair of printing rollers 39 and 40 where printing takes place. After the strip receives the ink impression for tinting, it is drawn upward through the long vertical warming box 25 into which a current of heated air is directed by a blower behind heating coils which are not shown.

At the top of the machine the guide pulley 27 supports the record strip and guides it to curve downwardly and pass around another tension regulating roller 43 mounted on one end of a lever 44, at the other end of which is an adjustable weight 45. This lever 44 swings up and down according to the tension of the record strip between the guide pulley 27 and the rewind roll 50. It operates a brake cooperating with the portion of the strip passing around the fixed circular guide 46 fastened on a standard 47 supported on a bracket 48 fastened to frame 22 of the machine. Application of the braking action on guide 46 serves to diminish the pull exerted by the rewind action against the top loop formed by the printed strip as it passes over the top guide pulley 27.

After leaving the circular guide 46, the strip is finally drawn down around the rewind roll 50 which is supported on a center 51 extending from a large flat disk 52, which is frictionally driven by mechanism, the speed of which is regulated according to the diameter of the rewind roll. This flat disk 52 is pivoted on a frame 53 which extends from the main frames of the machine and is supported on a shaft 54 centered in the two main side frames. A bracket 55 is braced between the outer end of frame 53 and the side of base 21 to act as a support for the rewind mechanism.

The main driving connections are established by means of belts and pulleys and their general location can be noted on Fig. 1. There it is seen that the shaft of motor M carries a pulley 60 which acts as a driver for a belt 61 which is wound around a larger pulley 62 connected directly to the main drive gearing of the printing mechanism. Also connected to pulley 62 is a small pulley 63 for operating a belt 64 cooperating with a large pulley 65 mounted on the shaft 54 already mentioned as the rewind driving shaft. This shaft carries a small pulley 66 for supporting a belt 67 which is twisted to cooperate with a small pulley 68 mounted on a movable vertical center in connection with a friction drive roller for rotating the rewind disk 52.

In Fig. 2 it is noted that the pulleys 62 and 63 are mounted on a shaft 70 which also carries gears 71 and 72. The small gear 71 is in mesh with a gear 73 fastened to a shaft 76 supported in bearings extending from both side frames 22 and 23. Shaft 76 extends to the left outside the left side frame 22 and there it carries the driving printing roller 39. By means of the train of connections already traced, it is apparent that the printer roller 39 is rotated constantly as long as the motor

5

is in operation. Cooperating with it is the other similar printing roller 40 and between the two is pinched the record strip 30, there being a substantial amount of pressure exerted on the shaft carrying roller 40 to press it in frictional contact with the strip and the hardened end rings on the roller so as to partake of the positive motion of roller 39.

The large driving gear 72 is arranged to mesh with a pair of gears 79 and 80 attached to the ends of shafts having clutch connections to worm pumps in the ink containers to keep the ink in circulation and to lift it in position to run against the periphery of the printing rollers. Before describing the other driving connections, it is believed best to consider the construction and manner of assembling the inking containers cooperating with the pair of printing rollers.

Referring to Fig. 3 showing the main printing and inking apparatus assembled on the outside of the frame 22, it is noted that a stud 81 extending from the frame, carries a large pivoted supporting cradle 82 to which is articulated at 83, one end of a toggle linkage 84 and 85. The cradle is pivoted and made movable in order that the ink containers carried thereon may be lowered below the printing rollers to permit a change in rollers and also allow removal of the containers for cleaning at intervals. The lowering devices include a lever 86 forming part of the toggle member 85 pivoted on a fixed center 87. The centralized pivot 88 between toggle members 84 and 85 is arranged to assume a position normally slightly above dead center in which position it abuts against a fixed stop stud 89 to hold the inking devices in the normal elevated position. However, when lever 86 is manipulated counter-clockwise, the pivot 88 is moved below the dead center position and the cradle 82 is lowered into the position facilitating removal of the ink containers.

The center of the horizontal portion of the cradle 82 is slotted to permit upward passage of the record strip 30. The upper surface of the horizontal portion of the cradle 82 is formed with four raised rectangular guide portions 93, each of which carries an extending bar 90 which fits into a groove 95 cut in the side of the castings 91 and 92 forming the ink containers. These containers are somewhat similar in construction but the formations thereon are reversed in position because they are placed together beneath the two printing rollers and serve the same function, the one to provide ink for the roller 39 and the other to ink the roller 40. They are generally rectangular in horizontal and vertical cross section and at the bottom they are provided with the machined slide grooves 95, one on each side to cooperate with the bars 90 held on the upward extensions 93 of the cradle. Locking arms 248 and 248' hold the containers in on the cradle but can be lowered as shown to permit forward withdrawal of one or both containers.

The various construction features of the ink container are shown in Figs. 3, 4, 5 and 8, the best general showing being the sectional view of Fig. 8. There the features of the left hand container 91 are shown but it is apparent that a description of one applies as well to the other. The section shows that the container is provided with a semi-circular enclosure 96 situated in the lower left hand corner of the holder. This has an opening 97 giving the ink access to a feed worm or pump 98 fitted closely within the cylindrical opening. The ink 99 is drawn from the

6

bottom of the container and forced upward through a vertical opening 100 (Fig. 4) which leads into an upper horizontal chamber 101 formed in the top plate 102 fastened over the container. This top plate 102 (Fig. 8) is also formed as a shield with an arcuate portion 103 extending along the under side of the printing roller 39 to prevent the ink from splashing out of the top of the container. Instead, the ink is poured on, and distributed along, the upper surface of another plate 105 mounted inside the container and having an upper portion which is almost tangential with the lowest part of the periphery of the inking roller. As the ink is forced upward and into opening 101, it flows over the top of plate 105 and toward the right into contact with the rotating surface of the printing roller and the excess ink is spilled over the right hand edge of plate 105. The remaining excess ink formed as a film on a surface of the printing roller is skimmed off and distributed by means of a reciprocating doctor blade 106 which is held in flexible contacting relation with the surface of the roller. Although the doctor blade skims off the ink standing above the design indentations, the design cuttings retain enough ink to provide the printed pattern when the roller is pressed against the record material.

In order to wipe off ink from the sides of the roller and to provide a bearing surface for the top edge of the doctor blade 106, which is reciprocated back and forth to help distribute the wear and also distribute the ink across the surface of the printing roller, a pair of edge wiping arms 107 are provided each having a portion cooperating with the side of the roller and another overturned portion 108 resting on the hardened marginal section of the printing roller to regulate the location of the resting surface for the upper edge of the doctor blade 106. These wiping arms 107 are attached to a fulcrum block 109 and rod 110 which passes through a pair of depending bearing formations 111 formed as extensions on the under side of the ink distributor plate 105. A compression spring 112 is located between openings in the plate and block to rock the arms in a counter-clockwise direction and maintain the overturned lug 108 in contact with the periphery of the roller.

As a portion of the right wall of the container 91 there is provided a separation plate 115 which corresponds with the other plate 115' located on the other inking container 92 and the two are spaced apart to provide a shielded path for the record material or check strip which runs upward between the two inking containers in order to pass between the printing surfaces of the two rollers.

It is already mentioned with reference to Fig. 3 that the ink containers are lowered for removal by depressing the supporting cradle 82. This combination of container motion for lowering and removing necessitates a unique form of driving connection to the worm 98 in the container which is shown in Fig. 4. There it is seen that at the front or left end of the cylindrical opening containing the worm 98, a trunnion on the worm is fitted loosely into a blind bearing 117. The other end of the worm is formed with an elongated trunnion 118 which passes through a bearing block 119 fastened to the container 91 and containing a leakproof gasket ring 120 to hold the ink from passing through the drive connection opening. Attached to the end of the trunnion 118 is a cylindrical clutch member 121

formed with a circular socket receptive to the ball end 122 of a flexible drive rod 123 which carries another clutch member 124 formed with teeth 125 cooperating with the clutch teeth on the member 121. This clutch driver 124 is formed as a slidable sleeve on the rod 123 and has a pin and slot connection 127 therewith. A compression spring 128 is present between a fixed collar 129 and the right end of the clutch member 124. The spring tends to hold the clutch members together and provide a flexible realigning means for reengaging the clutch teeth as the members are tipped at an angle to be raised and lowered, engaged and disengaged.

As a guide for the left end of the driving connections, which is clutch sleeve 124, there is provided a bearing plate 132 fastened to a stud 133 extending from the cradle 82. This bearing plate 132 is formed with a conical opening 135 for receiving sleeve 124 and providing line contact between the supporting plate and the cylindrical clutch sleeve, so that as the cradle is lowered, the sleeve is permitted to rock at an angle in following the removable clutch member 121 downward to the removal position. When the ink container is lowered for removal, the driving rod 123 is tipped at an angle, but the ball end 122 thereon remains in registry with the open end of clutch member 121, and maintains this relation in readiness for reinsertion of the ink container after adjustment and cleaning operations. Of course, as the container 91 is drawn to the left (Fig. 4) for removal, the clutch portion 121 follows along therewith and away from the ball end 122.

Turning now to the other connections between the worm driving rod 123 and the operating gear 79, it is seen in Fig. 4 that the gear is attached to a short shaft 139 passing through a bearing 140 fixed in the outer side frame 23. Also attached to the other end of the shaft 139 is a cylinder 141 which extends sufficiently to act as a receiver for the rounded end of drive rod 123. The rod not only fits within the walls of cylinder 141, but also has a pin and slot connection 142 therewith to provide enough play for the slanting operation necessitated by the lowering of the ink container as already described.

Fastened to the end of drive rod 123 is another cylinder 143 which acts as the securing means for one end of a tension spring 144, the other end of which is attached to a pin 145 passing through cylinder 141 and shaft 139. The spring tends to hold the driving rod within the driving cylinder 141 but yields when the parts are for lowering the ink container.

A few other features of the ink container construction may be noted with reference to Fig. 4. In this sectional view it is seen that the rod 110 holding the bearing blocks 109 of the edge wiping members 107 extends to the left beyond the left supporting bearing 111 and there carries an upwardly extending arm 147 fitted within a groove on a plunger 148 seated in a cylindrical opening and projecting with a knurled end outside the ink container 91. The knob of member 48 can be reciprocated to reseal the edge wipers so they come back to proper alignment with the ends of the inking roller when the ink container is lifted into cooperation therewith after removal. The hinged part 149 is a liftable cover for giving access to an opening in the container for replenishing the ink supply.

In Fig. 5 it is seen that the doctor blade 106 is secured to a shaft 151 which passes through a pair of bearing formations 152 and 153 formed

in the ends of the container 91. The left end of shaft 151 carries an arm 155 which is part of an interlock latch device for insuring that the doctor blade is out of abutting position when the ink container is lifted. The other end of the shaft is formed with a notch 156 into which there fits the end of an arm 157 which is part of a mechanism for reciprocating the doctor blade. Reference to Fig. 6 shows that there is a pair of such arms 157 provided with hubs mounted on a common shaft 159 held in the upper part of a supporting frame 160 fulcrumed at 161 (Fig. 5) in a bracket 162 extending from the side frame 22. One end of shaft 159 is provided with a follower roller 165 cooperating with a cylindrical cam 166 which has raised surfaces for reciprocating the doctor blade mountings. Attached to frame 160 is a tension spring 167 for rocking the frame in a clockwise direction and maintaining contact between the roller and the cam. The cam is fixed to a shaft 169 (Fig. 2) which carries a gear 170 meshing with a small pinion 171 fastened to another gear 172, both of latter being idlers pivoted on a stud 173 extending from the side frame 23. Gear 172 meshes with a gear 174 which is fastened to the shaft 76 of the printing roller 39, which is constantly operated as already noted. By means of these driving and cam connections both doctor blades are reciprocated as the printing rollers revolve, thus serving to distribute the ink and prevent localized wear at any particular point on the periphery of the printing roller or on the edge of the doctor blade.

Although the left printing roller 39 (Fig. 3) is mounted on the fixed center 76, the other cooperating roller 40 is supported in a swinging frame so that it may be pressed against the fixed roller and swung away therefrom for removal of one of the other of said printing rollers. Referring to Figs. 2, 3, 7 and 9, it is seen that a fixed ball-shaped frame composed of a cylindrical cross bar 180, an outer extending arm 182 and a large attaching side arm 181 is fastened on the side frame 22. Pivoted on shoulder bolts 183 (Fig. 9) extending inwardly from the side arms 181 and 182 are a pair of supporting links 185 and 186 formed with openings through which there projects a shaft 187. Fixed on the shaft 187 are a pair of ball bearings 188 and 189 which support the ends of the printing roller 40. The bearing 189 is attached to the inside of a sleeve 191 which is formed with gear teeth 192 for driving the roller when it is disengaged as explained hereinafter. The opposite end of sleeve 191 encircles a cup-shaped member 193 fastened around the outer portion of bearing 188 and attached to the hardened ring 194 forming one end piece of the printing roller. The central cylindrical surface or body 40 of the printing roller is composed of a non-ferrous metal subject to chemical or electrolytic action for etching the design used for check tinting purposes. The end ring 194 and another ring 196 at the opposite end of the printing roller are of hardened material to provide driving surfaces when brought into cooperation with similar rings.

In order to assemble the interior and exterior cylinders of the printing roller, a wedge-shaped cylinder 197 is driven between the interior member 191 and the outer cylinder 40 and it is keyed in position by a pin 198 projecting from the inner cylinder 191 into a notch cut in the end of cylinder 197.

From the foregoing description of the construction it is apparent that the printing roller 40 turns freely on the outer races of the ball bearings 188 and 189, the inner portions of which are fastened to the shaft 187.

In order to hold the shaft 187 from axial movement and to adjust it and the printing roller thereon for matched cooperation with the other printing roller 39, the left supporting link or arm 185 is formed to encircle shaft 187 and be clamped thereon by means of a split opening 199 (Fig. 7).

The plan view (Fig. 2) shows that the two supporting links or arms 185 and 186 are formed with recesses for receiving the ends of a pair of toggle links 201, 202. The toggle links fit within the recesses and are pivoted at 203 as shown in Fig. 7. The opposite ends of the toggle links are loosely pivoted on a shaft 204 which has eccentric formations 205 by which it is fitted in the side arms 181 and 182 of the printing roller frame. A pair of collars 207 (Fig. 2) hold the toggle links axially in position aligning with the supporting links 185 and 186. Also fastened to the eccentric shaft 204 is an operating lever 208 for rocking the shaft and toggle to press the printing rollers together or to separate them.

Cooperating with the right ends of links 201 and 202 (Fig. 7) is a pair of pressure plungers 210 sliding in the cylindrical formation 180 of the printing roller supporting frame. Encircling the plunger 210 and cooperating with a shoulder thereon is a strong compression spring 211 placed in the hollow opening of cylinder 180. The end of spring 211, opposite the end abutting against the shoulder on plunger 210, abuts against a screw plug 212 fitted in a threaded opening in frame 180 opposite the opening for the plunger. The reduced end of the plunger slides freely in an opening in the plug 212 and, when the plug is removed, the entire plunger assembled may be withdrawn through the threaded opening.

The cooperation between the printing roller releasing parts is such that, when lever 208 is rocked counterclockwise, the eccentric shaft 204 is turned to press the linkage toward the left (Fig. 7) and spring plungers 210 also operate in the same direction to press the printing roller 40 against the record strip 30 and the other printing roller 39. When it is desired to remove the roller 40 or separate it from the other printing roller, so that a change can be made in the printer or record strip, the lever 208 is rocked in a clockwise direction and the eccentric carries the supporting shaft 187 towards the right to relieve pressure between the printing rolls and separate them.

Whenever the movable roller 40 is disengaged, it is desired that it continue to rotate even when out of frictional contact with the drive roller 39. The reason for this is that the ink will otherwise dry and cake on the roller if it is not continuously applied and removed by the doctor blade. A separate gear connection is provided to be put into driving connection with roller 40 whenever the throw-off lever 208 is operated. For the purpose of establishing this gear connection, the eccentric shaft 204 (Fig. 2) carrying the throw-off lever 208, extends to the right beyond the inner surface of frame 22 and carries a face cam 214 cooperating with a pin 215 projecting downwardly from a horizontally mounted arm 216. Arm 216 is pivoted at 217 on a bracket 218 secured to the inside of the frame 22. Attached to the opposite end of the arm is a spring 219 tending

to rock it in a counterclockwise direction and hold the pin 215 against the operating surface of cam 214.

Projecting downwardly from the end of arm 216 is a lug 220 which projects in a circular groove provided between a pair of collars 221 secured to a sliding gear carrying shaft 222. Shaft 222 slides horizontally in bearings provided in both frames 22 and 23. Near the right end of shaft 222 is fastened a wide gear 224 which is maintained in constant mesh with the idler gear 172 forming part of the drive to the main drive shaft 76 as already noted. Attached to the left end of shaft 222 (Fig. 2) is a pinion 225 which is normally out of mesh but aligned with the gear teeth 192 on the core of the printing roller 40.

When the throw-off lever 208 is rocked clockwise, as in Fig. 7, to disengage roller 40, cam 214 (Fig. 2) turns away from pin 215 and allows spring 219 to rock arm 216 in a counterclockwise direction. This serves to carry the connected shaft 222 to the left and place the constantly rotating pinion 225 in mesh with the teeth 192 of the gear on the roller 40. The driving connections are maintained and the printing roller continues to receive and wipe off a film of ink because of the gear drive, until the throw-off lever is again operated to engage the printing roller 40, so that it is again driven frictionally through the positively rotated roller 39.

The supply of ink is described hereinbefore in connection with the showing in Fig. 8 where the ink container 91 is seen to have a worm drive for lifting the ink into cooperation with the printing roller 39. As an alternative to such a method for depositing the ink on the printing roller, another form of construction is shown in Figs. 10 and 10a. There it is seen that the ink is lifted by means of a roller 227 which is freely mounted in the container 91' so that the lower portion of it dips into the supply of ink 99 and carries it upward against the counterclockwise rotating printing roller 39'. As a means for insuring that the ink stays within the container, the supporting bearings for the inking roller 227 are separated from the outer frame of the container and supported as separate linkages with elevated fulcrum points.

Referring to Fig. 10a, it is seen that the top plate 229 is formed with a depending extension 230 from which there extends a stud 231. Encircling the stud 231 is the upper end of a bearing linkage 232, the lower end of which is formed with a cylindrical recess to receive the trunnion 233 extending from the shaft 234 carrying the inking roller 227. A bushing 235 fits within the opening in the link and it is formed with a threaded portion to receive a set screw 236 which acts as a plug to seal the end of the pivot of the inking roller.

The inking roller 227 is maintained in constant cooperation with the printing roller by means of a compression spring 238 (Fig. 10) which is pressed between an extension 239 formed on the top of link 232 and a set screw 240 threaded in the top of plate 229.

Pivotaly mounted on stud 231 (Fig. 10a) and straddling the end of link 232 is a bail formation 242 for carrying an extending end wiping member 243 cooperating with the end of the printing roller. Fastened to member 243 is an extending blade 244 which rests on the hardened periphery of the printing roller and acts as a guide for positioning the other member 243 so that its surface coincides with the surface of the

printing roller contacted by the upper edge of the doctor blade so that the blade slides freely from one to the other. The function performed by parts 243—244 are similar to those served by the members 107—108 shown in Fig. 8. In order to hold the wiping members against the periphery of the printing roller 39' (Fig. 10), a leaf spring 245 is fastened to the top of link 232. There it presses against the under side of member 243 and tends to rock it in a counterclockwise direction about the pivot 231 and holds the parts in cooperation.

It is already mentioned that the inking containers 91 and 92 are constructed to be lowered away from the printing rollers and then drawn forwardly over the guide formations on cradle 82 and thereby removed for cleaning and replenishment of the ink supply. After the containers are reinserted, it is desired that a lock be provided to hold them in the effective position. For this purpose there is mounted on the side of cradle 82 (Fig. 3) and pivoted on a center 247, a locking arm 248 formed with a shoulder 249 for engaging the front surface of the ink container to prevent it from sliding outwardly. The arms 248 and 248' are shown in the disengaged positions and, when it is desired to make arm 248 effective, it is rocked in the clockwise direction through an angle of about 90° which serves to elevate the shoulder 249 in a position to obstruct the movement of the container. A ball and socket locator is provided to hold the arm in either of the 90° positions.

In Fig. 8 it is seen that the doctor blades 105 and 106' are flexed against the periphery of the printing rollers 39 and 40. These plates are thin and flexible and in the operating condition they are tensioned against the ink bearing surface of the printing rollers to wipe off all excess ink. Of course, as the ink container is lowered, the doctor blade therein straightens out with the movement away from the under side of the printing roller and assumes a straight vertical position. If the container should then be raised with the doctor blade in such a straightened position, it would dig into the smooth surface of the printing roller. To avoid this, the shaft 151 of doctor blade 106 is rotated clockwise upon lowering the container and an interlock prevents the shaft from assuming the counterclockwise setting until the ink container is fully raised. For this purpose the outer end of shaft 151 (Fig. 3) is provided with an operating arm 155. The lower end of this arm 155 is shaped as a yoke embracing a notched collar 252 which slides on a stud 253 projecting from the upper end of a bell crank latch member 254.

Latch crank 254 is pivoted at 255 on the side of container 91 and has attached to it a tension spring 256 tending to rock it in a counterclockwise direction between a pair of stop pins 257 and 258. The horizontal arm of the latch is formed with a projection 260 which rests on a shoulder extending from a latch lever 261 pivoted at 262 and having a ball formation 263 which is part of an upper vertical cam extension 264. A coil spring 265 wrapped around center 262 cooperates with latch lever 261 and tends to rock it in a counterclockwise direction to seek the latching position.

The parts are normally latched as shown in Fig. 3 and remain so until the container 91 is lowered, then a cam face 266 formed on the side of the upper end of arm 264 cooperates with an extending stud 267 fixed in the side frame 22. Thus the latch lever is cammed in a clockwise direction sufficiently to move the shoulder away from the projection 260 and permit spring 256 to

rock crank 254 in a counterclockwise direction. This movement carries arm 155 along therewith in a clockwise direction and rocks shaft 151 (Fig. 8) clockwise so that the doctor blade 106 is moved to the right where tension is relieved on it as it is away from the surface of the printing roller.

Crank 254 (Fig. 2) is attached to a bushing 269 which also carries a manipulative arm 270. After the ink container 91 is raised to the operative position, the arm 270 is grasped and rocked in a clockwise direction (Fig. 3) to restore the parts to the latched position, whereupon the doctor blade is again flexed against the periphery of the printing roller.

Should the arm 270 be manipulated to relatch the parts while the container is in the lowered position, thus erroneously positioning the doctor blade to threaten to damage the printing roller, then the stud 267 operates on the cam face 266 automatically upon elevation of the container, to disengage the latch and rock the doctor blade to an inoperative position before any damage is done. This insures correct timing in the manipulation of arm 270 to restore the parts to the proper printing position.

Although the doctor blade latch and release mechanism is described in connection with the parts associated with container 91, it is obvious that a similar set of parts are provided for the doctor blade in container 92, and they function in a similar manner to protect the printing roller 40. For the purpose of operating the latch lever 264' swinging on container 92, a pin 271 extends from the frame 182 to cooperate with the cam face on lever 264'.

As the record strip 30 is drawn around the elevated pulley 27 (Fig. 1), it is desired that both printed surfaces be free from contact with anything except the current of air tending to dry the ink. Therefore, the pulley 27 is formed with a drive groove having sloping or conical sides (Fig. 11) to carry the record strip. The sectional view shows that the printed record strip 30 is in contact with the pulley 27 only along the sides which cooperate with the pulley at points part of the way up the sloping sides of the pulley groove. This arrangement allows space under the record strip so that air circulates around the surface to facilitate drying. However, with the strip in such a raised position, it is necessary to insure that the tension or feeding pull on the strip does not rise to such an extent that the strip is arched down into contact with the bottom of the groove of the pulley and thus overcome the good effects of the construction shown in Fig. 11.

For the purpose of regulating the tension applied to the strip as it is drawn around the top pulley 27 (Fig. 1), a brake is applied at guide 46 by a tension regulator which is positioned midway between the pulley 27 and the rewind roll 50. Referring to the large view (Fig. 12), it is seen that the strip 30 encircles the tension regulating roll 43 before passing over the stationary circular guide 46. This guide 46 (Figs. 1 and 13) is fastened between the upper part of bracket 47 and an outer face plate 275 by a series of bolts 276. Although the guide body 46 is composed of wood, a thin shell of metal 277 is curved and fastened thereon and it is over this that the record strip is drawn down toward the rewind roll. The upper ends of bracket 47 and plate 275 are formed with openings to act as bearings for a shaft 278 formed with a centralized eccentric portion 279. The left end of shaft 278 (Fig. 13) extends beyond bracket 47 and there it is at-

13

tached to a hub 280 which is secured to the center of the tension regulating arm 44. In Fig. 12 it is seen that this tension regulating lever carries an adjustable counterweight 45 at one end, and at the other end it carries the tension regulating pulley 43.

Cooperating with the top of guide 46 and overlying the record strip is a wooden brake block 282 which is notched on the sides to slide vertically on guide pins 283 projecting from the bracket and face plate. Fastened to the upper portion of the brake block 282 and separated therefrom by a pair of spacers 284 is a strip of spring steel 285 underlying the eccentric portion 279 of shaft 278. The arrangement is such that, when roller 43 (Fig. 12) is elevated, it is an indication that the tension around upper pulley 27 is getting too great and tending to warp the check strip 30 down into the hollow of the pulley groove and there is need to relieve this tension by obstructing the pull from the rewind roll. This tension relieving function is performed by the brake which is operated when lever 44 rocks in a counterclockwise direction turning the eccentric 279 so that it bears down on the spring strip 285 and pushes the brake block 282 down against the fixed circular guide 46, thereby preventing the pull exerted by the rewind roll from continuing along the strip up to the elevated pulley. When sufficient slack is gathered by such relief of tension, then the lever 44 again rocks clockwise and removes the braking effect so that the rewind action again takes up additional slack.

Regarding the rewind operation, it is already explained with reference to Fig. 1 that the rewind roll 50 is located on the shaft 51 extending from a friction disk 52 which is driven by belting 67 from a driver pulley 66. Reference to Fig. 16 shows the parts in a plan view and there the supporting bracket 53 for disk 52 and shaft 51 is seen to be secured to a shaft 54, which runs through the main side frames 22 and 23 and on its two ends carries the pulleys 65 and 66. There it is also noted that the friction driving roller is carried on a swinging arm 69 also pivoted on shaft 54.

On the end of rocking lever 69 there is pivoted at 287 a rocking frame 288 which carries a U-shaped bar 289 for supporting the frictional driving roller 295. Mounted as an L-shaped extension from rocking frame 288 is a supporting member 290 for carrying a freely turning follower roller 291 which rests on the periphery of the rewind roll 50 and serves to follow the enlargement of the diameter of this roller and thereby swing the operating point of the friction drive out toward the enlarged diameter of the friction disk 52, so the rewind action is constantly proportional to the size of the rewind roll.

In Figs. 14 and 15 the rewind driving parts are shown in greater detail and in the sectional view (Fig. 15) it is seen that a number of parts are confined between the extending ends of the U-shaped hanger 289. Near the top of the hanger is the driving pulley 68 containing a ball bearing 292 for permitting it to rotate freely on a vertical shaft 293 passing through openings in both ends of the arms of the hanger. The pulley 68 is seen to be formed with a cylindrical extension 294 upon which is fastened a conical ring 295 of rubber or other frictional material shaped to cooperate with the side wall of the friction disk 52. Inside the lower end of cylinder 294 is another ball bearing 296 encircling the shaft 293 and in-

14

suring free rotation of the connected parts on this shaft.

Shaft 293 also carries a means for throwing off the friction driving connections so that the rewind may be disabled at any time. These throw-off connections are pinned to opposite ends of shaft 293. At the upper end of the shaft is fastened an extending arm 297 (Fig. 14) cooperating with a stop pin 298 which extends from the top of hanger 289 for limiting the rocking movement of the lever. At the lower end of shaft 293 (Fig. 15) is fastened another arm 300 carrying a roller 301 normally out of contact with the face of disk 52. However, when arm 297 (Fig. 14) is rocked counterclockwise for the throwing-off operation, arm 300 is moved in the same direction and roller 301 presses against the side of the friction disk 52 and shaft 293 is shoved away from the disk so that the friction wheel 295 is moved out of cooperation with the disk. When the parts are so situated, the pulley 68 and friction wheel 295 are allowed to operate without communicating any driving action to the rewind roll.

A plan view of Fig. 14 shows the details of the connection between the swinging frame 288 and the holder 290 for the follower roller 291. The connection involves a hinged construction 303 where the end of frame 288 fits into a recess cut in the side of the member 290. There is a certain amount of play in the joint allowing the roller to move back and forth in following the periphery of the rewind roll. To hold the parts together the end of frame 288 is formed with a T-shaped recess in which fits the head 304 of a bolt which is tightened on the outside of member 290.

In order to uphold the swinging arm 69 and the rewind drive parts thereon (Fig. 16), a spring 305 is attached to a stud 306 extending from frame 23, and at its opposite end is connected to a rod 307 which is fixed to a bracket 308 extending horizontally from the carrying arm 69. Reference to Fig. 1 shows that the link 307 is shaped to encircle the operating shaft 54. The spring not only tends to swing the rewind parts against the side of friction disk 52, but it also tends to hold the end of the lever 69 down so that roller 291 is maintained in contact with the top of the rewind roll.

A compensating means is provided for swinging frame 288 so that it follows more closely to a radial line of movement across the surface of disk 52 rather than in arcuate path of travel, which would prevail if the holder 288 were fixed to the end of arm 69. Seeing that the parts are pivoted at 287, it is possible to rock the frame 288 toward the right (Fig. 1) as it is elevated and thus flatten out the arcuate path of travel. For this purpose a link 310 is articulated at 311 on the bottom end of frame 288 and the opposite end of the link is pivoted at 312 on the stationary supporting frame 53.

In divisional application Serial No. 742,113, filed on April 17, 1947, I present claims to the feeding control devices of the invention.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a printing machine, a printing roller, means for inking said roller, a doctor blade for removing excess ink from said roller, means for rocking said doctor blade to a position where it is flexed into cooperation with the surface of said roller, means for latching it in the operative position, a tripping means for unlatching said doctor blade latching means, a flexible means for moving said doctor blade to an inoperative position, means for moving said doctor blade bodily away from and towards said printing roller and means for automatically operating said tripping means when said moving means takes said doctor blade away from said printing roller.

2. In a printing machine, a printing roller, a container of ink mounted below said roller, a movable supporting frame upon which the container is elevated into cooperation with said roller and lowered therefrom, means in said container for elevating said ink and applying it to the surface of said roller, a doctor blade mounted in said container, a pivotal mounting for said doctor blade, a spring connected to said pivotal mounting for pressing said doctor blade against the periphery of said roller, an arm carried by said pivotal mounting, a latching crank connected to said arm, a latch for said crank normally holding it and the connected parts in a position whereby the doctor blade is in an operative position, said latch being mounted on said movable container, a fixed stud, a cam face on said latch cooperating with said fixed stud in the frame of the machine whereby lowering of said container causes automatic unlatching of said doctor blade and movement of it to an inoperative position, and a manipulative lever for restoring said blade to the position wherein it cooperates with the printing roller.

3. In a printing machine, a printing roller, inking devices therefor, a doctor blade cooperating with said roller to distribute the ink, a shaft carrying said doctor blade, means for reciprocating said shaft axially to move said doctor blade back and forth across the surface of said roller, a pair of arms cooperating with the ends of said roller, said arms each carrying an overturned lug for resting on the edge of the periphery of said roller, said arms formed with bearing surfaces serving as platforms for the edge of said doctor blade, said arms mounted in a common pivot, and flexible means cooperating with said pivot to hold said arms in cooperation with said printing roller.

4. A machine of the kind set forth in claim 3 wherein there is a means for lowering said inking devices and said arms below the stationary mounting of said printing roller, and manipulative means for reciprocating said common pivot whereby said arms may be relocated in cooperation with the ends of said roller after elevation of said inking devices.

5. In a printing machine, a printing roller, an inking means therefor, a container for said inking means, means for lowering said container, an inking worm in said container for circulating the ink to and from said roller, a shaft on said worm extending outside said container, a clutch member fastened to the end of said shaft, a companion clutch member cooperating to drive said shaft, a supporting means for the first mentioned clutch member extending from said means for

lowering the container, a drive shaft extending through said second mentioned clutch member and having a ball end located in a recess in the first mentioned clutch member, a main operating means, a shaft driven by said main operating means, and a flexible connection between said operating means and said shaft for the clutch member, whereby it is possible to tilt the movable drive shaft so that the ball end follows the downward motion of the clutch portion mounted on the worm shaft, making possible removal and reinsertion of the container with disconnection and connection of the clutch members.

6. A machine of the kind set forth in claim 5 wherein there is a compression spring, said second mentioned clutch member being slidably mounted on the drive shaft and forced into clutching position by said compression spring, a sleeve on the driving means for receiving the opposite end of said drive shaft which is connected thereto by a pin and slot connection, and a tension spring for flexibly connecting said sleeve and drive shaft.

7. In a printing machine, a printing roller, an ink container mounted below said roller, an ink applying roller mounted in said container and serving to convey ink from the container to the periphery of the printing roller, the ink roller mounting including a pair of pivoted bearings rocking on downwardly extending ears formed on the top plate of the container, each of said pivots also holding a ball straddling said pivotal bearing, said ball having an arm for wiping the end of said printing roller, and a lug projecting from said arm for riding on the edge of the periphery of said printing roller.

8. In a printing machine for printing a safety design all over a check strip, a pair of printing rollers cooperating with opposite sides of said check strip, inking devices therefor, a main driving means, gear connections from said driving means to one of said rollers which has a stationary bearing, a movable mounting for the second of said rollers, said movable mounting including supporting arms for the shaft of said second roller, a pair of eccentrically fulcrumed toggle links for pressing said second roller into frictional contact with the stationary roller, a manipulative lever on said toggle eccentric fulcrum for operating the toggle to separate the two printing rollers, a flexible means for pressing said toggle connections into frictional driving position, a normally disconnected gear drive from said driving means to said second roller, and means under control of said lever for connecting said gear drive to said second roller, whereby it is positively operated to be continuously inked when disconnected from frictional contact with the first mentioned roller.

FRED M. CARROLL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,404,589	Dixon et al.	Jan. 24, 1922
2,105,488	Massey et al.	Jan. 18, 1938
2,141,073	Wetzel	Dec. 20, 1939
2,236,239	Lipton	Mar. 25, 1941
2,273,021	Cox	Feb. 17, 1942
2,321,812	Heller	June 15, 1943
2,396,391	Ross	Mar. 12, 1946