Feb. 6, 1951 F. SHURLEY 2,540,554

ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

Filed Sept. 12, 1945 7 Sheets-Sheet 1

FIG. 1.

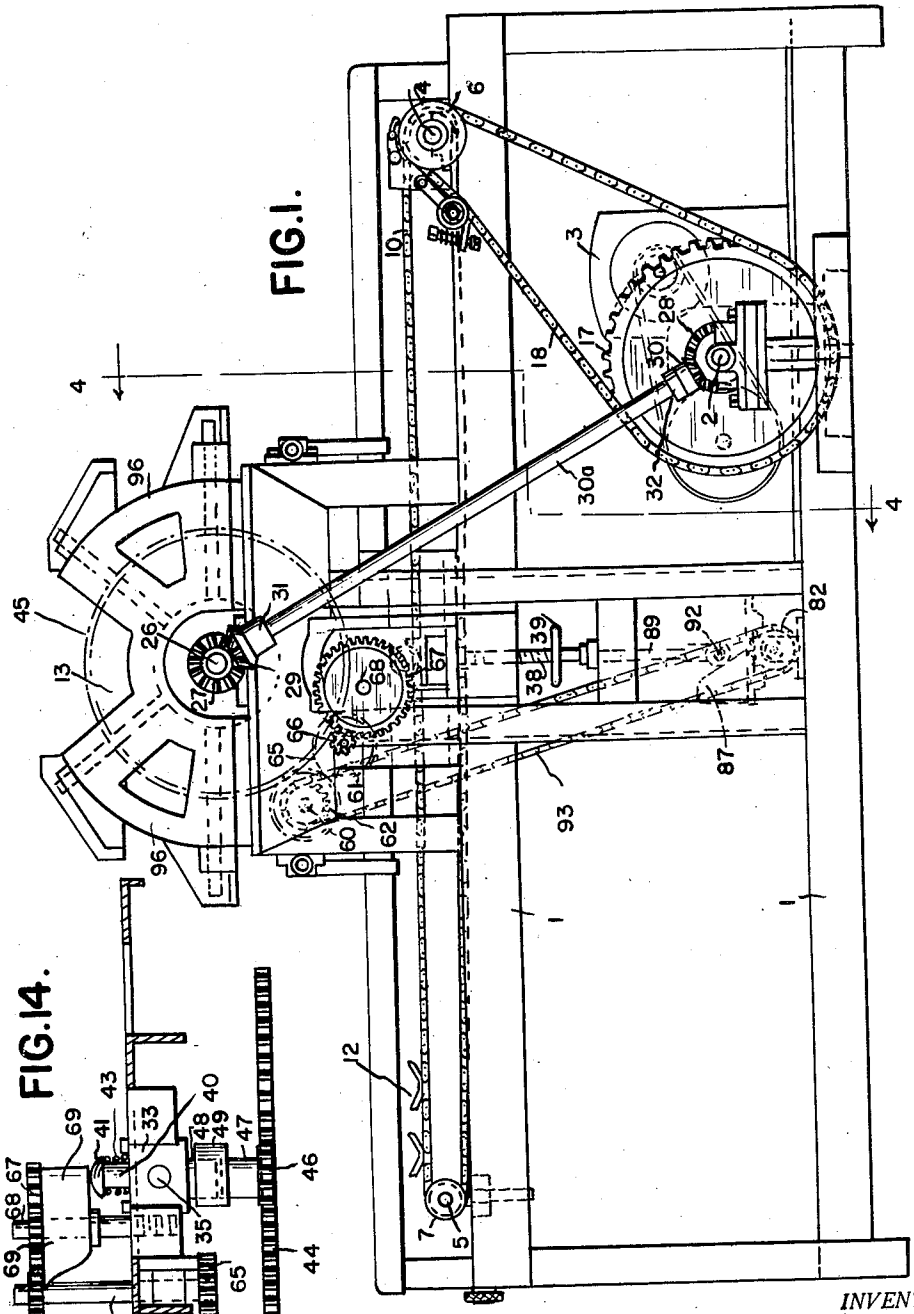

FIG. 14.

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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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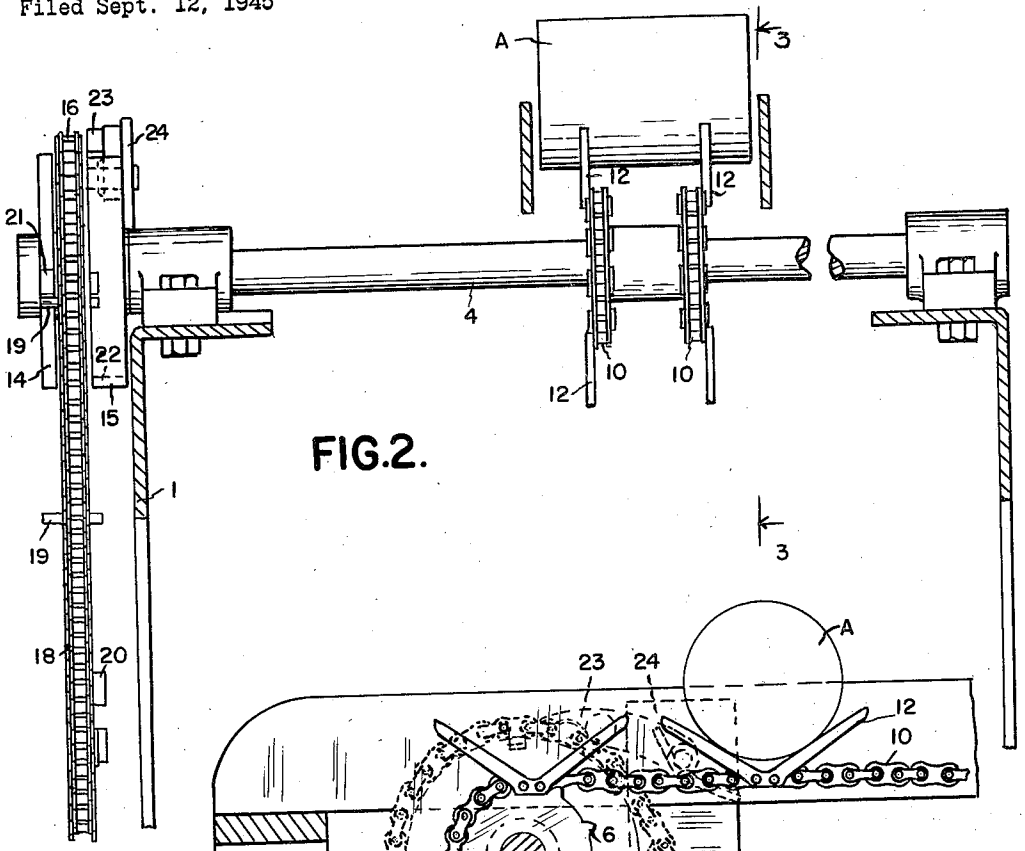

FIG.2.

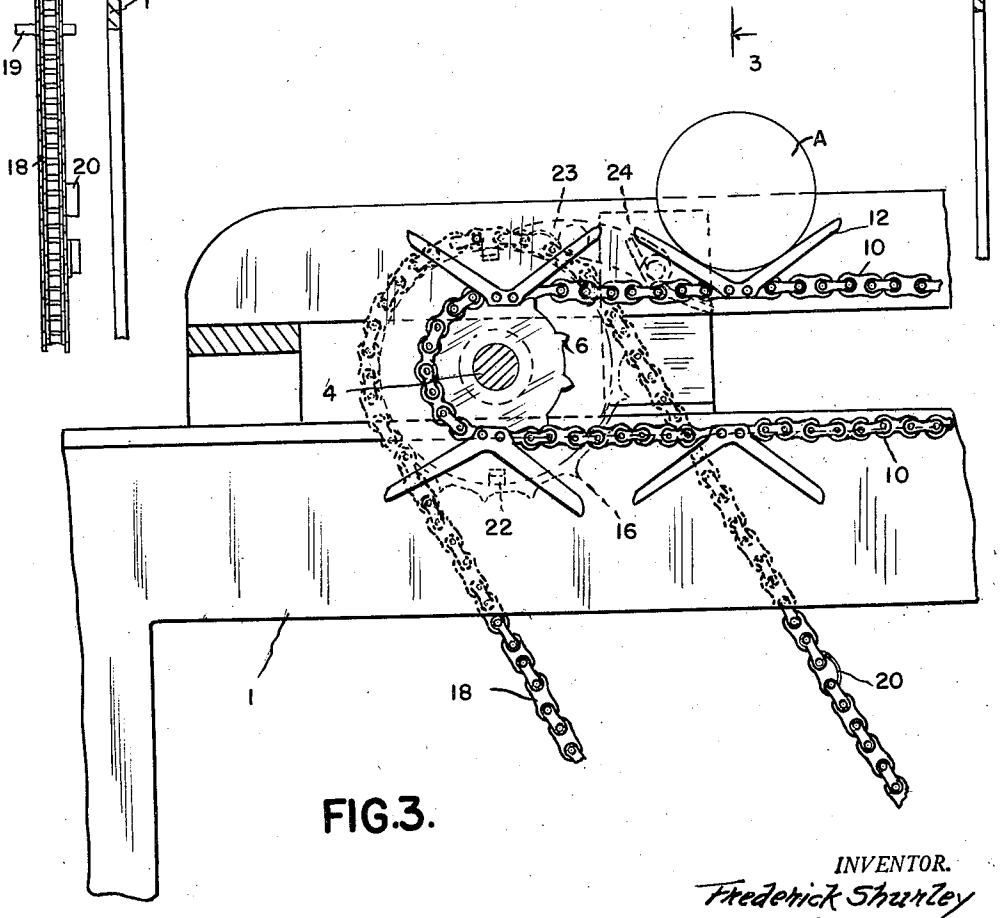

FIG.3.

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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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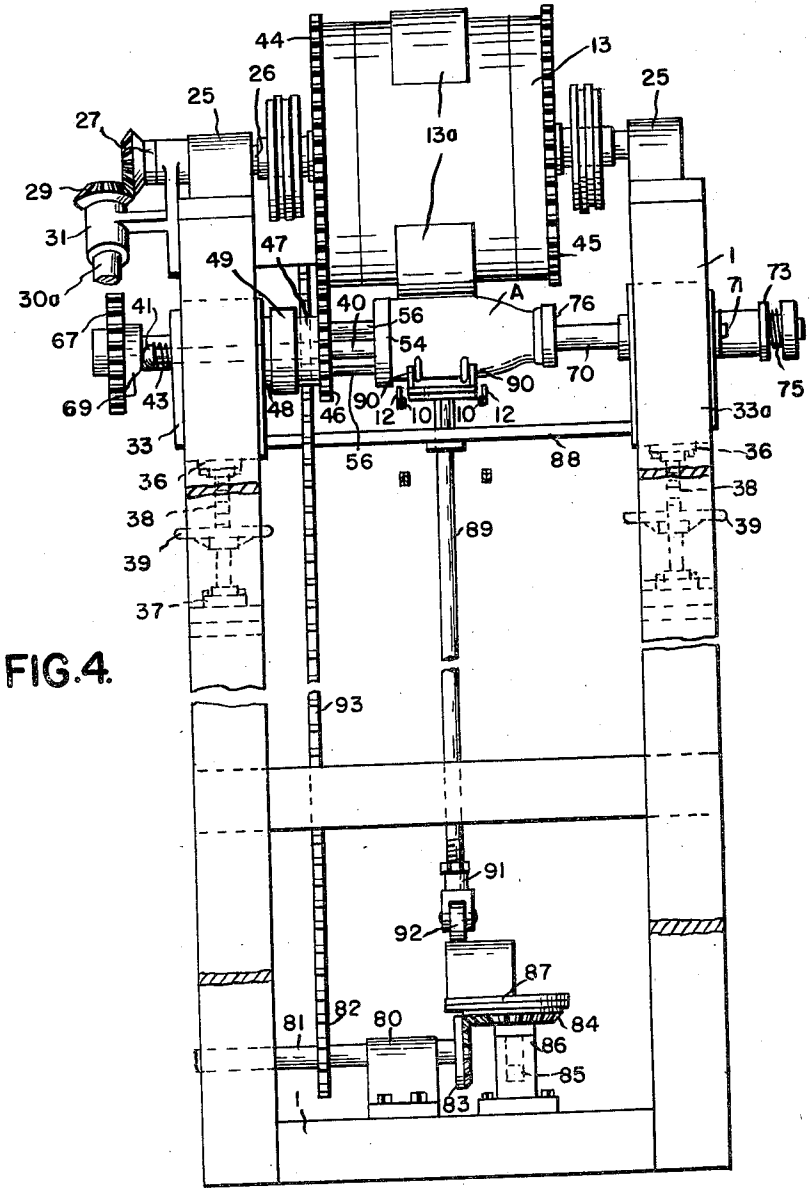

FIG.4.

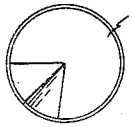

FIG.5.

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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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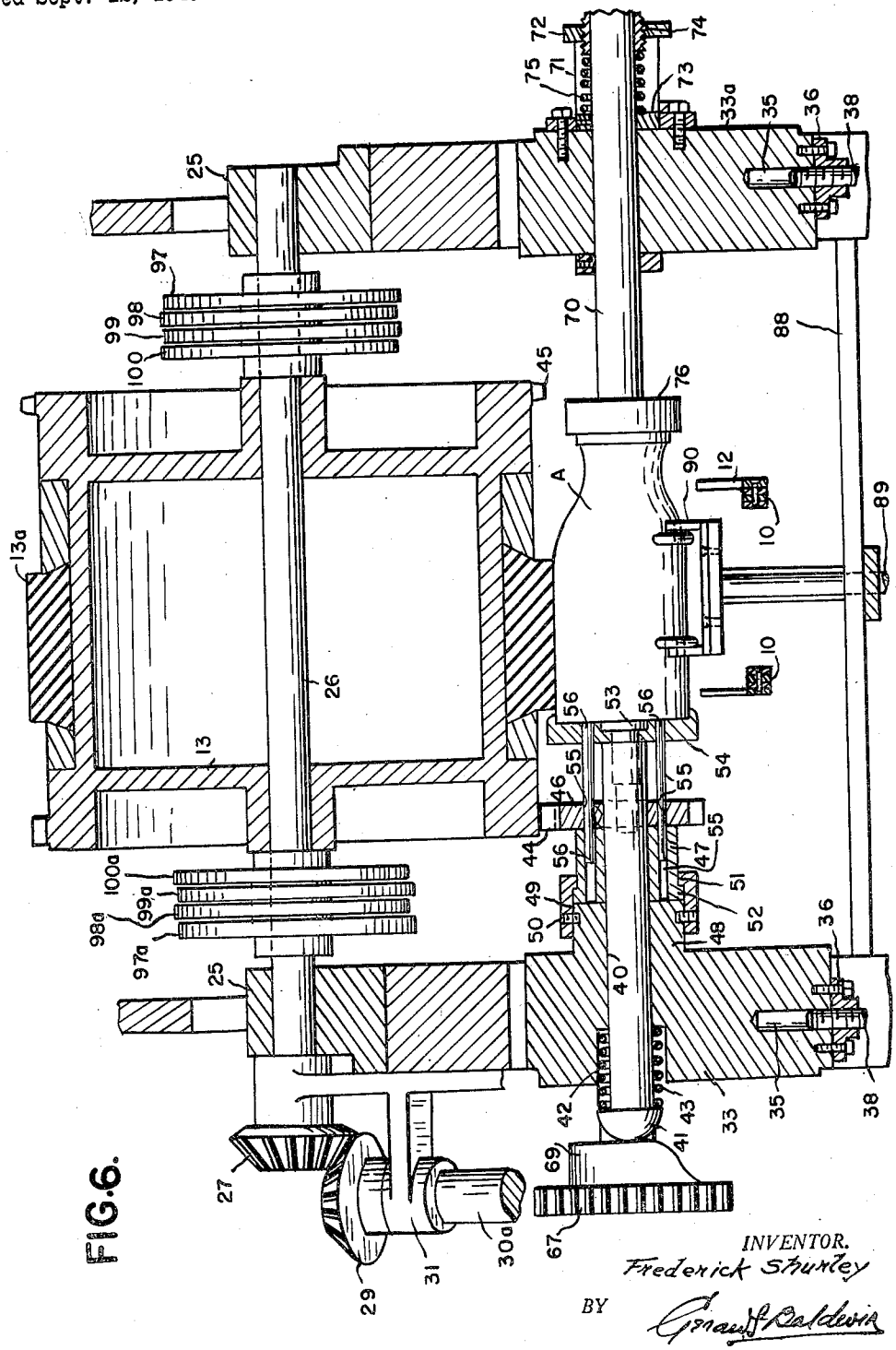

FIG. 6.

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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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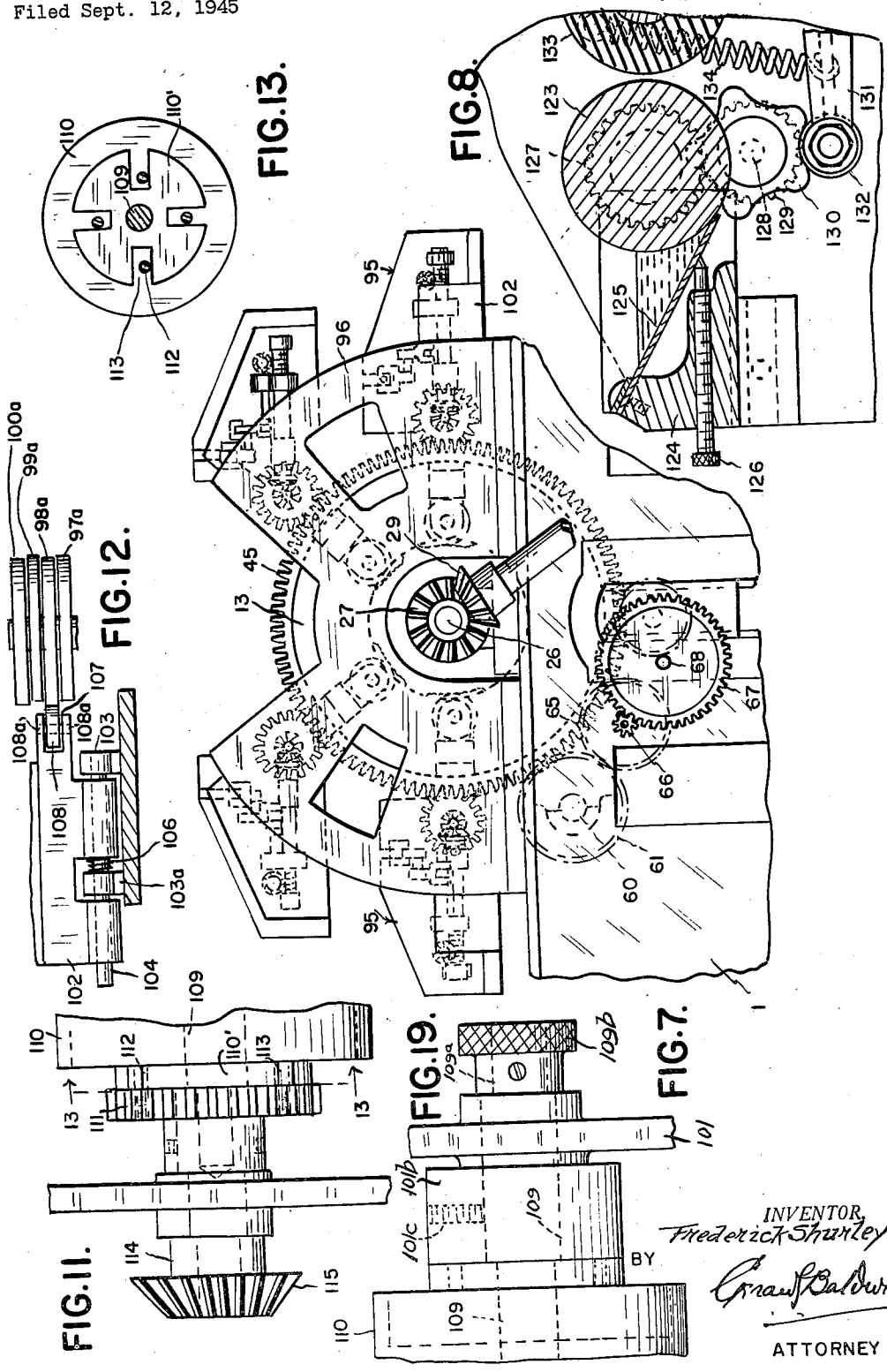

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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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FIG.9.

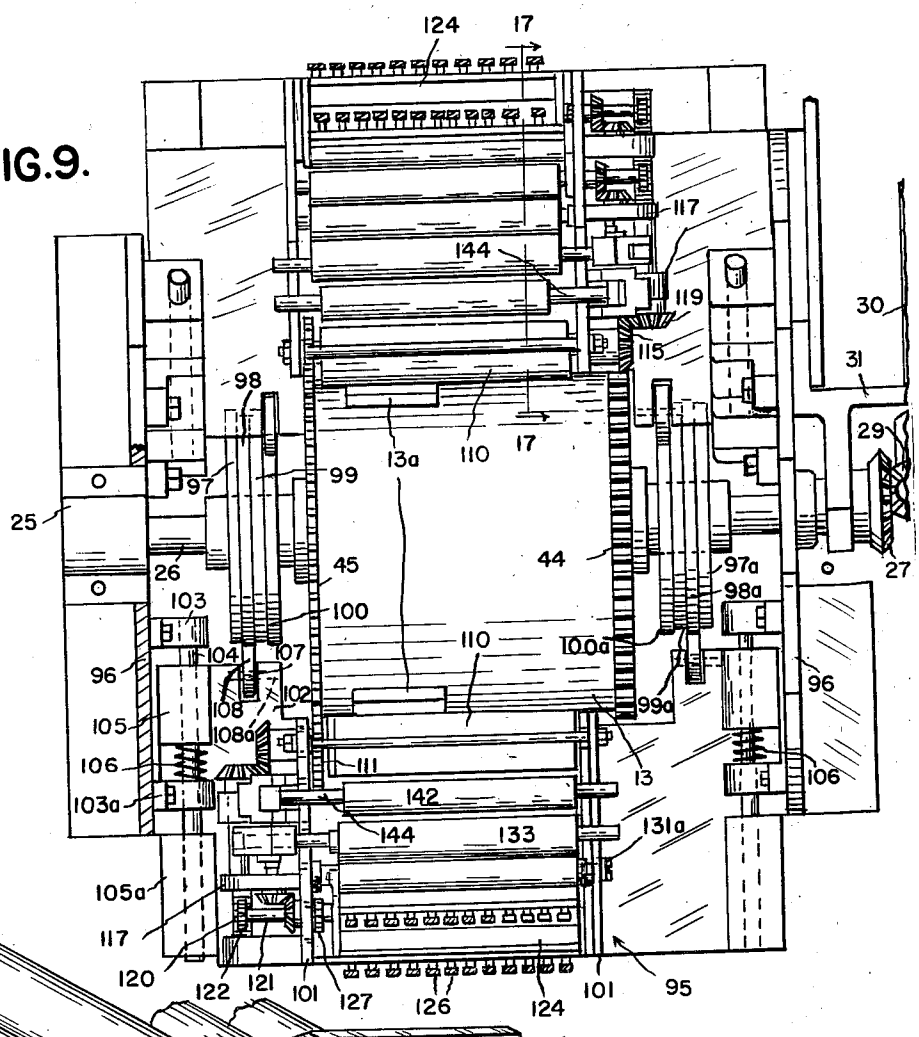
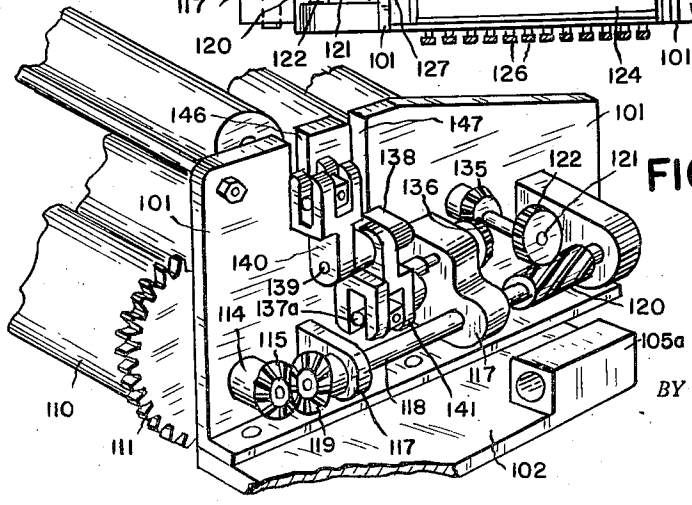


FIG.10.



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ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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FIG.17.

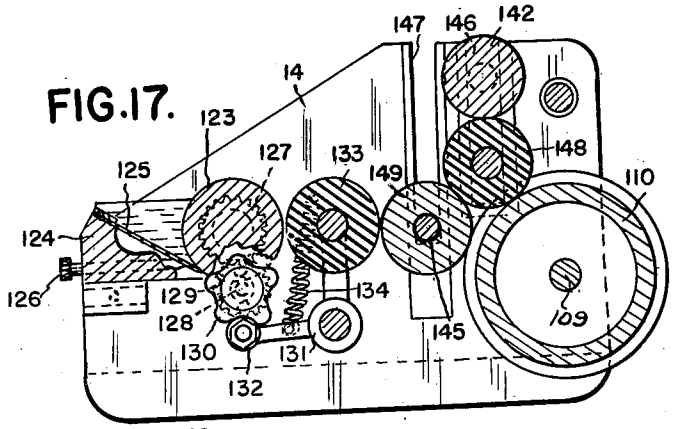


FIG.16.

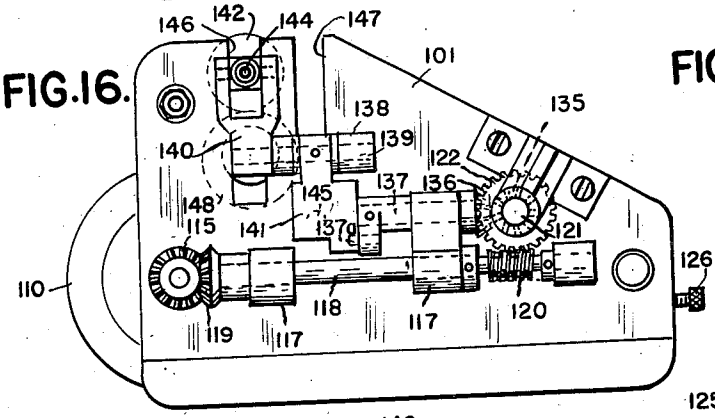


FIG.18.

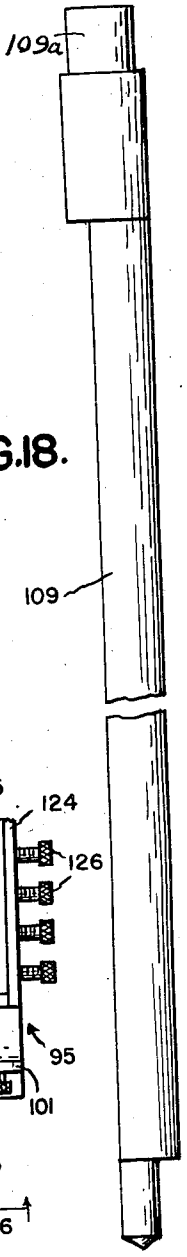
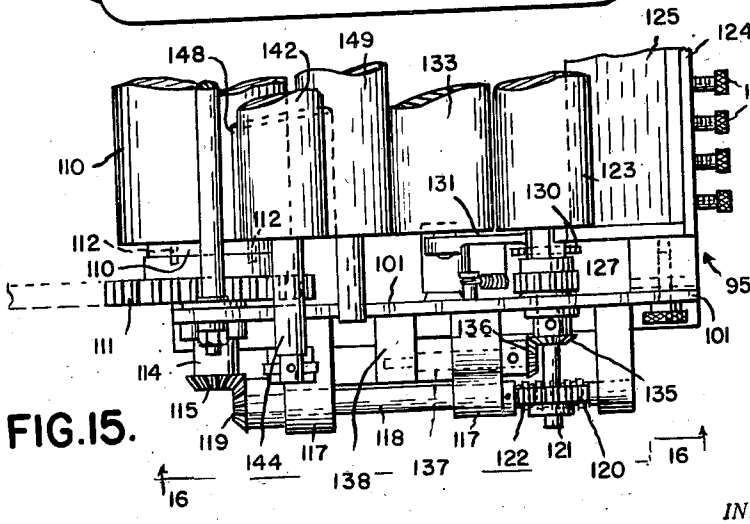


FIG.15.



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Patented Feb. 6, 1951

2,540,554

UNITED STATES PATENT OFFICE

2,540,554

ROTARY PRINTING MACHINE FOR CYLINDRICAL ARTICLES

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Application September 12, 1945, Serial No. 615,869
In Great Britain August 3, 1945

8 Claims. (Cl. 101—38)

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This invention relates to improvements in rotary printing machines, and refers particularly to rotary printing machines with which cylindrical articles such as bottles, tumblers, jars, cans and the like may be printed, labelled, or embossed in a plurality of colors in each printing cycle.

The invention aims, among other things, to provide a rotary printing machine wherein means are provided for: continuously rotating a cylinder carrying a plurality of printing plates and for inking each plate during rotation of the cylinder with a different attachment each of which is adapted to ink its plate a different color; moving the cylindrical work pieces to be printed intermittently and consecutively substantially into position for printing in a plurality of colors in a single operation and for moving them away when printed; elevating each workpiece from the intermittent moving means into position to be engaged for rotary contact with the printing plates; engaging and subsequently releasing each workpiece in turn for rotation during the printing operation; positively rotating the workpiece during the printing operation at the same peripheral speed as that of the printing plates; and adjusting the distance between the axis about which the printing plates are rotated and that of the work engaging means so that workpieces of different diameters may be printed.

When silk or metal screens are employed for printing it is necessary to dry each color before printing in another color, and moreover printing in that manner necessitates the use of a relatively heavy layer of color and not infrequently results in a ragged, uneven color edge. It is an object of this invention to provide a rotary printing machine equipped with means for printing in a plurality of colors directly onto the work at one setting and without having to wait for one color to dry before printing thereon in another color, thereby materially increasing the speed of production; and also to provide for printing by the application of either a relatively thin layer of color or a relatively thick one, since ceramic or vitreous enamels require perfect opacity; in either of the latter cases my invention produces unblurred, even edges in the resultant printing.

A further object of the invention is to provide a rotary printing machine wherein the plates may be made of rubber, composition, or other somewhat resilient material so that perfectly clear and regular imprints may be obtained on workpieces having slightly irregular surfaces.

Yet another object of the invention is to provide a rotary printing machine whereby different colors may be intermingled in designs which include fine detail, and the different colors applied in a single operation.

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Another object of the invention is to provide a rotary printing machine including elevating means synchronized with the intermittent movement of the conveying means, for raising workpieces from the latter into position to be engaged by chucks for rotation in contact with the printing plates.

Another object of the invention is to provide a rotary printing machine wherein chucks engage and disengage the workpieces; wherein the chuck engaging movement is automatic and the chucks are adapted to engage opposite extremities of circular workpieces so that their peripheral surfaces may be printed throughout their entire length; and wherein the chuck movement is synchronized with that of the elevating means.

Having thus briefly and broadly stated some of the objects and advantages of the invention I will now describe the preferred construction thereof in detail with the aid of the accompanying drawings, in which:

Figure 1 illustrates a side elevation of the machine.

Figure 2 is an enlarged view showing the head shaft for the conveyor mechanism and the intermittent drive therefor.

Figure 3 is a view on the line 3—3 of Figure 2.

Figure 4 is a vertical section on the line 4—4 of Figure 1.

Figure 5 is a plan view of a detail comprising a cam supported on a horizontal base connected thereto, whereby the rotation of the cam and its base elevates a workpiece to chucking position.

Figure 6 is an enlarged vertical section through the printing cylinder.

Figure 7 is a partial side view—enlarged—showing the inking fountains.

Figure 8 is a further enlarged sectional view showng one portion of one inking fountain.

Figure 9 is a plan view of Figure 7 showing the inking fountains.

Figure 10 is a perspective view of one side of one inking fountain.

Figures 11 and 12 are details of one inking fountain.

Figure 13 is a section on the line 13—13 of Figure 11.

Figure 14 is a detail showing an inverted plan of the cam actuating means for one of the chuck plates.

Figure 15 is a plan view showing one side of one inking fountain.

Figure 16 is a view on the line 16—16 of Figure 15, and

Figure 17 is a section on the line 17—17 of Figure 9.

Figure 18 shows the cranked shaft for the inking roll.

Figure 19 shows the bearing supporting one end of the cranked shaft.

Referring to the drawings, 1 designates a frame having a drive shaft 2 mounted transversely thereon which in the present instance is rotated through suitable means by an electric motor 3. Mounted crosswise of the frame toward each extremity thereof are head and tail shafts 4 and 5 having head sprockets 6 and tail sprockets 7 respectively mounted thereon. A chain 10 passes around each pair of sprockets 6 and 7; and 12 denotes carriers secured to the chains 10 in opposed pairs to support cylindrical workpieces A and carry them substantially to and from printing position beneath a printing cylinder 13 mounted for rotation substantially centrally of the machine.

Loosely mounted on the head shaft 4 between two cams 14 and 15 fixed on the said shaft is a sprocket 16; and fixed on the drive shaft 2 is a second sprocket 17. Extending around these sprockets 16 and 17 is a chain 18 having spaced pins 19 extending laterally from one side and spaced lugs 20 extending laterally from the other. Formed on the cam 14 are two substantially opposed radially projecting lobes 21 one of which is adapted to be engaged by each of the pins 19 so that partial rotation is intermittently imparted to the head shaft 4. In order to prevent accidental rotation of the shaft 4 the cam 15 is provided with opposed and substantially radial apertures 22 either of which may be engaged by a dog 23 pivotally mounted on the bracket 24 secured to the frame 1. The lugs 20 are so spaced that each in turn engages the dog 23 and withdraws it from one of the apertures 22 just prior to the time that one of the pins 19 contacts the cam 14 and commences to rotate the latter and the head shaft 4. As soon as the other aperture 22 is opposite the dog 23 the latter drops thereinto; this occurs just as the pin 19 by which the cam 14 has been rotated disengages itself from the latter. Thus intermittent rotation is imparted to the head shaft 4 and to the conveyor chains 10.

Provided on opposite sides of the frame 1 substantially centrally of its length are bearings 25 which support a shaft 26 for rotation, and mounted upon the latter to turn therewith is the printing cylinder 13. Fixed on one extremity of the shaft 26 is a bevel gear 27 and mounted on the drive shaft 2 is another bevel gear 28. These two bevel gears 27 and 28 mesh with gears 29 and 30 respectively which are secured on opposite ends of a shaft 30*a* supported as by bearings 31 and 32.

Mounted for vertical movement in the frame 1 in vertical alignment with and beneath the axis of the shaft 26 are bearings 33 and 33*a* having vertical openings 35 formed in their undersides, and nuts 36 secured on their lower faces beneath the said openings and in axial alignment therewith. Mounted for rotation in bearings 37 supported on the frame 1 are the lower extremities of spindles 38 the upper portions of which are threaded to engage the nuts 36 while their upper extremities project into the openings 35. These spindles 38 are readily turned by handwheels 39 secured thereon so that the height of the bearings 33 and 33*a* may be adjusted to suit the diameter of the work pieces being printed.

Mounted for rotation in the bearing 33 is a shaft 40 having a cap 41 of increased diameter on its outer extremity, the outer face of this cap is substantially hemispherical whereas its inner face is flat. The outer side of the bearing 33 is counterbored at 42 to receive a helical spring 43 which extends between the flat inner side of the cap 41 and the base of the counterbore 42 and tends to move the shaft axially outward.

Fixed on opposite sides of the printing cylinder 13 and concentric therewith are gears 44 and 45 the latter having specially deep teeth. The gear 44 meshes with a pinion 46 suitably secured on the inner face of a sleeve 47 through which the shaft 40 extends. The outer extremity of this sleeve 47 is held against a boss 48 on the inner face of the bearing 33 by a collar 49 secured to the said boss as by screws 50. The collar 49 is provided at its inner extremity with an inturned annular flange 51 which engages an external flange 52 on the outer extremity of the sleeve 47 and holds the said flange 52 between the flange 51 and the inner face of the boss 48. Mounted on the inner extremity of the shaft 40 as by a screw 53 is a chuck plate 54 and through the pinion 46 are aligned openings to receive axially movable drive pins 56 which are upon outward movement of the shaft 40 and the chuck plate 54 are adapted to move further into the openings 55 formed in the sleeve 47.

Supported for rotation on the frame 1 is a shaft 60 having a pinion 61 thereon which meshes with the gear 44 and is driven thereby. Fixed on the shaft 60 is a sprocket 62 and a gear 63. Also supported on the frame 1 is a shaft 64 having two gears 65 and 66 thereon. The gear 65 meshes with the gear 63 and the gear 66 with a gear 67 fixed on a shaft 68 which also has a cam 69 fixed thereon which intermittently exerts pressure in an inward direction against the cap 41 and forces the shaft 40 and its chuck plate 54 inwardly against the tension of the spring 43.

Mounted for rotary and axial movement in the bearing 33*a* is a shaft 70 and fixed on the outer face of the said bearing and projecting outwardly therefrom is a bracket 71 having an internally threaded annular flange 72 at its outer extremity. Fixed around the shaft 70 outwardly of the bearing 33*a* is a collar 73 and in threaded engagement with the flange 72 is an externally threaded sleeve 74. A spring 75 is mounted around the shaft 70 between the collar 73 and the sleeve 74 so that by rotation of the latter the tension of the spring which tends to force the shaft 70 inwardly may be adjusted. Mounted on the inner extremity of the shaft 70 is a chuck plate 76 between which and the chuck plate 54 a workpiece A is adapted to be supported, and turned through the pinion 46 and the plate 54. The gearing 44 and 46 is so calculated that the peripheral speed of a workpiece thus held between the chuck plates is the same as that of the printing plates 13*a* mounted on the printing cylinder 13. When workpieces of different diameter are to be printed it is merely necessary to substitute a pinion of the required size for the pinion 46 and to adjust the height of the bearings 33 and 33*a* by rotation of the hand-wheels 39.

Mounted on the base 1, Fig. 4, is a bearing 80 which supports a shaft 81 having a sprocket 82 and a bevel gear 83 thereon. The latter meshes with a bevel gear 84 on a vertical shaft 85 sup-

ported in a bearing 86, and fixed on the gear 84 is a cam 87. Arranged transversely of the frame 1 is a horizontal support 88 through which a vertical rod 89 extends which has spaced opposed yokes 90 on its upper extremity. These yokes normally rest upon the support. The lower extremity of the rod 89 is threaded to receive a member 91 so that the latter may be vertically adjusted to control the amount of lift imparted by the yokes. Dependingly supported by the member 91 is a roller 92 which rides upon the cam 87 so that each time the latter is turned the yokes 90 are raised to engage the underside of a workpiece A on an opposed pair of carriers 12 above them and lift the workpiece into position to be engaged by and between the chuck plates 54 and 76. Rotation is imparted to the shaft 81 by a chain 93 which extends around the sprockets 62 and 82.

It can now be understood readily that I have produced a purely structural or mechanical control mechanism for printing on cylindrical articles or objects which are transferred and elevated to printing position and maintained in that position until printed. All electrical and pneumatic devices have been eliminated. It is true that I have included an electric motor 3 as a prime mover but any prime mover could be substituted, such as a steam engine or an internal combustion engine.

Each series of articles of a certain diameter requires a gear as 46 of corresponding diameter so that the surface speed of the printing plates 13*a* shall be substantially identical with the surface speed of the cylindrical surface portion being printed. It is conclusive that the pinion or pinions 46 must be attachable, detachable and replaceable as conditions of article diameter require.

The parts, Fig. 14, comprising gears 44, 46, shaft 60, spur gears 61, 63, 65, shafts 64, 68 and 40, spur gears 66 and 67 and the cam 69 constitute a combined cam and transmission mechanism which is purely mechanical and positive in action.

In the embodiment shown four printing plates 13*a* are secured on the cylinder 13 each to print in a different color, so that a separate inking fountain 95 is required for each plate. Fixed on opposite sides of the frame 1 are castings 96, and secured around the shaft 26 for rotation therewith are eight cams 97, 97*a*, 98, 98*a*, 99, 99*a*, 100 and 100*a* which in the present instance are arranged four on each side of the printing cylinder 13. By rotation of each pair of cams one of the inking fountions 95 is operated. Since all the fountains are identical except that some of the actuating means are provided on one side of some of them and on the opposite side of others; I will therefore just describe one fountain and its operation.

Each fountain 95 consists of two vertical side members 101 each of which is secured to a carrier plate 102 projecting outwardly therefrom. On each casting 96 are two spaced, aligned bearings 103 and 103*a* to support a rod 104 which extends radially from the axis of the cylinder 13, and integral with each carrier plate 102 are two spaced bearings 105 and 105*a* through which one of the rods 104 also passes. Mounted around each rod 104 between the bearings 105 and 103*a* is a helical spring 106 which tends to force the fountain toward the axis of the printing cylinder 13. Formed in one margin of each carrier plate 102 is a slot 107 to receive a roller 108 which is rotatably supported on a pin 108*a* which extends into the plate 102 and across the said slot. The rollers 108 are held in engagement with the periphery of the cams 98 and 98*a* by the action of the springs 106.

Extending between the side members 101 and held stationary by one of them is a centrally cranked shaft 109 having an inking roll 110 rotatably mounted on its cranked portion, so that by rotary adjustment of the shaft 109 the distance between the axes of the roller 110 and of the printing cylinder 13 may be varied. Secured to one of the side members 101, Figure 3 is a collar 101*b* having a set screw 101*c* in threaded engagement therewith which engages one end of the shaft 109 and holds it against rotation. Fixed on the extremity 109*a* of the shaft 109 outwardly of the adjacent side member 101 is a knurled knob 109*b* so that after the set screw 101*c* has been loosened the shaft 109 may be rotarily adjusted. This is very desirable because there may be a variation in the distance which the printing plates 13*a* project from the cylinder and in this way the position of the inking roll relative to the plate it inks may be easily adjusted. Mounted for rotation on the uncranked end of the shaft 109 is a pinion 111 having extra deep teeth so that in spite of variation in the distance between the axes of that pinion and the printing cylinder the said pinion will always remain in mesh with the gear 45 the teeth of which are also extra deep as already noted. Projecting inwardly from the pinion 111, Figs. 11 and 13, are drive pins 112 which extend into slots or larger openings 113 formed in a flange or plate 110′ secured on one extremity of the inking roll 110 so that irrespective of the rotary position of the cranked shaft 109 the roll is always rotated when the pinion 111 is turned. Projecting outwardly through one of the side members 101 and secured for rotation with the pinion 111 is an extension 114 having a bevel gear 115 fixed thereon.

Supported for rotation on the outer face of one of the side members 101 are bearings 117 which support a shaft 118 for rotation. Fixed on one extremity of this shaft is a bevel gear 119 which meshes with a bevel gear 115, and provided also on the said shaft is a worm 120. Mounted in and extending through one side member 101 is a shaft 121 having a wormwheel 122 thereon meshing with the worm 120. Mounted also on the shaft 121 is a metal roll 123 and the opposite extremity of the said shaft is rotatably supported in the opposite side member 101. Mounted on and extending between the side members is an ink trough 124 having a resilient metal strip 125 extending forwardly and downwardly therefrom across substantially the entire width of the roll. This strip across its forward edge bears against the roll 123 below the horizontal centre of the latter and its edge is forced against the said roll by a plurality of screws 126 which are tightened against the strip and are in threaded engagement with the trough 124. Mounted on opposite ends of the shaft 121 adjacent the side members 101 are gears 127, and projecting inwardly from one of the said side members is a pin 128, Figs. 8 and 17, having a gear 129 thereon which meshes with the gear 127. Also mounted on the pin 128 for rotation with the gear 129 is a cam 130. Rotatably supported on the inner face of one side member 101 is a bellcrank 131 having a roller 132 on one arm which engages the cam 130 and supported by the other arm of the bellcrank is one extremity of a rubber roll 133. Pivotally mounted

on the inner face of the opposite side member 101 and coaxially with the bellcrank 131 is an arm 131a which supports the opposite end of the roll 133 and swings about its axis with the said bellcrank. Secured at one extremity to one arm of the bellcrank 131 and at its opposite extremity to the adjacent side member 101 is a spring 136 which retains the roller 132 in contact with the cam 130 so that upon rotation of the roll 123 the rubber roll 133 is alternately moved into contact with the roll 123 and another metal roll 149.

Fixed also on the shaft 121 outwardly of one side member 101 is a bevel gear 135 which meshes with a bevel gear 136 fixed on one extremity of a crank shaft 137. Supported in bearing 138 on one side member 101 is an oscillating pin 139 having rockers 140 and 141 thereon for movement therewith. The rocker 140 engages one end of the shaft 144 of a metal roll 142 and the rocker 141 engages one extremity of the shaft 145 of the metal roll 143. The rocker 141 is also slotted to receive the cranked end 137a of the shaft 137 so that upon rotation of the latter the pin 139 is oscillated through the rocker 141 and both rolls 149 and 142 are moved axially back and forth in opposite directions. It will also be noted that opposed vertical slots 146 and 147 are provided in the side members 101 to receive opposite ends of the shafts 144 and 145 of the rolls 142 and 149 respectively; it is of course also understood that these two rolls are sufficiently short to permit their axial reciprocation between the side members 101. 148 denotes a metal roll having its ends mounted for rotation in the slots 146; this roll bears both against the inking roll 110 and against the rolls 142 and 149 so that by axial movement of the latter the ink is uniformly spread on the said roll 149 by which it is transferred to the inking roll 110.

From the foregoing it will be clearly seen that the rolls 108 on the fountains are retained in contact with one pair of cams, for instance the cams 97 and 97a, at all times by the springs 106, and that due to the extra depth of the teeth of the gears 45 and 111 these gears remain in mesh at all times. Consequently though the inking roll 110 rotates continuously together with its other associated rolls it is only near enough to the printing cylinder axis to ink one printing plate 13a thereon as the latter passes that roll, because the cams are so shaped and arranged that inward movement of each fountain occurs only for the period when its inking roll is opposite the plate which it inks. The coaction of the various rolls on each fountain and the way in which movement is imparted to them has already been fully explained.

While the preferred embodiment of the invention has been described and shown, it is understood that alterations and modifications may be made thereto provided they fall within the scope of the appended claims.

What I claim is:

1. In a rotary printing machine for printing on cylindrical surface portions of containers, comprising a frame having a printing cylinder rotatably mounted thereon, a plurality of impression printing means carried on the circumference of said cylinder, a prime mover in said frame operatively connected with said cylinder for rotating the same, in combination with a conveyor located beneath said cylinder and extending transversely of the axis of said cylinder, a pair of longitudinally spaced and axially aligned shafts, said shafts being rotatively and axially movable in bearings located in said frame, said bearings being movable upwardly and downwardly in the frame for adjustment thereof relative to the printing means, the adjacent ends of said shafts being provided with chuck plates axially and fixedly mounted thereon, said chuck plates being arranged in spaced opposed relation to each other and adapted to hold a container between them for rotation and printing while so held, one of said shafts having a spring thereon abutting a collar on the shaft and an adjustable screw threaded collar, said screw threaded collar being located in a supporting bracket, said spring urging one chuck plate toward the other chuck plate, the other shaft and its chuck plate being actuated into container holding position by a combined transmission mechanism and cam, said transmission mechanism being propelled by a spur gear located on the printing cylinder, said last named shaft and its chuck plate being retracted by a spring, said shaft having a head, said spring abutting against said head and against a portion of said slidable bearing on said shaft, said shaft have a spur gear detachably mounted thereon and meshing with the spur gear on the printing cylinder whereby the container being printed has the same surface speed as the imprinting means on the printing cylinder, in combination with an elevating means on said frame and beneath said cylinder for elevating a container from said conveyor to a position between said chuck plates.

2. The construction set forth in claim 1, in which said frame is provided with a mechanical adjusting means engaging both said frame and said slidable bearings, whereby said bearings may be adjusted accurately to obtain efficient printing upon the surface of the containers.

3. The construction set forth in claim 1, in which the cam actuated chuck plate and spur gear are both removable from the cam actuated shaft.

4. In a rotary printing machine, a frame having a drive shaft, a conveyor mechanism mounted on the frame, means for intermittently driving said conveyor from said drive shaft, a printing cylinder shaft mounted on said frame and driven from said drive shaft disposed transversely over said conveyor, a rotary printing cylinder having spaced impression members mounted on said printing cylinder shaft to turn therewith, rotatable article holding chucks mounted on the frame and disposed beneath the printing cylinder and being horizontally aligned on opposite sides of the conveyor, means interconnecting one of said chucks with the printing cylinder shaft to be driven therewith at the same peripheral speed as the printing cylinder, a shiftable shaft on which the driven chuck is mounted, means biasing said shiftable and said driven chuck towards a retracted position away from the other chuck, means for axially moving said driven chuck against the biasing means into article engaging position towards the other chuck, a vertically movable article lifting member mounted on the frame adjacent said conveyor, cam controlled means for intermittently moving the article lifting member upwardly while the conveyor is at rest, whereby it removes an article from the conveyor and brings it into horizontal alignment with the chucks, means actuated in synchronism with the conveyor mechanism and article lifting member to axially move the aforesaid shiftable shaft and the chuck carried thereby into article

engaging position with the other chuck when the article is raised by the lifting member, said means for axially moving the shiftable shaft comprising a rotatable cam shaft interconnected with the drive means for the conveyor and printing cylinder to be rotated thereby, a cam on said cam shaft disposed in abutting relation with the shiftable chuck shaft and designed to axially shift said chuck shaft against the biasing means with each revolution of the printing cylinder to engage the article and rotate the same in printing engagement with the rotary printing cylinder and release the same at the end of the printing cycle.

5. The combination set forth in claim 4, wherein a plurality of ink fountain means are provided, one for each impression member on the printing cylinder, each of said ink fountain means comprising an ink supply and an inking roll, means connecting said inking roll to said printing cylinder driving means whereby said inking rolls are continuously rotated therewith, individual cam means for moving each ink fountain means successively to an inking position and return, whereby each inking roll engages its respective printing element only on said printing cylinder while being continuously rotated.

6. The combination set forth in claim 4, wherein the intermittent drive for the conveyor mechanism includes a conveyor head shaft rotatably mounted on the frame, a rotatable cam disk carried by the conveyor shaft and having abutment lugs extending therefrom, and a sprocket chain driven from said main drive shaft and having side pins for successively engaging the lugs on said cam disk and thereby intermittently rotating said cam disk and said conveyor head shaft.

7. The combination set forth in claim 4, wherein means is provided for adjusting the spacing between the axes of the printing cylinder and the chucks, whereby articles of varying diameters may be rotatably supported by the chucks during printing engagement with said printing cylinder.

8. The combination set forth in claim 4, wherein the article lifting means comprises two laterally opposed yoke members connected to a depending rod, a horizontal support arranged transversely of the frame normally supporting said yoke members, means for vertically reciprocating said rod, said rod extending through the horizontal support, and cam controlled means intermittently operated for raising said rod and yoke members to thereby engage the article and lift the same from the conveyor into position for engagement by the chucks.

FREDERICK SHURLEY.

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Number	Name	Date
235,606	Dooley	Dec. 14, 1880
484,421	Grandy	Oct. 18, 1892
684,223	Grandy	Oct. 8, 1901
2,009,098	Smith	July 23, 1935
2,027,102	Hommel	Jan. 7, 1936
2,142,158	Sloan	Jan. 3, 1939
2,231,553	Soubier	Feb. 11, 1941
2,261,255	Jackson	Nov. 4, 1941
2,351,552	Shurley	June 13, 1944
2,361,325	Shurley	Oct. 24, 1944
2,363,698	Shurley	Nov. 28, 1944