June 13, 1944. F. SHURLEY 2,351,552

ROTARY PRINTING MACHINE

Filed May 25, 1942 5 Sheets-Sheet 1

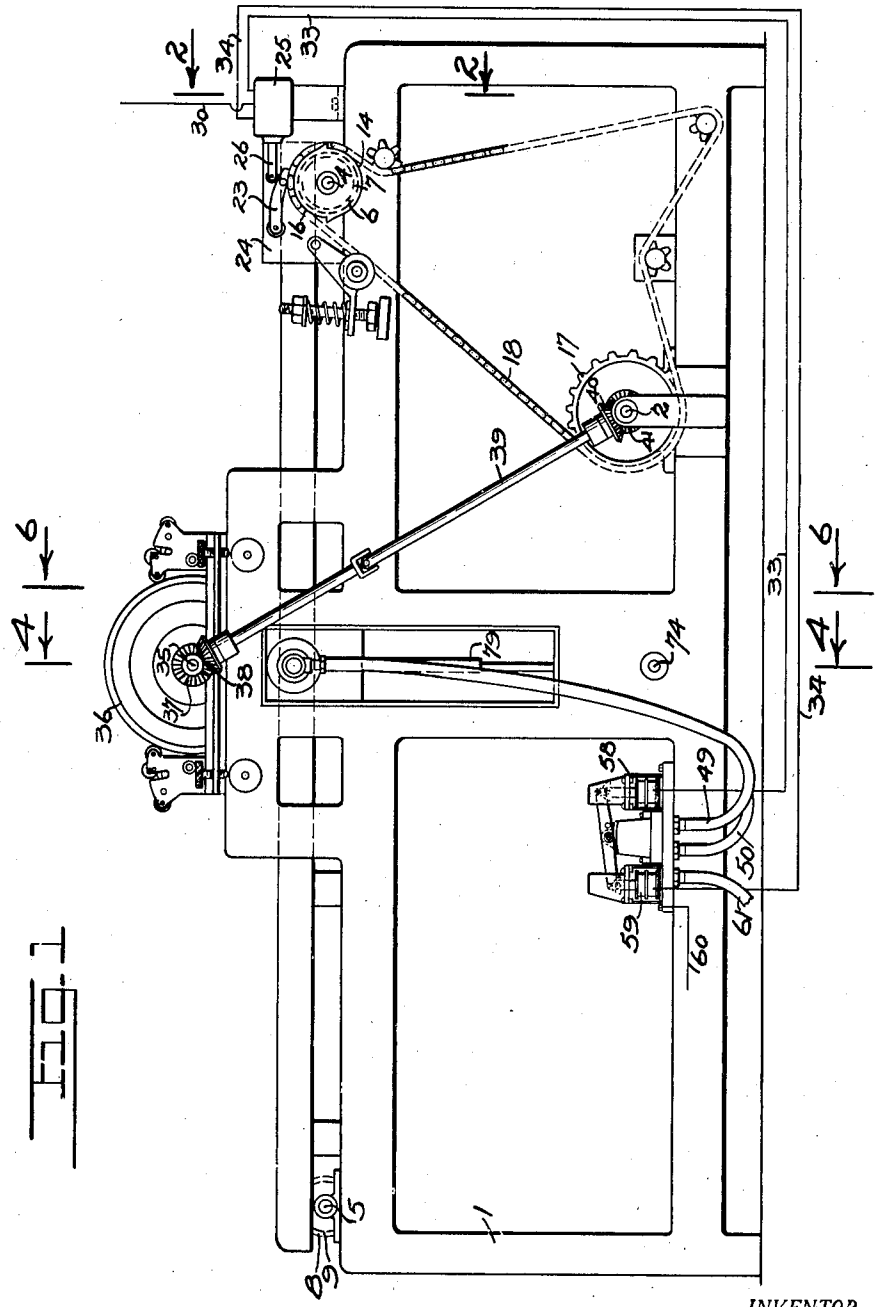


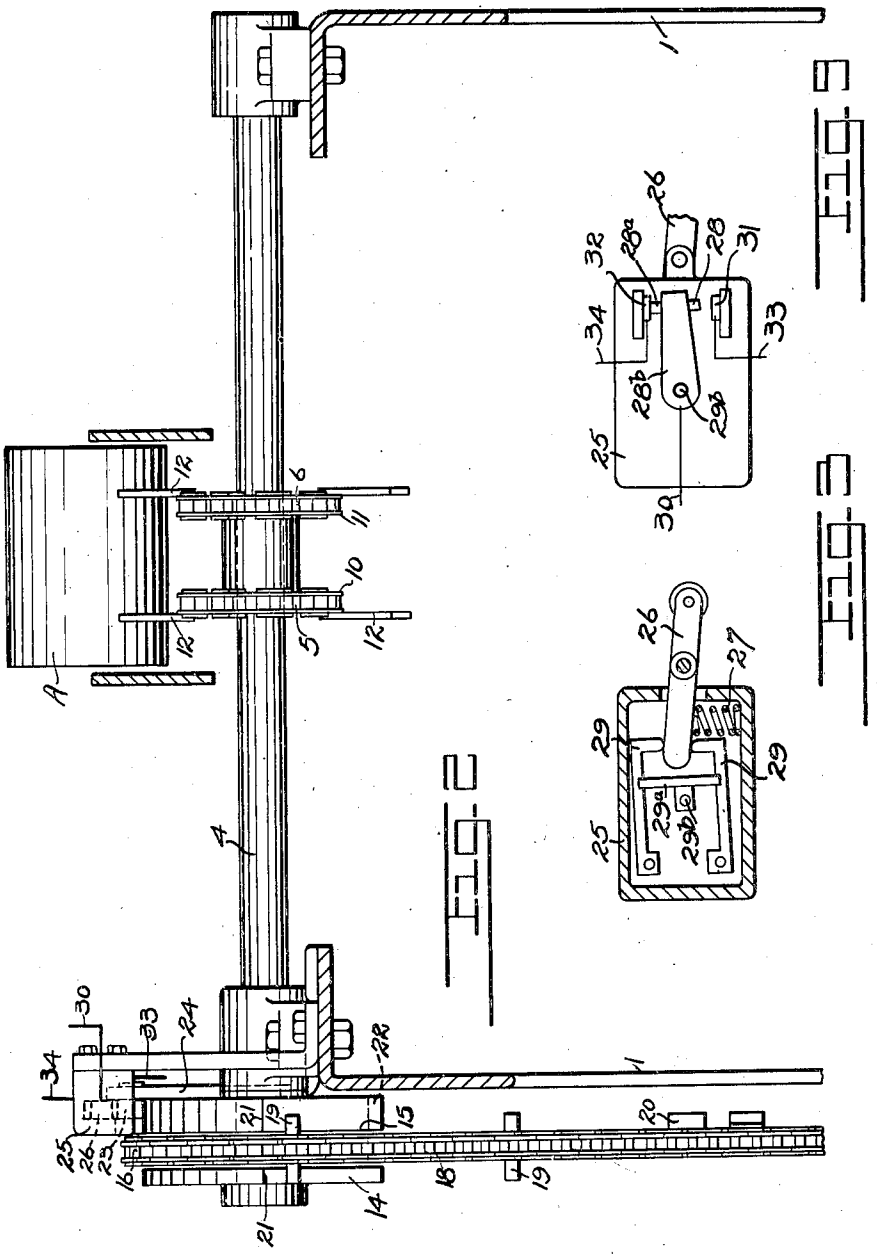
FIG. 1

INVENTOR.
FREDERICK SHURLEY
BY
Grace J. Baldwin
Attorney

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ROTARY PRINTING MACHINE

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INVENTOR.

FREDERICK SHURLEY

BY Grace J. Baldwin

June 13, 1944. F. SHURLEY 2,351,552

ROTARY PRINTING MACHINE

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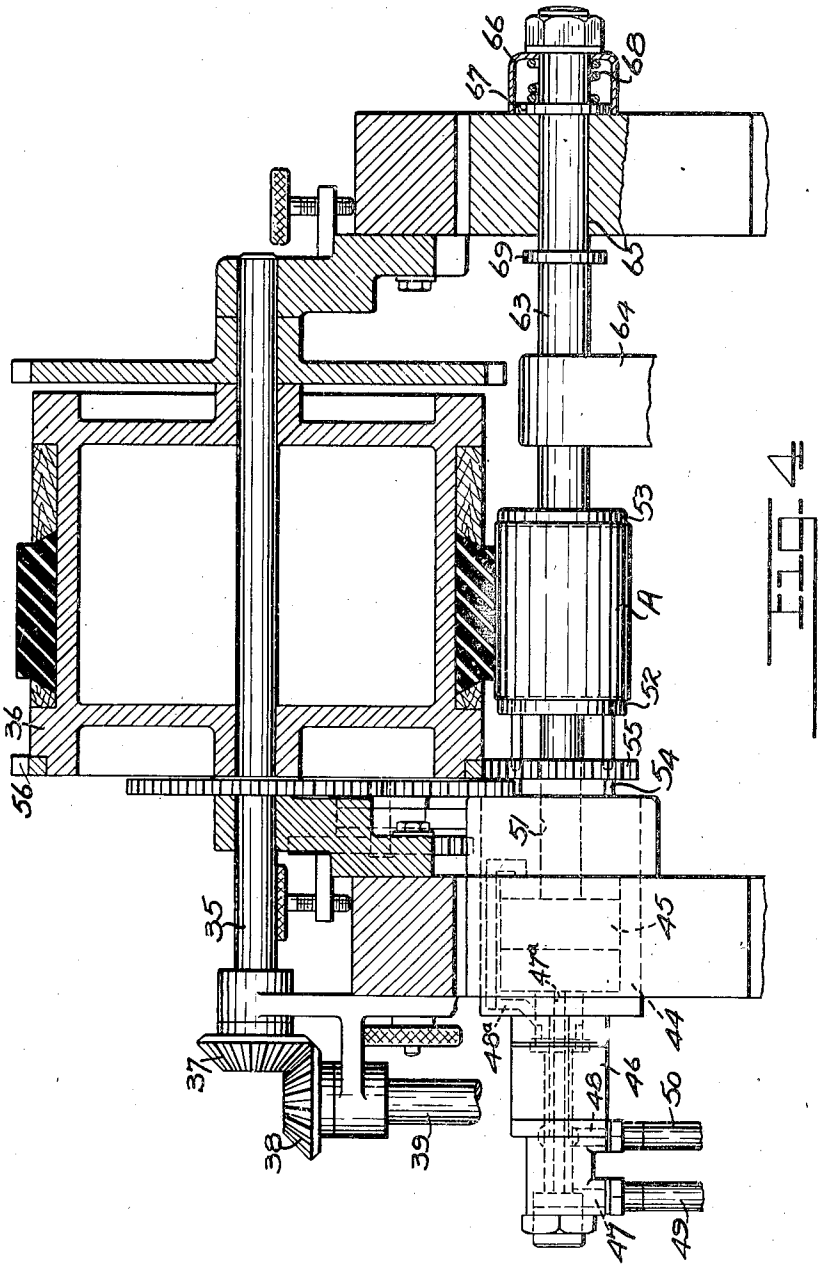


FIG. 4

INVENTOR.
FREDERICK SHURLEY
BY
Gerald S. Baldwin
Attorney

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ROTARY PRINTING MACHINE

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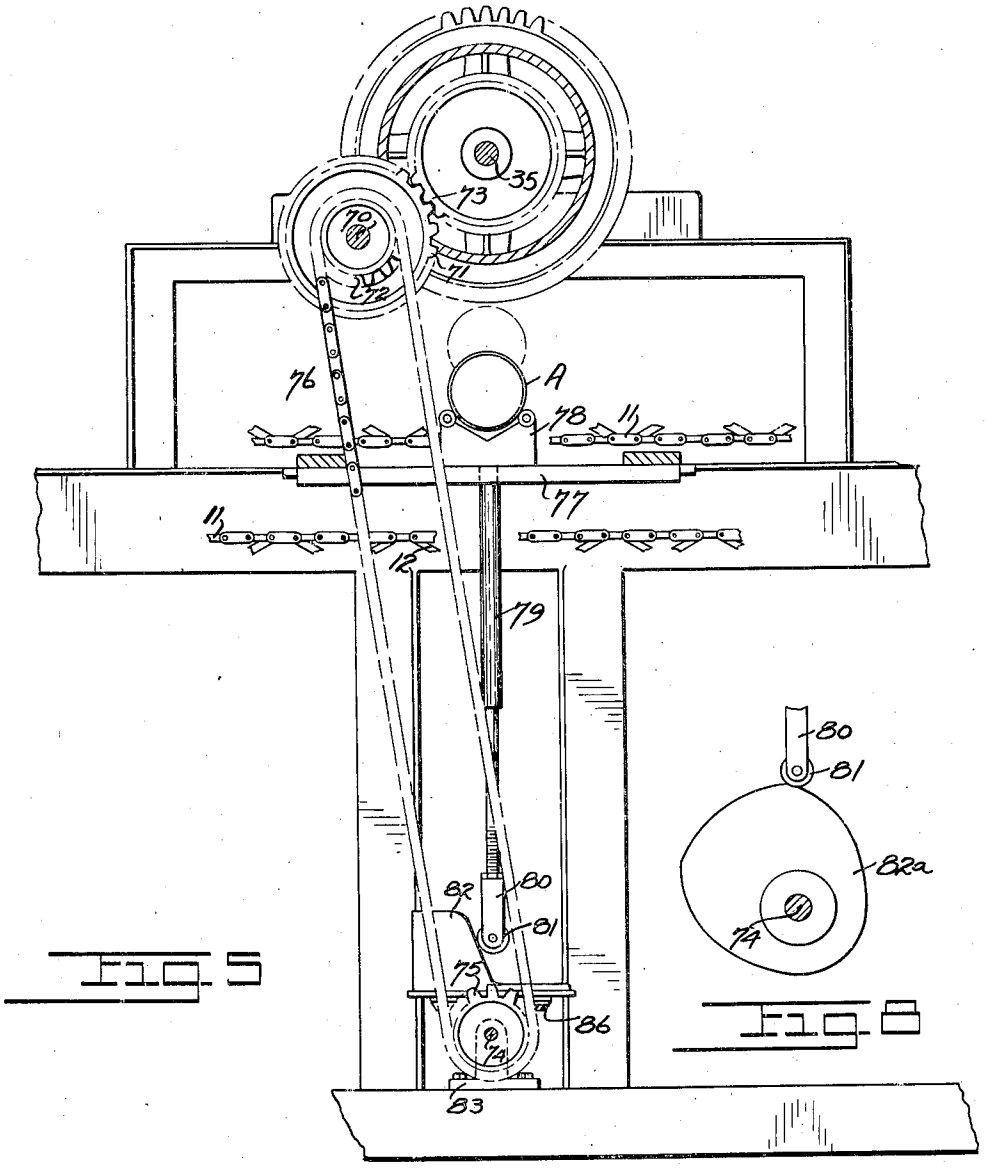


FIG. 5

FIG. 8

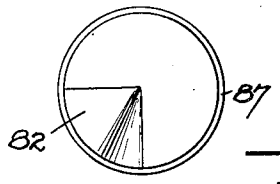


FIG. 7

INVENTOR.
FREDERICK SHURLEY
BY
George F. Baldwin
Attorney.

June 13, 1944. F. SHURLEY 2,351,552

ROTARY PRINTING MACHINE

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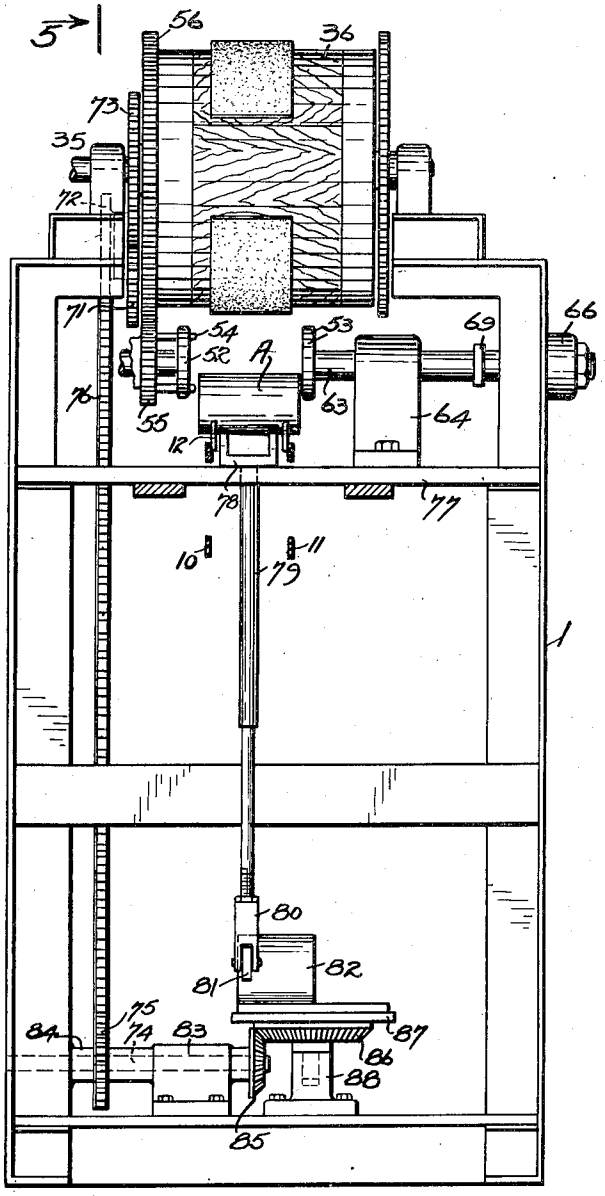


FIG. 6

INVENTOR.
FREDERICK SHURLEY
BY
Gerald J. Baldwin
Attorney.

Patented June 13, 1944

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UNITED STATES PATENT OFFICE

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ROTARY PRINTING MACHINE

Frederick Shurley, Windsor, Ontario, Canada

Application May 25, 1942, Serial No. 444,394

4 Claims. (Cl. 101—38)

This invention relates to improvements in rotary printing machines, and refers particularly to rotary printing machines of the type shown and described in my co-pending application Serial No. 380,024 filed on February 21, 1941, with which cylindrical articles such as bottles, tumblers, jars, cans and shells and the like may be printed, labelled or embossed in a plurality of colors simultaneously.

It is an object of the invention to provide such a rotary printing machine in which work is carried by an intermittently moved conveyor beneath a printing cylinder; wherein the work is lifted from the conveyor for engagement between rotary chuck plates at printing position by a mechanically actuated means operating in synchronism with the chain movement; wherein the conveyor drive also actuates an electric switch mechanism by which two electrically operated valves are alternately moved to control a flow of fluid pressure into opposite ends of a cylinder having a piston therein which moves one of the chuck plates either to work engaging or work releasing position; wherein the other chuck plate is mounted in axial alignment with the first chuck plate and is axially movable a limited distance against the tension of a spring to cushion the shock when the first chuck plate is moved to work engaging position and a work piece is engaged between said plates; and wherein the first chuck plate is provided with means for positively insuring the release of work therefrom when that plate is moved to work releasing position.

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

Figure 1 is a side elevation of the printing machine.

Figure 2 is an enlarged section on the line 2—2 of Figure 1.

Figure 3 is an enlarged detail showing one preferred form of switch mechanism.

Figure 4 is an enlarged cross section on the line 4—4 of Figure 1.

Figure 5 is a section on the line 5—5 of Figure 6.

Figure 6 is a section on the line 6—6 of Figure 1.

Figure 7 is a plan view showing a detail.

Figure 8 is a detail showing a slightly modified cam arrangement.

Figure 9 is a view showing the opposite side of the switch shown in Figure 3.

Referring to the drawings, transversely mounted on the frame 1 is a drive shaft 2. Mounted crosswise of the frame towards its opposite extremities are head and tail shafts 4 and 5 having head sprockets 6 and 7 and tail sprockets 8 and 9 respectively mounted thereon. Conveyor chains 10 and 11 extend around the sprockets 6 and 8 and 7 and 9 respectively. Secured to the chains 10 and 11 and arranged in transversely opposed pairs are carriers 12 to support cylindrical work pieces A.

Loosely mounted on the head shaft 4 between two cams 14 and 15 fixed upon the latter is a sprocket 16 which is driven by a chain 18, which also passes around a sprocket 17 fixed on the drive shaft 2. Projecting from both sides of the chain 18 are spaced pins 19, and projecting from one side thereof are spaced fingers 20. Formed on the cams 14 and 15 are opposed radially projecting lands 21 one opposed pair of which is engaged by the extremities of each pin 19 in turn so that movement of the sprocket chain 18 imparts intermittent rotary movement to the cams 14 and 15 and the head shaft 4. The cam 15 is also provided with radial apertures 22 any one of which may be engaged by a dog 23 pivoted on a bracket 24 secured to the frame 1, to prevent accidental rotation of the shaft 4. The fingers 20 are so spaced that each in turn engages the underside of the dog 23 and withdraws it from the aperture 22 in which it is seated just prior to the contacting of one pair of the lands 21 by one of the pins 19, thereby permitting the latter to rotate the cams and the shaft 4. Thus intermittent movement is imparted to the head shaft but the said shaft is positively held at other times to insure correct positioning of the conveyor chains and the work carried thereby.

Mounted upon the frame 1 is a switch 25 having an arm 26 pivoted thereon which is normally retained in its position shown by a spring 27—see Figure 3—until the dog 23 against which the outer extremity of the arm bears is raised out of engagement with one of the apertures, then the arm is moved pivotally to its other limit of travel against the tension of a spring 27 by the dog 23. Movement of the arm 26 may be utilized to operate any preferred type of double throw switch so that when the arm is in either end position one of two circuits is closed. In the present instance mounted for pivotal movement by the arm 26 are two opposed rockers 29 having a rocking plate 29*a* supported between them. Integral with this plate is a pin 29*b* and fixed on the latter is an arm 28*b* from opposite sides of which contacts 28 and 28*a* extend, and to both

of the latter a power line 30 is suitably connected. Thus movement of the arm 26 moves one of the contacts 28 or 28a into electrical connection with the contact 31 or 32 from which leads 33 and 34 respectively extend.

Mounted transversely of the frame 1 substantially centrally of its length is a print shaft 35 on which a printing cylinder 36 is mounted for rotation therewith. Fixed on the shaft 35 is a gear 37 which meshes with a gear 38 on one extremity of a shaft 39. Fixed on the opposite end of the shaft 39 is a gear 40 which meshes with a gear 41 on the drive shaft 2. Thus the print shaft 35 and the cylinder 36 are constantly driven by the said drive shaft by which the conveyor chains 10 and 11 are actuated.

Rotatably mounted in a sleeve 42 on one side of the frame 1 beneath the print shaft 35 and parallel therewith is a double acting rotary cylinder 44 having a piston 45 therein. Mounted in the frame 1 outwardly from the cylinder 44 is a stationary fitting 46 through which passages 47 and 48 extend which communicate with passages 47a and 48a which open into the back and front of the cylinder respectively. At their outer extremities the passages 47 and 48 are provided with suitable connections for hose 49 and 50 respectively. Fixed on the front extremity of a rod 51 extending from the piston 45 is a chuck plate 52 which is adapted to engage one end of a work piece A the opposite end of which is then supported by a second rotary chuck plate 53. Extending from the cylinder 42 parallel with the piston 45 are a plurality of pins 54 which extend through a gear 55 and at all times at least partly through the chuck plate 52. These pins insure rotation of the cylinder 44 with the gear 55 which is, in turn, driven by a gear 56 carried by the print cylinder 36. In this manner the chuck plate 52 is so rotated that the peripheral speed of the workpiece A supported thereby is the same as that of the printing cylinder 36 by which it is printed.

The method of moving the piston 45 in the cylinder 44 is as follows: Mounted upon the frame 1 are two electrically operated valves 58 and 59 of the well known solenoid type and connected to them are the leads 33 and 34 respectively and also a common wire 60 which extends to the source of power—not shown. Thus the solenoid in one or other of the valves is always open. Connected to the outlets of the valves 58 and 59 are the hose 49 and 50 respectively, and both valve inlets are connected to a common fluid pressure line 61. Consequently the position of the dog 23 through the switch 25 and the valves 58 and 59 controls the flow of fluid pressure to opposite sides of the piston 45 and thus moves the chuck plate 52 to its work engaging or releasing position. Moreover due to the fact that the pins 51 at all times extend through the chuck plate 52 when the latter is moved to releasing position the pins project relatively farther forward and positively insure release of the work piece from the said chuck plate.

The chuck plate 53 is rotatably mounted on one extremity of a shaft 63 which is supported for axial movement in a bearing 64 mounted between opposite sides of the frame 1 and in a second bearing 65 formed through one side of the latter. Extending outwardly from the side of the frame wherein the bearing 65 is provided is a bracket 66 between which and a collar 67 secured to the shaft 63 a coil spring 68 is provided which tends to hold the shaft 63 against outward movement which is limited by a second collar 69 fixed around the shaft between the bearings 64 and 65 and adjacent the latter. If excessive pressure is exerted against the chuck plate 53 as for instance by engagement of a work piece of somewhat greater than usual length the crushing effect caused by inward movement of the chuck plate 52 would be minimized by the spring. This applies particularly in the case of glassware when the length is liable to vary somewhat, and the resilience afforded by the spring 68 would save the bottle or jaw from being broken.

Mounted on the frame 1 is a stub shaft 70 having a gear 71 and a sprocket wheel 72 mounted thereon for rotation together. Fixed on the print shaft 35 is a gear 73 which meshes with the gear 71, and supported transversely of the lower portion of the frame is a cross shaft 74 having a sprocket wheel 75 thereon driven by a chain 76 which also passes around the sprocket wheel 72. Normally resting upon a brace 77 supported transversely of the frame 1 is a U-shaped lifting member 78 positioned centrally between the chains 10 and 11. Depending from the member 78 is a rod 79 the lower extremity of which is in threaded engagement with an extension 80 having a roller 81 mounted for rotation thereon about a horizontal axis. A cam 82, or 82a, rotated by the cross shaft 74 imparts intermittent vertical movement to the roller 81 and thus to the lifting member 78; as the cross shaft is rotated in synchronism with the print shaft 35, and the roller 81 is lifted immediately after each stoppage of the chains 10 and 11, the work pieces A are raised one at a time when positioned beneath the chuck plates 52 and 53 into position to be engaged by the latter for printing.

In Figures 5 and 6 the cross shaft 74 is shown supported in bearings 83 and 84 and provided with a bevel gear 85 which meshes with a bevel gear 86 secured to the underside of a plate 87 rotatably mounted in a bearing 88 and having the cam 82 upon its upper face. It will be noted that the roller 81 when at its bottom position, is spaced above the lower portion of the cam 82. This is to permit adjustment of the lift of the member 78 by screwing the extension 80 up or down upon the rod 79, since obviously more lift is required to raise smaller articles from the chains 10 and 11 into axial alignment with the chuck plates 52 and 53 since their centers are lower. In the modification shown in Figure 8 the cam 82a is secured directly upon the cross shaft 74 and the roller 81 rides upon the cam periphery. It may also be noted that in order to set the machine to print work pieces of different diameters it is also necessary that the gears 55 and 56 be changed for gears of different ratios in order that the peripheral speeds of the work pieces and of the printing cylinder be the same.

While in the foregoing the preferred embodiments of the invention have been described and shown it is understood that alterations and modifications may be made thereto provided the said alterations and modifications fall within the scope of the appended claims.

What I claim is:

1. In a rotary printing machine, the combination of an intermittently moved conveyor mechanism including transversely spaced chains and opposed pairs of carriers carried by the chains to support work pieces, a rotary printing cylinder disposed over said conveyor rotated in

timed relation to movement of the conveyor mechanism, rotary chuck plates disposed at opposite sides of the conveyor and positioned between the conveyor mechanism and said printing cylinder, a lifting member mounted for vertical movement between the chains for shifting work upwardly from the conveyor and into position between the chuck plates, a cam mounted for rotation under the elevating member, means actuated by rotation of the printing cylinder for rotating said cam, means depending from the lifting member for contacting the cam whereby rotation of the cam intermittently raises the elevator and a work piece is shifted upwardly into position between the chuck plates, means operated in synchronism with the intermittent conveyor movement for moving one chuck plate toward the other and clamping the lifted work piece between said plates, and means for rotating one of the chuck plates in timed relation with the printing cylinder including members passing through said plate and adapted to guide sliding movement of the said plate and free the work piece from the plate as the plate moves away from the other chuck plate.

2. In a rotary printing machine, the combination set forth in claim 1, wherein the other chuck plate is mounted for limited movement along a path coaxial with the path of movement of the first chuck plate, and a spring yieldably resisting movement of the second chuck plate away from the first chuck plate and serving to cushion the shock upon the work piece when the first chuck plate is moved into contact with the work piece to clamp the work piece between the chuck plates.

3. A printing machine comprising an intermittently moved conveyor mechanism including transversely spaced chains and transversely opposed carriers carried by the chains to support work pieces across the chains, a rotary printing cylinder rotatably supported over said conveyor transversely thereof and rotated in timed relation to the movement of the conveyor mechanism, supporting members rotatably mounted above and at opposite sides of the chains for engaging opposite extremities of a work piece, continuously intermeshing gears for driving one supporting member from said cylinder, a lifting member mounted for vertical movement between the chains to engage and lift the work piece off the carriers to an elevated position between and in horizontal alignment with the supporting members, a cam rotatably mounted below the lifting member, means for turning the cam in timed relation with the movement of the printing cylinder and the conveyor, means depending from the lifting member and engaging the cam whereby the said lifting member is intermittently shifted upwardly to raise a work piece from the carriers while the conveyor is stationary and into horizontal alignment with the rotary supporting members, and means actuated in synchronism with the conveyor mechanism for causing the supporting members to engage opposite ends of each work piece when lifted from the stationary conveyor by the lifting member.

4. In a rotary printing machine, an intermittently moved conveyor having transversely opposed carriers to support work pieces, a printing cylinder rotatably mounted over the conveyor mechanism and moved in timed relation to the movement of the conveyor mechanism, means operated in timed relation to the movement of the conveyor mechanism for lifting the work pieces from the carriers, chuck plates rotatably mounted above and at opposite sides of said conveyor mechanism for gripping opposite ends of a work piece lifted from the conveyor and supporting the work pieces between the chuck plates, a cylinder having a piston therein to which one chuck plate is connected for movement with the piston toward and away from the other chuck plate, means actuated in timed relation to the movement of the conveyor for reciprocating said piston and moving the chuck plate carried thereby into and out of position to effect the gripping of a work piece between the chuck plates, and continuously meshing gears carried by the cylinder and by the chuck plate connected to the piston for rotating the said chuck plate in timed relation to the rotation of the printing cylinder and causing a work piece carried between the chuck plates to rotate at the same surface speed as the printing cylinder.

FREDERICK SHURLEY.