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Hardt

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[54] **INK APPLICATOR MEANS FOR PRINTING PRESS**

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[73] Assignee: **Faustel, Inc.,** Butler, Wis.

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[52] **U.S. Cl.** **101/366,** 101/169

[51] **Int. Cl.** **B41f 31/06,** B41f 9/10

[58] **Field of Search** 101/366, 157, 169, 101/148, 350, 351, 363, 364, 365, 207, 208, 210

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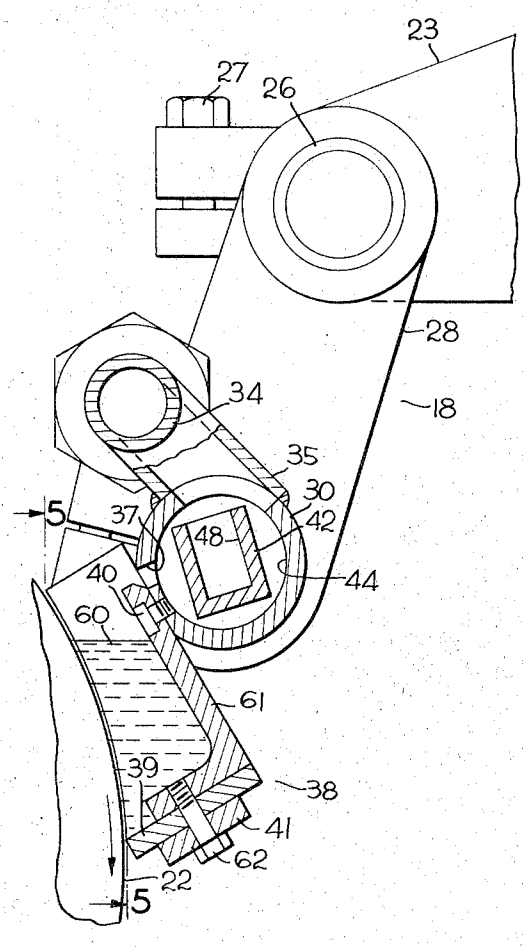
Primary Examiner—J. Reed Fisher

Attorney—James E. Nilles

[57] **ABSTRACT**

Ink applicator means for a printing press for applying liquid ink to a roll therein comprises a hollow cylindrical tube adjacent the roll and having a chamber therein. The tube has a longitudinal slit in one side thereof communicating with the chamber and ink inlet ports for communication with the chamber. A longitudinal member of rectangular cross-section is axially disposed within the tube chamber, and cooperates with the interior wall of the chamber to define metering orifices which control passage of ink from the ports to the slit. The longitudinal member is provided with depressions in one surface thereof which extend from a location in the vicinity of the inlet ports along the longitudinal member to equalize fluid pressure in the tube.

8 Claims, 11 Drawing Figures



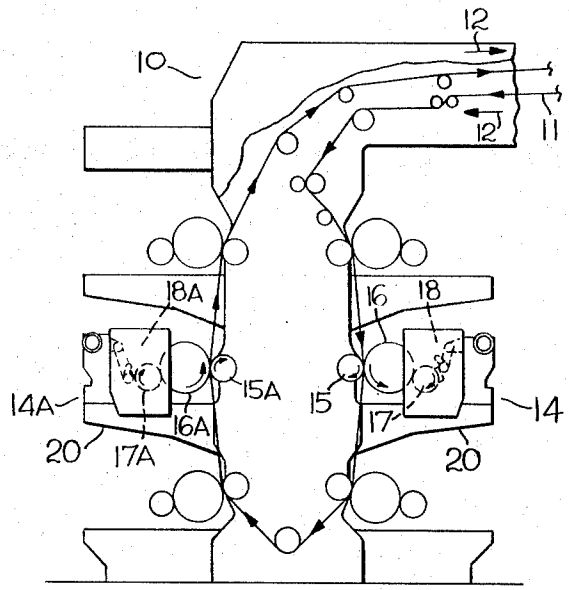


FIG. 1

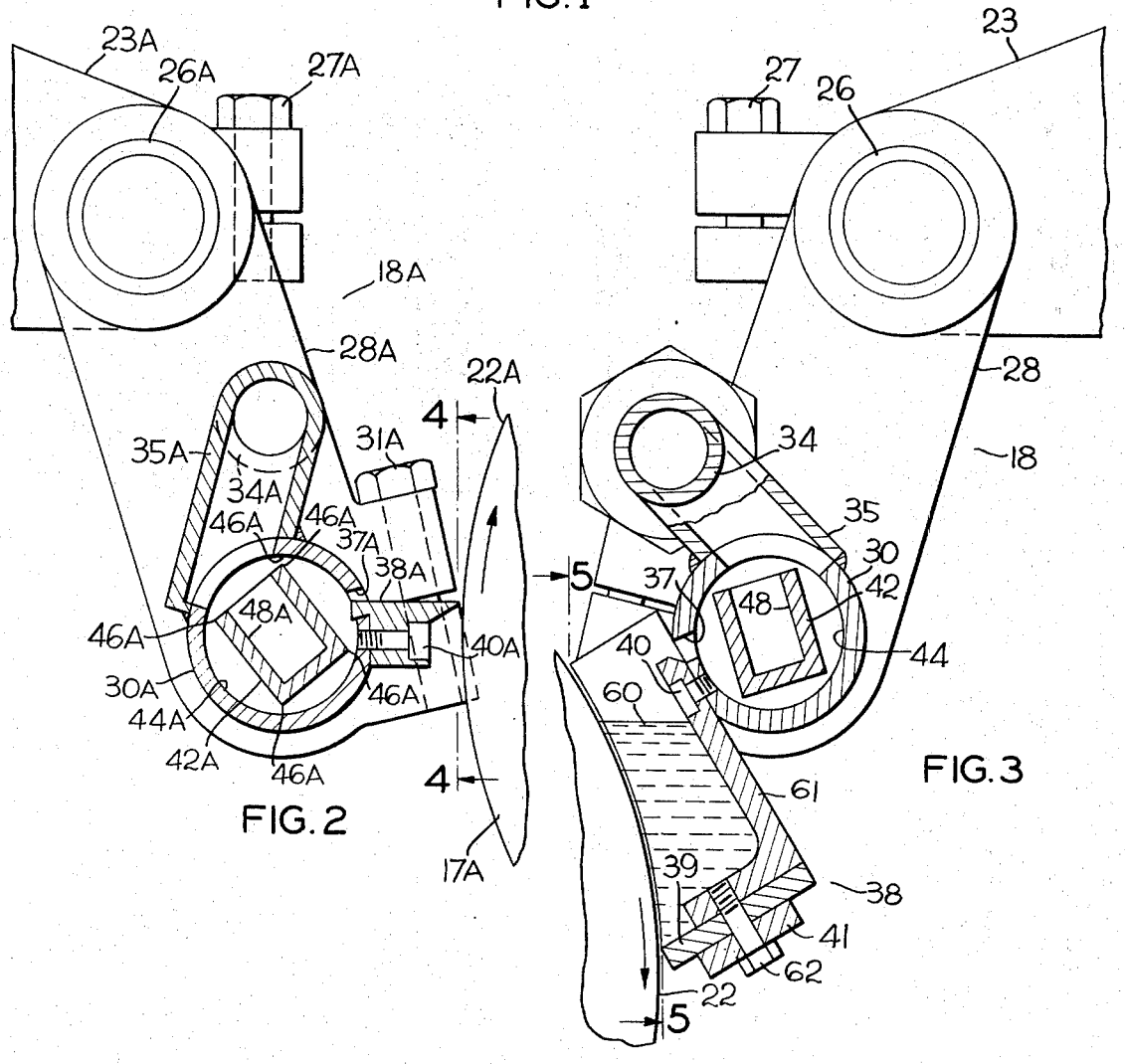


FIG. 2

FIG. 3

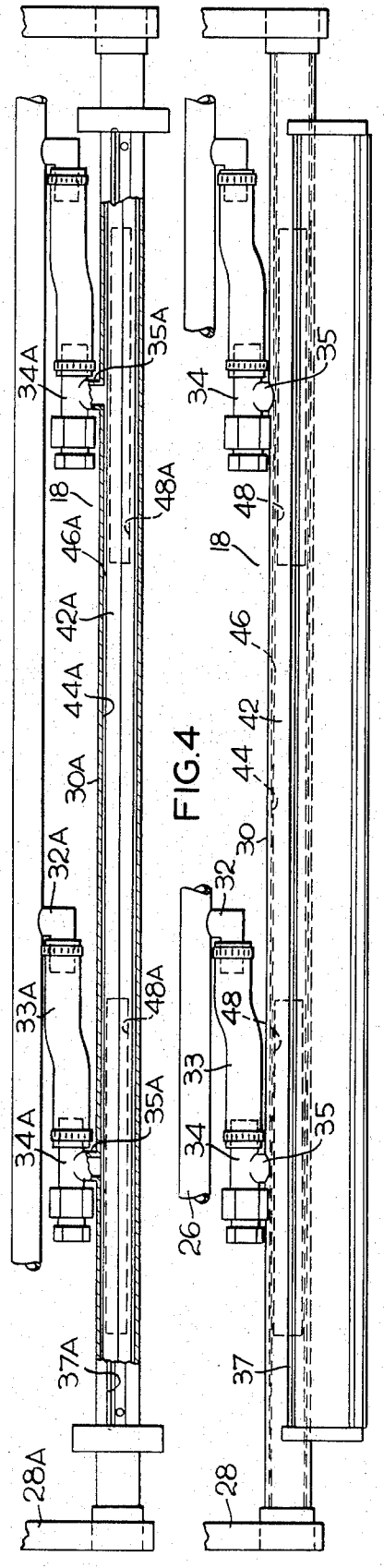


FIG.4

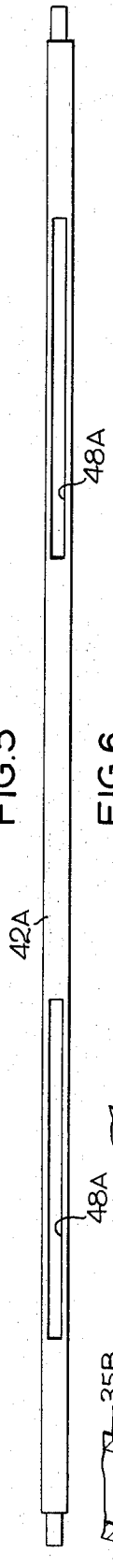


FIG.5

FIG.6

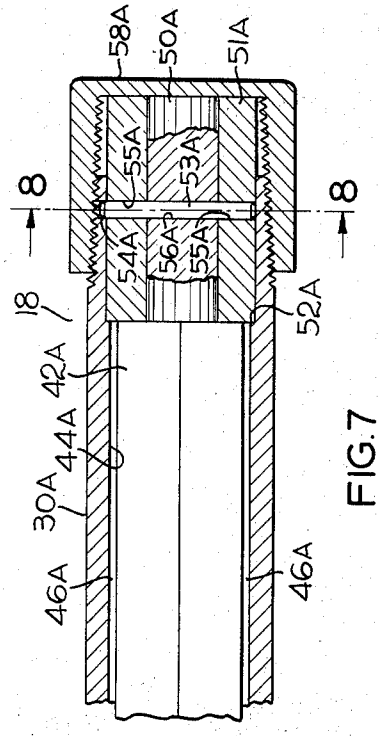


FIG.7

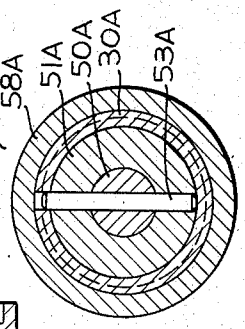


FIG.8

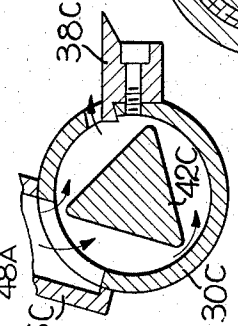


FIG.10

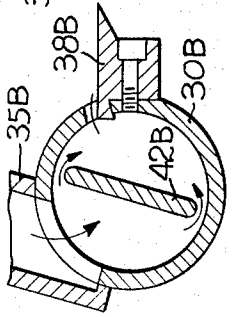


FIG.9

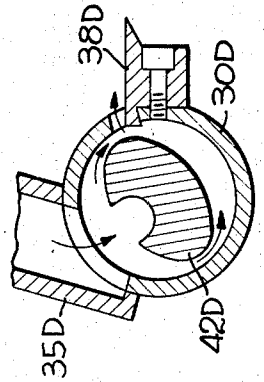


FIG.11

INK APPLICATOR MEANS FOR PRINTING PRESS

BACKGROUND OF THE INVENTION

1. Field of Use

This invention relates generally to fluid applicator means, and particularly to ink applicator means for applying liquid ink to cylinders in printing presses, such as rotogravure or flexographic presses.

2. Description of the Prior Art

Rotogravure and flexographic printing presses, for example, employ a rotatable printing cylinder having engraving thereon and an ink applicator means adjacent the cylinder for continuously applying ink thereto as the cylinder rotates. Typically, the ink applicator means takes the form of a tube axially aligned with and adjacent the cylinder. The tube is supplied with ink and is provided with a slit in the side thereof near the printing cylinder through which ink emerges. Normally, applicator lips are arranged along the slit to guide the ink emerging therefrom onto the printing cylinder. Such tubes sometimes have a slit which is 4 or 5 feet long and it is difficult to maintain a steady and even flow of ink therealong because fluid pressure in the tube near an ink inlet port is greater than elsewhere in the tube. Furthermore, the problem of uneven distribution of ink from ink applicator means of the aforesaid character are even further aggravated when such means are used to apply ink to the downside printing cylinders or other rolls in high-speed presses. This is because the peripheral speed of the roll or cylinder to which the ink is being applied tends to tear or interrupt the film of ink being applied, especially if the film is already uneven and the ink is thin. Attempts to equalize the fluid pressure by providing several evenly spaced ink inlet ports or by providing internal baffles have not been entirely successful because they have resulted in unduly large and bulky ink applicator assemblies.

SUMMARY OF THE PRESENT INVENTION

In accordance with the present invention there is provided a web printing press, such as a flexographic press, having one or more engraved or etched rolls or cylinders on its upside and downside to which ink is applied. Each such roll is mounted for rotation on the press frame and each is provided with an adjustably movable ink applicator means or assembly adjacent the cylinder for continuously applying ink thereto as the cylinder rotates. The ink applicator means comprises a hollow tube or member, preferably cylindrical, axially aligned with and adjacent the cylinder and having a chamber therein. The tube is enclosed at both ends and its chamber is supplied with ink through one or more ink inlet ports in the side of the tube. The tube is provided with an elongated slit in the side thereof near the cylinder through which ink emerges from the chamber. An applicator lip is arranged alongside and below the slit to guide the ink emerging therefrom onto the cylinder.

A longitudinal member is axially disposed within the tube chamber. The longitudinal member has a cross-sectional configuration which differs from the cross-sectional configuration of the tube chamber whereby at least one portion of the longitudinal member cooperates with the wall of the tube chamber to define at least two spaced apart metering orifices to control passage of ink from an inlet port to the slit. In operation, ink entering the tube chamber from the inlet port impringes directly against a surface of the longitudinal member and is diverted toward and through the two metering orifices wherein fluid velocity increases. After passing through the metering orifices the relatively high velocity fluid streams are diverted toward each other with resultant interference which removes or dissipates unwanted force components before the ink flows through the slit. In one embodiment shown, the tube chamber has a circular cross-sectional configuration and the longitudinal member has a rectangular cross-sectional configuration whereby four metering orifices are defined. In accordance with another aspect of the invention, the longitudinal member is provided with a depression in a surface thereof which extends from a location in the vicinity of an inlet port along the longitudinal member to evenly distribute fluid pressure in the chamber. In embodiments where the hollow tube has a plurality of spaced apart ink inlet ports therein, the longitudinal member has a plurality of depressions, one for each ink inlet port. The slotted longitudinal member is most advantageously employed in an ink applicator having a tube wherein the chamber is of relatively small diameter or cross-section.

Ink applicator means in accordance with the present invention are especially well-adapted for use with upside or downside rolls in flexographic presses, but are not so limited in use. Furthermore, the ink applicator means are well adapted for use in presses where the ink applicator assembly must be relatively movable for adjustment with respect to the roll or other press components. The ink applicator means ensure that ink is evenly applied in an unbroken film to the roll. The ink applicator means also enables a very compact and versatile arrangement of press components. Although the present invention is disclosed herein as embodied in apparatus for applying ink to a roll in a printing press, it is apparent that it could be employed in other types of apparatus wherein liquids, such as glue, or other fluids, such as gases, are to be evenly applied to a surface. Other advantages of the invention will hereinafter appear.

DRAWINGS

FIG. 1 is a side elevational view in schematic form of a flexographic type printing press with a web therein and having two types of ink applicator assemblies in accordance with the invention;

FIG. 2 is an enlarged view, partly in section, of one of the ink applicator assemblies shown in FIG. 1;

FIG. 3 is an enlarged view, partly in section, of the other of the ink applicator assemblies shown in FIG. 1;

FIG. 4 is a side view of an assembly taken on line 4—4 of FIG. 2;

FIG. 5 is a side view of an assembly taken on line 5—5 of FIG. 3;

FIG. 6 is a side view of the internal shaft used in the assemblies shown in FIGS. 4 and 5;

FIG. 7 is an enlarged cross-sectional view of the end of the assembly shown in FIG. 5;

FIG. 8 is a cross-sectional view taken on line 8—8 of FIG. 7; and

FIGS. 9, 10 and 11 are cross-section views of alternative forms of longitudinal members for cooperating with ink applicator tubes to define metering orifices.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. 1, the numeral 10 designates a flexographic type printing press in accordance with the

invention having a web 11 to be printed therein which is understood to be movable in the direction of the arrows 12. In FIG. 1, the right side of press 10 is the downside and the left side is the upside. Press 10 is shown as having six printing stations, three downside and three upside. Downside printing station 14, which is typical of the two other downside stations, and upside printing station 14A, which is typical of the other two upside stations, are hereinafter described in detail.

Downside station 14 comprises a steel backup roll 15 in contact with the rear unprinted side of web 11, a printing roll 16 preferably formed of rubber or the like for transferring an ink image to the front side of the web; and an engraved or etched metal roll 17 which transfers the ink image to printing roll 16. The rolls 15, 16 and 17 are mounted on a support frame 20 of press 10 for rotation in the direction of the arrows shown thereon in FIG. 1.

Upside station 14A comprises a steel backup roll 15A in contact with the rear unprinted side of web 11, a printing roll 16A preferably formed of rubber or the like for transferring an ink image to the front side of the web; and an engraved or etched metal roll 17A which transfers the ink image to printing roll 16A. The rolls 15A, 16A and 17A are mounted on support frame 20 of press 10 for rotation in the direction of the arrows shown thereon in FIG. 1. All of the rolls are understood to be driven by suitable conventional drive means not shown.

FIG. 1 shows that stations 14 and 14A also comprise ink applicator means or assemblies 18 and 18A, respectively. Assembly 18 is shown in detail in FIGS. 3, 5, 6, 7 and 8. Assembly 18A is shown in detail in FIG. 4.

Referring to FIG. 2, adjustable ink applicator means or assembly 18A is provided to apply ink to the surface 22A of upside roll 17A and comprises a support bracket 23A which is rigidly secured to frame 20 and supports a hollow shaft or ink supply tube 26A through which a supply of ink flows. Ink supply tube 26A is rotatably adjustable with respect to bracket 23A and is clamped in fixed position therein by means of a bolt 27A. An extension arm 28A is rigidly secured to tube 26A, as by welding, and affords support for one end of a hollow ink feed tube 30A. Ink feed tube 30 is rotatably adjustable with respect to arm 28A and is clamped in fixed position therein by means of a bolt 31A.

As FIGS. 2 and 4 show, ink is transferred from ink supply tube 26A to ink feed tube 30A by means of an outlet pipe 32A on supply tube 26A which connects to a flexible hose 33A, which, in turn connects to a rigid pipe 34A. Rigid pipe 34A is connected to ink feed tube 30A by an inlet pipe or port 35A thereon which also mechanically supports pipe 34A.

Ink feed tube 30A is provided on its front side, i.e., that side facing roll 17A, with a slot 37A through which ink is supplied to the surface 22A of roll 17A. A guide lip 38A is secured on tube 30A below slot 37A by bolts 40A to assist in proper application of ink to roll 17A. In the embodiment shown, ink feed tube 30A is provided with two inlet ports 35A.

As FIGS. 2, 4, 7 and 8 show, a longitudinal member 42A is axially disposed within the chamber 44A of ink feed tube 30A. As FIG. 2 shows, longitudinal member 42A has a rectangular cross-sectional configuration which differs from the circular cross-sectional configuration of the chamber 44A of tube 30A. Consequently, the corner portions of longitudinal members 42A cooperate with the wall of the tube chamber 44A to define four metering orifices such as orifice 46A to control the passage or flow of ink from an inlet port 35A to the slit by evening out or smoothing the flow. In operation, ink entering the tube chamber from the inlet port impinges directly against a surface of the longitudinal member and is diverted toward and through the two metering orifices wherein fluid velocity increases. After passing through the metering orifices the relatively high velocity fluid streams are directed toward each other with resultant interference which removes or dissipates unwanted force components before the ink flows through the slit. As FIGS. 2, 4 and 6 show, the longitudinal member 42A is provided with two depressions 48A in the surface thereof which faces the inlet ports 35A. Each depression 48A extends from a location in the vicinity of an inlet port 35A along the longitudinal member sufficiently far to evenly distribute fluid pressure in the chamber 44A. The slotted longitudinal member is most advantageously employed in an ink applicator having a tube wherein the chamber is of relatively small diameter or cross-section.

In an actual embodiment of the invention, where chamber 44A had a diameter of 1-1/16 inches, the longitudinal member 42A was 3/4 by 5/8 inches (with the grooves or depressions 48A in the narrower side) and each groove 42A was 10 inches long and the distance between the adjacent ends of the grooves was 13 inches. The diameter of each inlet port 35A was about 1/2 inch and ink was supplied at a suitable pressure.

Referring to FIGS. 7 and 8, longitudinal member 42A is provided at each end with an integrally formed cylindrical end portion 50A which extends into a support bushing 51A in the end of ink tube 30A and bears against a shoulder 52A therein. A pin 53A extending through a hole 54A in tube 30A, through holes 55A in bushing 51A and through a hole 56A in end portion 50A prevents rotation of longitudinal member 42A with respect to tube 30A. An end cap 58A screws onto the end of tube 30A to seal off the ends of tube 30A against ink flow and also maintain pin 53A in place.

FIGS. 1 and 3 show another embodiment of ink applicator means 18 such as is used in downside station 14 of press 10. Referring to FIG. 3, adjustable ink applicator means or assembly 18 is provided to apply ink to the surface 22 of downside roll 17 and comprises a support bracket 23 which is rigidly secured to frame 20 and supports a hollow shaft or ink supply tube 26 through which a supply of ink flows. Ink supply tube 26 is rotatably adjustable with respect to bracket 23 and is clamped in fixed position therein by means of a bolt 27. An extension arm 28 is rigidly secured to tube 26, as by welding, and affords support for one end of a hollow ink feed tube 30. Ink feed tube 30 is rotatably adjustable with respect to arm 28 and is clamped in fixed position therein by means of a bolt 31.

As FIGS. 3 and 5 show, ink is transferred from ink supply tube 26 to ink feed tube 30 by means of an outlet pipe 32 on supply tube 26 which connects to a flexible hose 33, which, in turn connects to a rigid pipe 34. Rigid pipe 34 is connected to ink feed tube 30 by an inlet pipe or port 35 thereon which also mechanically supports pipe 34. Ink feed tube 30 is provided on its front side, i.e., that side facing roll 17 with a slot 37 through which ink is supplied to the surface 22 or roll 17. Ink guide means 38 are secured on tube 30 below slot 37 to assist in proper application of ink to roll 17.

In the embodiment shown, ink feed tube 30 is provided with two inlet ports 35.

Since roll 17 is a downside roll, it is preferred that ink guide means 38 provide a reservoir of ink 60 which enables any air entrained in the ink as roll 17 rotates downwardly to escape. The means 38 comprise an L-shaped angle iron 61 secured to tube 30 by bolts 40 and an extension lip 39 secured to member 61 by bolts 62 and a clamp bar 41. Lip 38 is adjustably movable.

As FIGS. 3 and 5 show, ink feed tube 30 is provided with a longitudinal member 42 identical to member 42A hereinbefore described which is axially disposed within the chamber 44 of tube 30. The longitudinal member 42 also has a cross-sectional configuration which differs from the cross-sectional configuration of the chamber 44 whereby at least one portion of the longitudinal member cooperates with the wall of chamber 44 to define four metering orifices, such as 46, to control ink flow. In operation, ink entering the tube chamber from the inlet port impinges directly against a surface of the longitudinal member and is diverted toward and through the two metering orifices wherein fluid velocity increases. After passing through the metering orifices the relatively high velocity fluid streams are directed toward each other with resultant interference which removes or dissipates unwanted force components before the ink flows through the slit. Member 42 is also provided with two depressions 48 to evenly distribute fluid pressure in chamber 44. The slotted longitudinal member is most advantageously employed in an ink applicator having a tube wherein the chamber is of relatively small diameter or cross-section. Aside from the ink guide means 38, applicator assembly 18 is constructed and functions in the same manner as assembly 18A hereinbefore described.

As FIGS. 9, 10 and 11 show, ink feed tube 30A (or tube 30) may be provided a longitudinal member of a different cross-sectional configuration than member 42A hereinbefore described, such as members 42B, 42C and 42D, for example.

In the embodiment shown in FIGS. 2, 3, 9, 10 and 11, the longitudinal member has a cross-sectional configuration which differs from the cross-sectional configuration of the chamber wherein it is disposed. Furthermore, the longitudinal member has a surface which is presented to or faces the fluid inlet port and against which the fluid impinges so as to be given sideward force components. The longitudinal member having at least two portions, such as opposite side edges, which cooperate with the wall of the chamber to define at least two metering orifices to control passage of fluid from the port to the slit. In FIGS. 9 and 10, neither of the longitudinal members is provided with a depression in the surface thereof, although such a depression is shown in the embodiment of FIG. 11.

Although the present invention is disclosed herein as embodied in apparatus for applying ink to a roll in a printing press, it is apparent that it could be employed in other types of apparatus wherein liquids, such as glue, cooling liquids or other fluids, such as cooling gases, are to be evenly applied to a rotating, moving or stationary surface.

I claim:

1. Fluid applicator means for applying ink to a surface of a printing press roll comprising,
- a hollow tubular member adjacent said roll surface and having a chamber therein, said member having a longitudinal slit in one side thereof communicating with said chamber,
- at least one ink inlet port communicating with said chamber,
- and a longitudinal member axially disposed within said chamber,
- said longitudinal member having a cross-sectional configuration which differs from the cross-sectional configuration of said chamber and having a surface against which ink from said inlet port impinges,
- said longitudinal member having at least two portions which cooperate with the wall of said chamber to define at least two metering orifices to control passage of ink from said port to said slit,
- and said longitudinal member being provided with at least one depression in said surface which depression extends from a location in the vicinity of said inlet port along said longitudinal member.

2. Applicator means according to claim 1 wherein said hollow tubular member has a plurality of spaced apart ink inlet ports therein and wherein said longitudinal member has a plurality of depressions therein, one for each inlet port.

3. Applicator means according to claim 2 wherein said chamber has a circular cross-sectional configuration, and wherein said longitudinal member has a rectangular cross-sectional configuration whereby four metering orifices are defined.

4. Ink applicator means for applying fluid to a printing press roll surface comprising,
- a hollow tubular member adjacent said roll surface and having a chamber therein, said member having a longitudinal slit in one side thereof communication with said chamber,
- at least one ink inlet port communicating with said chamber,
- and a longitudinal member axially disposed within said chamber,
- said longitudinal member having a cross-sectional configuration which differs from the cross-sectional configuration of said chamber and having a surface against which ink from said inlet port impinges,
- and said longitudinal member having at least two portions which cooperate with the wall of said chamber to define at least two metering orifices to control passage of ink from said port to said slit.

5. Applicator means according to claim 4 wherein said chamber has a circular cross-sectional configuration, and wherein said longitudinal member has a rectangular cross-sectional configuration whereby four metering orifices are defined.

6. Ink applicator means for applying fluid to a printing press roll surface comprising,
- a hollow tubular member adjacent said roll surface and having a chamber therein, said member having a longitudinal slit in one side thereof communication with said chamber,
- at least one ink inlet port communicating with said chamber,
- and a longitudinal member axially disposed within said chamber,
- said longitudinal member having a cross-sectional configuration which differs from the cross-sectional configuration of said chamber and having

a surface against which ink from said inlet port impinges,

and said longitudinal member being provided with at least one depression in said surface which depression extends from a location in the vicinity of said inlet port along said longitudinal member.

7. Applicator means according to claim 6 wherein said hollow tubular member has a plurality of spaced apart ink inlet ports therein and wherein said longitudinal member has a plurality of depressions therein, one for each inlet port.

8. Applicator means according to claim 7 wherein said chamber has a circular cross-sectional configuration, and wherein said longitudinal member has a rectangular cross-sectional configuration whereby four metering orifices are defined.

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