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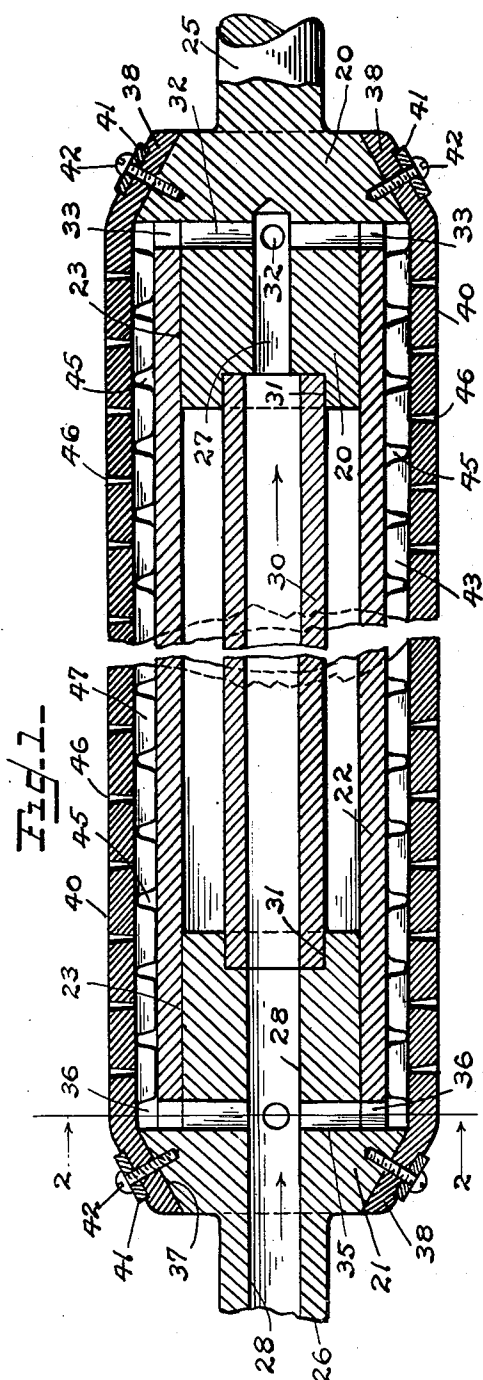
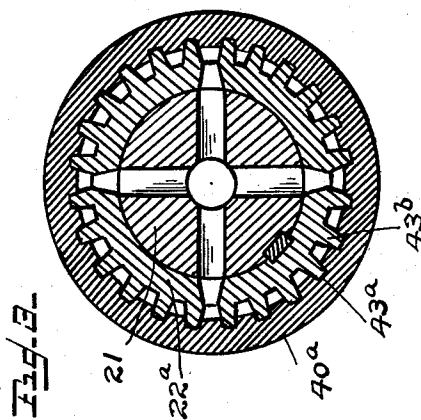
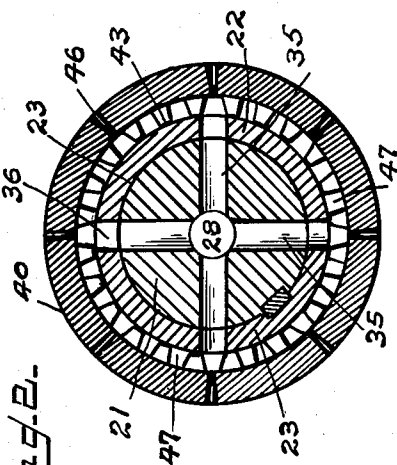
A. J. HORTON

2,217,552

INK SUPPLY ROLLER

Filed Aug. 27, 1937

3 Sheets-Sheet 1



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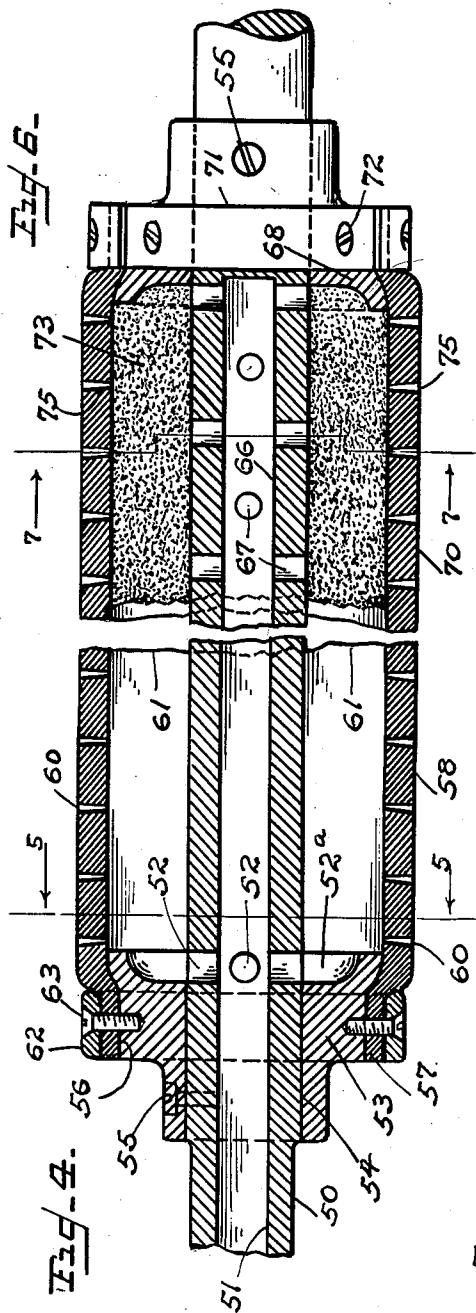
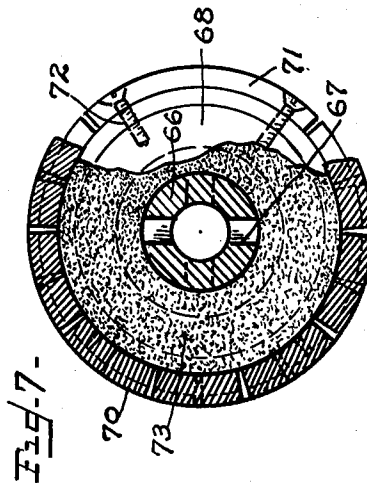
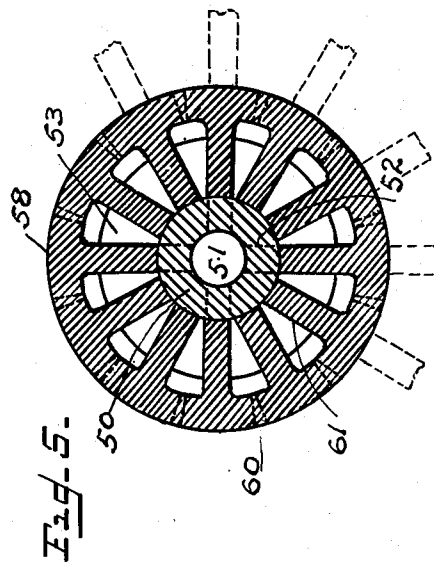
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INK SUPPLY ROLLER

Filed Aug. 27, 1937

3 Sheets-Sheet 2



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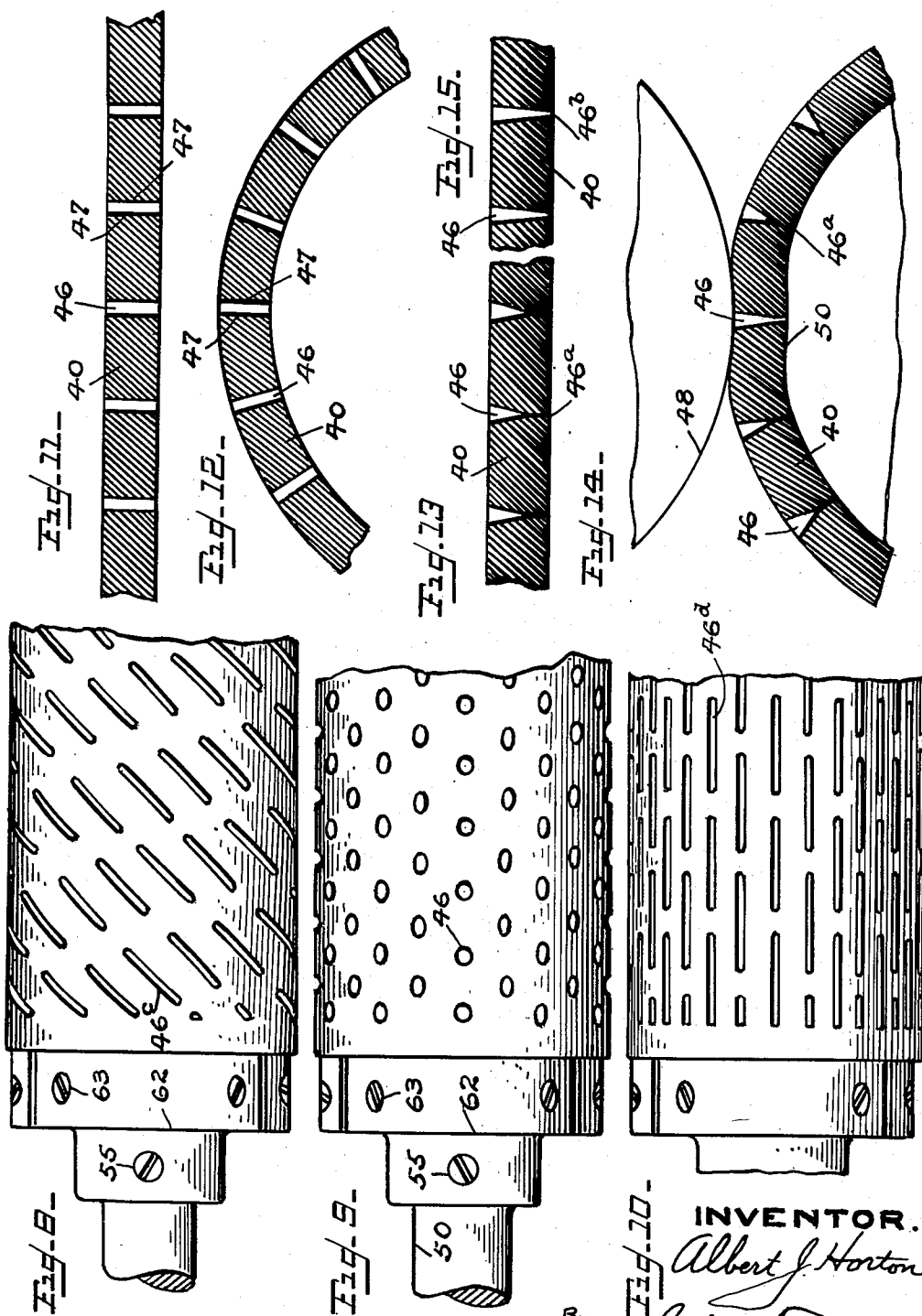
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INK SUPPLY ROLLER

Filed Aug. 27, 1937

3 Sheets-Sheet 3



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Fig. 10-

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UNITED STATES PATENT OFFICE

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INK SUPPLY ROLLER

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Application August 27, 1937, Serial No. 161,341

8 Claims. (Cl. 91—67.8)

This invention relates generally to a liquid supply or control roller and method of producing it, and more particularly to an ink supply roller to be employed in connection with modern rotary printing machines.

There exists a progressively increasing demand for better quality printing and higher speeds in the operation of modern rotary printing machines. Uniform printing requires the presence of a film of ink of proper and continuously uniform thickness on the form roller to give the desired color tone regardless of the character or arrangement of the printed matter on the plates.

Present ink feeding and distributing systems rely upon a series of rollers which feed the ink from an ink fountain or ink rail, thence from roller to roller, and, finally, to the form roller or rollers, there to replace ink removed by the previous contact of the form roller with the image-producing portions of the printing plate. This works satisfactorily as long as the printing plates or forms carry a fairly uniform distribution of small type or other image-producing forms over their entire surface, or as long as there are no appreciable contrasting unprinted areas and solidly printed areas. The problem, however, of maintaining a uniform film of ink on the form roller becomes more difficult in proportion to the degree of such contrast or variation in the distribution of the printing, therefore an object of this invention is to provide an improved liquid supply or ink control roller to operably cooperate with the form roller or other component of an inking or liquid coating mechanism.

Another object of this invention is the provision of a liquid supply or control roller having a relatively soft yieldable peripheral portion for cooperable engagement with a selected component of an inking or liquid coating mechanism to supply the requisite quantity of liquid or ink to the mechanism, the liquid or ink being supplied from the interior of the roller through its soft yieldable peripheral portion.

A further object of this invention is to provide a liquid supply or ink control roller having its peripheral portion formed of rubber or relatively soft yieldable composition which has suitable apertures formed therein to supply the ink or liquid therethrough from the interior of the roller to a cooperating component of an inking or liquid coating mechanism or to convey ink therethrough back into the roller.

It is an object of this invention to provide a liquid supply or ink control roller having its peripheral portion formed of relatively soft yield-

able material, and the invention also contemplates the method of producing the soft yieldable peripheral portion of the roller.

A specific object of this invention is to provide a liquid supply or ink control roller having its peripheral portion formed of rubber or suitable soft composition, the peripheral portion of the roller having apertures formed therein to supply liquid therethrough to a selected cooperating component of an inking or liquid coating mechanism, and the soft peripheral portion of the roller being formed in the manner to produce unequal internal stresses therein.

A more specific object of this invention is to provide a liquid supply or ink control roller having its peripheral portion formed of a tube of a tube of rubber or suitable relatively soft composition, the soft tube having apertures of predetermined configuration formed therein and extending therethrough to supply liquid therethrough to a selected cooperating component of an inking or liquid coating mechanism, the soft tube being produced by forming it originally in predetermined tubular shape and then turning it inside out to produce permanent unequal internal stresses in the rubber or composition of which the tube is formed so that the inner portion of each aperture is reduced in sectional dimension, there being means provided for supplying liquid or ink to the interior of the roller so that it may be fed therefrom through the apertures to the said cooperating component of the inking or coating mechanism.

It is also an object of this invention to provide a liquid supply or ink control roller of generally improved construction, whereby the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinbefore described, it being understood that various changes in form, proportion, and details of construction may be made within the scope of the claims without departing from the spirit or sacrificing any advantages of the invention.

For a complete disclosure of the invention, a detailed description of the improved liquid supply or inking roller will now be given in connection with the accompanying drawings forming a part of this specification, wherein:

Figure 1 is a longitudinal sectional view of the

improved liquid supply roller, parts appearing in elevation.

Figure 2 is a transverse sectional view taken on the line 2—2 of Figure 1.

5 Figure 3 is a similar view taken through a slightly modified form of the invention.

Figure 4 is a fragmental longitudinal sectional view of another modified form of the liquid supply roller.

10 Figure 5 is a transverse sectional view taken on the line 5—5 of Figure 4.

Figure 6 is a fragmental longitudinal sectional view of a further modified form of the invention.

Figure 7 is a transverse sectional view taken 15 on the line 7—7 of Figure 6.

Figure 8 is a fragmental elevational view depicting an arrangement of outlet apertures formed in the soft peripheral tube of the supply roller.

20 Figure 9 is a similar view depicting another arrangement of outlet apertures.

Figure 10 is a similar view depicting still another arrangement of outlet apertures.

Figure 11 is a fragmental detail longitudinal sectional view taken through the soft tube forming the peripheral portion of the supply roller showing this tube in its normal condition.

Figure 12 is a fragmental transverse sectional view taken through the tube while in its normal condition.

Figure 13 is a fragmental detail longitudinal sectional view similar to Figure 11 but depicting the soft tube after it has been turned inside out.

35 Figure 14 is a fragmental detail transverse sectional view depicting the soft tube after it has been turned inside out, the peripheral surface of the tube being engaged by a form or ink roller which is shown in elevation.

40 Figure 15 is a view similar to Figure 13, but depicting outlet apertures of modified configuration.

Referring to the drawings, in which similar reference characters designate corresponding 45 parts, there is depicted in Figures 1 and 2 a form of the improved ink or liquid supply or control roller which includes spaced cylindrical supporting members or heads 20 and 21 which are received within the terminal portions of a 50 rigid cylindrical shell 22. Each terminal portion of the shell 22 is formed to provide cylindrical surfaces 23 for the reception of the outer cylindrical surfaces of the heads or supporting members 20 and 21. These heads 20 and 21 are 55 rigidly secured to the cylindrical shell 22 by forcing or pressing them into the shell terminals to thus produce in effect an integral structure including the shell 22 and both head members or supports 20 and 21. Axial shafts 25 and 26 60 extend outwardly from the supporting heads 20 and 21 to operatively support the supply roller. The outer terminals of these shafts may be received in roller sockets or bearings of any suitable construction, and, inasmuch as the oper- 65 able mounting of ink rollers is well understood by those skilled in the art, such mounting has not been depicted in the drawings of this application. Axial bores 27 and 28 are formed in the 70 supporting heads 20 and 21 respectively, and these bores are united by a rigid cylindrical tube or pipe section 30 which is received in axial recesses 31 formed in the supporting members or heads 20 and 21. Any preferred number of bores or conduits 32 extend radially from the axial 75 bore 27 through the supporting head 20, and

aligned apertures 33 extend through the cylindrical shell 22. Any preferred number of similar bores or conduits 35 also extend radially from the 28 through the supporting head 21 and align with another series of apertures 36 which extend 5 through the cylindrical shell 22.

The outer terminals of the supporting members or heads 20 and 21 are beveled to provide frusto-conical supporting surfaces 37 to which is secured the opposed terminals 38 of a soft yield- 10 able tube 40 which is preferably formed of rubber or suitable composition which may be readily molded or otherwise formed in cylindrical or tubular configuration. Frusto-conical clamping bands 41 engage the outer surface of the soft tube terminals 38, and these bands are preferably secured to the heads 20 and 21 by screws or other suitable securing devices 42 which extend 15 through the bands and terminal portions 38 of the soft tube 40 and are screwed into the head members 20 and 21, as best shown in Figure 1. The inner peripheral surface of the soft yieldable tube 40 is provided with a plurality of radially-projecting axially-extending ribs 43 25 which engage the outer peripheral surface of the rigid shell 22 to thereby support the soft yieldable tube 40. The inner terminals of the ribs 43 which engage the outer surface of the rigid shell 22 are vulcanized or otherwise securely fastened to the shell to prevent rotary motion of the soft yieldable tube relative to this supporting 30 shell. The ribs 43 are provided with axially spaced recesses 45, and a plurality of apertures 46 extend radially through the soft yieldable tube 40 for a purpose to be hereinafter disclosed. By spacing the inner surface of the soft yieldable tube 40 from the outer peripheral surface of the rigid shell 22 by means of the recessed ribs 43, an annular or cylindrical chamber 47 is 40 formed between the inner peripheral surface of the soft tube 40 and the outer peripheral surface of the rigid shell 22.

The method of forming and preparing the soft yieldable tube 40 for use in the liquid supply or control roller is an important feature of this invention, and Figures 11 to 14, both inclusive, 45 illustrate, diagrammatically, phases of its production. The tube 40 is preferably molded or otherwise formed of rubber or suitable soft yieldable composition in cylindrical or tubular configuration. In forming the tube, the outlet apertures 46 extend axially therethrough, and the side walls 47 of the apertures 46 are preferably 50 disposed in parallelism, as best seen in the diagrammatic Figures 11 and 12. These apertures 46 may be of various shapes or configuration, as will be hereinafter disclosed, but, in each instance, it is preferable that the side walls 47 be disposed in parallelism or substantially so when the tube 40 is initially formed. When the cylindrical soft yieldable tube 40 has been formed 60 with the apertures 46 therein, it is preferred that the internal stresses of the soft, yieldable and preferably elastic constituent material of the tube be uniformly distributed, thus producing a cylindrical soft yieldable tube of uniform 65 density throughout. After the tube 40 has been formed, but prior to securing it to the outer surface of the supporting shell 22, the rubber or composition tube is turned inside out. By this 70 turning operation, the portion of the tube which originally provided the outer peripheral surface of the tube becomes the inner peripheral surface, thereby stretching the new outer peripheral surface of the tube 40 and compressing the new 75

inner surface, thus increasing the density of the material at the inner portion of the turned or reversed tube, and decreasing the density of its new outer peripheral portion, as best depicted in Figure 15. Inasmuch as the constituent material of the inner portion of the turned tube 40 is compressed, and the material forming the outer portion of the turned tube is stretched, it is manifest that the inner terminals of the apertures 46 will be closed, as indicated at 46^a in Figures 13 and 14, or nearly closed, as indicated at 46^b in Figure 15, and the outer terminals of the apertures will be somewhat enlarged as shown in Figures 13, 14 and 15. The compressed condition of the inner portion of the turned tube 40 will normally hold the inner terminals 46^a of the apertures 46 in closed condition, or, in partly closed condition, as indicated at 46^b in Figure 15, but the inner terminals of the apertures 46 are yieldable to opened position, as will be more fully explained hereinafter.

In operation, ink or liquid under the desired controlled pressure is supplied to the axial bore 28 of the head 21, and through the tube 30 into the bore 27 of the head 20, and from the bore 27 the ink or liquid flows through the radial conduits 32, apertures 33 into the annular chamber 47 formed between the inner surface of the tube 40 and the outer surface of the shell 22. Similarly, ink or liquid flows from the bore 28 through the radial conduits 35, apertures 36 into the annular chamber 47. The operable position of the ink supply or control roller may be adjusted in conformity with the usual practice to exert any desired pressure against the peripheral surface of the ink roller 48 (Figure 14), and the degree of pressure regulates the quantity of ink supplied to or removed from the surface of the ink roller, as will be more fully explained hereinafter, or, if preferred, the supply roller may engage the cooperating roller with a fixed or predetermined pressure, and the hydrostatic pressure of the ink within the control roller may be regulated to control the quantity of ink supplied to the surface of the cooperating roller 48 through the apertures 46. In either case, as the cooperating roller 48 rotates, its frictional engagement with the peripheral surface of the supply roller rotates this roller, or, if preferred, the supply roller may be driven by suitable conventional gearing, not shown. The liquid supply or control roller may be located in any desired position in an inking mechanism for printing machines or liquid supply mechanism, so that the outer peripheral surface of the roller engages an ink roller, form roller or liquid-receiving roller 48 of any approved construction, and inasmuch as the tube 40 is formed of soft yieldable material, such as rubber or suitable composition, it is preferable that the outer peripheral surface of the tube 40 of the roller coat with a hard roller 48, as shown in Figure 14. The roller 48 may be any selected ink or liquid-receiving roller forming a component of an inking or liquid supply mechanism. The apertures 46 of the soft tube 40 may be of any suitable configuration, and it is here assumed that circular apertures, as depicted in Figure 9, are employed. When the relatively hard surface of the roller 48 engages the soft yieldable outer surface of the tube 40, this portion of the tube is pressed inwardly, as indicated at 50, in Figure 14, thereby opening the inner terminal 46^a of each engaged aperture 46 to permit the ingress or egress of ink or liquid therethrough. If an over supply of ink is present on the peripheral

surface of the roller 48 and tube 40, then this over supply will create a pressure in the open aperture 46 which is in excess of the hydrostatic pressure within the supply roller, thereby forcing ink back into the control roller. If, however, the quantity of ink present on the peripheral surface of the roller 48 and control roller is insufficient to meet the printing need, then the requisite quantity of ink will flow outwardly through the apertures 46 to the surface of the roller 48. By forming the tube of rubber or suitable composition with apertures extending therethrough which have parallel walls, and then turning the tube inside out, the inner terminals of the apertures are stressed to closed position so that each aperture 46 in effect becomes a valve-controlled ink supply or receiving pocket. If an excess quantity of ink is forced into a closed aperture 46, then when the portion of the yieldable tube which surrounds this aperture is operably engaged by the coating roller 48, the pressure of the ink within the aperture will force the walls of the inner terminal of the aperture apart to permit the ink to move back into the roller. Or, if the walls of the inner terminal of an aperture have been opened by the pressure of the engagement between the peripheral surface of the roller 48 with the soft peripheral surface of the control roller, then the pressure of the ink or liquid within the pocket-like aperture 46 will further open the inner aperture terminal to permit ready movement of the ink back into the control roller. When it is necessary to replenish the supply of ink on the peripheral surface of the form or ink roller 48, then the ink within the control or supply roller will flow outwardly through the open inner terminals of the apertures which are engaged by the peripheral surface of the roller 48, thereby permitting a sufficient quantity of ink to flow to the surface of this roller to replenish the ink supply which has been depleted by the previous inking operation. Under conditions in which a relatively large quantity of ink is necessary to meet the printing requirements, the inner terminals of the apertures 46 may be arranged to be normally slightly open, as indicated at 46^b in Figure 15, so that the engagement of the roller 48 with the surface of the tube 40 will further open the inner terminal to permit a relatively large quantity of ink to flow outwardly through the apertures 46 to the surface of the roller 48.

The outlet apertures 46 may be of any suitable configuration, and, as depicted in Figures 9, 11 to 15, both inclusive, these apertures are of circular configuration, and any suitable number may be formed in the soft tube 40 to meet the printing or supply requirements.

In Figure 8, the apertures are elongated and disposed helically around the peripheral surface of the soft tube 40, as indicated at 46^c. The length of these helically disposed apertures 46^c may be chosen to best supply ink to predetermined increments of the length of the roller, and the number of apertures employed may also be chosen to meet the printing requirements.

In the form of the control or supply roller depicted in Figure 10, the apertures 46^d are elongated and disposed axially along the peripheral surface of the soft tube 40, and these apertures are preferably staggered, as indicated. The number and size of the apertures employed in this arrangement are chosen to conform with the quantity of ink required in the printing operation. Although the arrangement of apertures herein disclosed may be advantageously employed, it is to

be understood, of course, that apertures of other configuration and arrangement may be employed within the scope of this invention.

The form of the invention depicted in Figure 3 is similar to that disclosed in Figures 1 and 2 except that spaced axially extending grooves 43^a are formed in the inner peripheral surface of the soft tube 40^a for the reception of the outer terminals of axially-extending ribs 43^b which project radially from the outer peripheral surface of the rigid shell 22^a. By this arrangement, the soft tube 40^a, which forms the peripheral portion of the roller, is held against rotary movement relative to the supporting shell 22^a.

A modified form of the invention is depicted in Figures 4 and 5, and inasmuch as the construction at each end or terminal of the roller is similar except that one end of the supporting shaft is closed, only one terminal has been illustrated in Figure 4. In this form of the invention there is provided a rigid hollow tube or shaft 50 having an axial bore 51 extending therethrough, and radial apertures 52 extend through the wall of the tube or shaft 50 and communicate with its bore 51 adjacent each terminal of the shaft or tube 50, the bore 51 being closed at the terminal of the tube which is remote from the ink supply terminal. A supporting head 53 is provided to be mounted on each terminal portion of the tube or shaft 50, and each head 53 is provided with an axial bore 54, which is dimensioned to be received on the outer surface of the tube 50 to permit each head 53 to be secured to the tube 50 by screws or other suitable securing devices 55. An annular recess 52^a is formed in each head or supporting member 53 and each recess 52^a communicates with the apertures 52 for a purpose to be hereinafter explained. The outer peripheral surface of each supporting head 53 is offset inwardly, as indicated at 56, to be engaged by the reduced cylindrical terminal 57 of a rubber or soft composition tube 58 having a plurality of apertures 60 extending radially therethrough. The soft tube 58 is provided with a plurality of axially-extending radial ribs 61 which extend inwardly from the inner peripheral surface of the tube 58 and engage the outer peripheral surface of the rigid tubular shaft 50 to which they are vulcanized or otherwise secured, so that the soft yieldable tube 58 is supported by the rigid tubular shaft 50. The reduced terminal portions 57 of the tube 58 are clamped to the inwardly offset peripheral portions 56 of the heads 53 by suitable clamping ring sectors 62 which engage the outer surface of each tube terminal 57 and are secured to the heads 53 by screws or other suitable securing devices 63.

The soft tube 58 is preferably molded, or otherwise formed of rubber or suitable composition, and, in its original form, the ribs 61 are positioned exteriorly of the tube 58, as indicated in dotted lines in Figure 5. After the original formation of the ribbed tube 58, it is then turned inside out, thus positioning the ribs 61 within the tube 58, as indicated in full lines in Figure 5. By this arrangement, when the roller is assembled, the cylindrical portion of the tube 58 is yieldably supported from the tubular shaft 50 through the interposed ribs 61, thus permitting this roller to operably engage a form or ink roller 48, in the manner hereinbefore disclosed. The ink is supplied to the interior of the tube 58 through the bore or conduit 51, radial apertures 52, annular recesses 52^a, and into the chamber defined between the inner peripheral surface of the tube

58, and the outer peripheral surface of the tubular shaft 50. When the tube 58 is turned inside out, its outlet apertures 60 are closed, or nearly closed, at their inner terminals, thus permitting this form of the liquid supply roller to cooperably engage a form or ink roller 48 in a manner hereinbefore disclosed.

A further modified form of the invention is disclosed in Figures 6 and 7, and this form includes a tubular shaft 66 having apertures 67 extending radially therethrough at spaced intervals throughout most of its length. A supporting head 68 is suitably secured to the shaft 66 adjacent each terminal thereof and each head has a soft tube 70 secured thereto by clamping the terminal of the tube 70 to the head 68 by suitable clamping ring sectors 71 which are secured to the head by screws or other suitable securing devices 72. The space existing between the inner peripheral surface of the tube 70 and the outer peripheral surface of the tubular shaft 66 is preferably filled with sponge rubber or other suitable soft yieldable material 73 to thereby yieldably support the soft tube 70. This tube 70 is originally molded in cylindrical configuration and then turned inside out, so that its outlet apertures 75 are closed, or partly closed, at their inner terminals.

This form of ink supply or control roller cooperates with the peripheral surface of a form or ink roller 48 in a manner hereinbefore disclosed. The ink is supplied to the interior of the roller through the bore of the tubular shaft 66, through the radial apertures 67 into the chamber formed between the inner peripheral surface of the soft tube 70 and the outer peripheral surface of the rigid tubular shaft 66. The sponge rubber filler 73 being of porous character, only partly fills the chamber within the tube 70, thus permitting the ink or liquid to flow to and through the apertures 75 of the soft tube 70 in a manner hereinbefore disclosed. It is preferred that in the construction disclosed in Figures 4 to 7 both inclusive, that the ink flowing to the roller through its supporting shaft at one terminal which is open, as shown in Figure 4, and the opposed terminal of the supporting shaft is closed, as indicated in Figure 6.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respect as illustrative and not restrictive and it will be further understood that each and every novel feature and combination present in or possessed by the method and mechanism herein disclosed forms a part of the invention included in this specification.

Having thus described my invention what I claim as new and useful is:

1. A liquid supply roller having a chamber therein to contain liquid, and a yieldable tube forming the peripheral portion of the roller and having apertures with outwardly diverging yieldable walls extending therethrough to communicate with the chamber to convey liquid from the chamber to the periphery of the roller and from the periphery of the roller back into the chamber.

2. A liquid supply roller having a chamber therein to hold liquid, and a peripheral portion formed of yieldable elastic material provided with apertures extending therethrough to communicate with the chamber to convey liquid from the chamber to the periphery of the roller or from

the periphery of the roller into the chamber, each aperture being so shaped that it is normally restricted or closed at its inner terminal and the yieldability and elasticity of the said peripheral portion being of such character that the aperture will open at its inner terminal responsive to pressure applied to the outer surface of the said peripheral portion and close when the application of said pressure is discontinued.

3. A liquid supply roller having a chamber therein to contain liquid, and a relatively soft tube forming the peripheral portion of the roller and having apertures of suitable configuration extending therethrough to communicate with the chamber to convey ink from the chamber to the periphery of the roller and from the periphery of the roller back into the chamber, each aperture having greater sectional area at its outer terminal than at its inner terminal.

4. A liquid supply roller having a chamber therein to contain liquid, and a relatively soft tube forming the peripheral portion of the roller and having apertures of suitable configuration extending therethrough and communicating with the chamber to convey liquid to and from the chamber, the inner portion of the tube being of greater density than the outer portion thereof to thereby restrict the sectional area or close the inner portion of each aperture.

5. A liquid supply roller having a chamber therein to contain liquid, and a relatively soft elastic tube forming the peripheral portion of the roller and having apertures with outwardly diverging yieldable walls which extend through the wall of the tube to convey ink to and from the chamber, the inner portion of the tube wall being of greater density than its outer portion so that each aperture extends through portions of the tube wall having different densities.

6. A liquid supply roller including spaced heads having axially extending shafts, a cylindrical shell secured at each terminal to a head, each head having axial apertures formed therein and the aperture in one head extending outwardly through the axially extending shaft of the head, a pipe secured at each terminal to each head to communicate the axial apertures formed in the head, a yieldable tube secured at each terminal to a head and located to surround the shell, said tube having radial apertures extending there-

through, axially extending ribs extending inwardly from the yieldable tube and suitably secured to the outer surface of the shell to support the tube in spaced relation to the outer surface of the shell to define a liquid holding chamber between the inner surface of the tube and the outer surface of the shell, means for communicating the liquid holding chamber with the axial apertures formed in the heads to convey liquid into the liquid holding chamber, the liquid from the liquid holding chamber being supplied to the outer surface of the tube through the said apertures formed in the tube.

7. A liquid supply roller including spaced heads having axially extending shafts, a cylindrical shell secured at each terminal to a head, each head having axial apertures formed therein and the aperture in one head extending outwardly through the axially extending shaft of the head, a pipe secured at each terminal to each head to communicate the axial apertures formed in the head, a yieldable tube secured at each terminal to a head and located to surround the shell, the inner surface of said tube having axially-extending grooves formed therein, ribs extending radially from the outer surface of the shell and the outer terminal of each rib being received within a groove formed in the yieldable tube to space the tube from the shell to define a liquid holding chamber therebetween and to hold the tube against rotary movement relative to the shell, the tube having apertures extending therethrough to convey fluid from the chamber to the outer surface of the tube.

8. A liquid supply roller including a tubular shaft, spaced supporting heads carried by the shaft, a yieldable tube secured at each terminal to the outer surface of a supporting head, ribs extending inwardly from the inner surface of the yieldable tube and suitably secured to the outer surface of the tubular shaft to support the yieldable tube in spaced relation to the tubular shaft to define a liquid holding chamber therebetween, the said tubular shaft having apertures formed therein to convey liquid into the liquid holding chamber, the yieldable tube having apertures extending therethrough to convey liquid from the chamber to the outer surface of the yieldable tube.

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