Dec. 16, 1958 G. W. LUPPOLD 2,864,308

SILK SCREEN PRINTING APPARATUS

Filed March 29, 1955 3 Sheets-Sheet 1

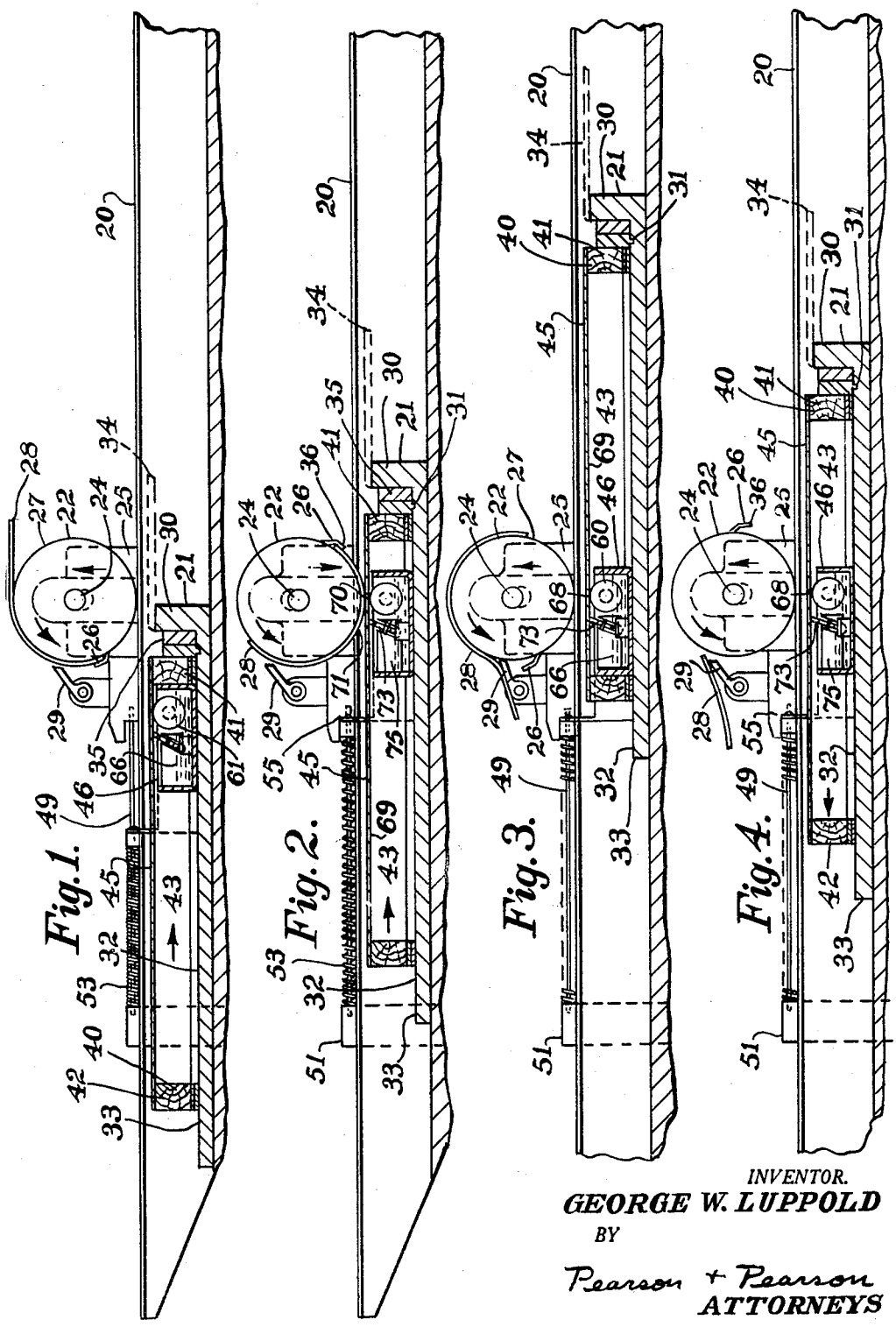


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

INVENTOR.
GEORGE W. LUPPOLD
BY
Pearson + Pearson
ATTORNEYS

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SILK SCREEN PRINTING APPARATUS

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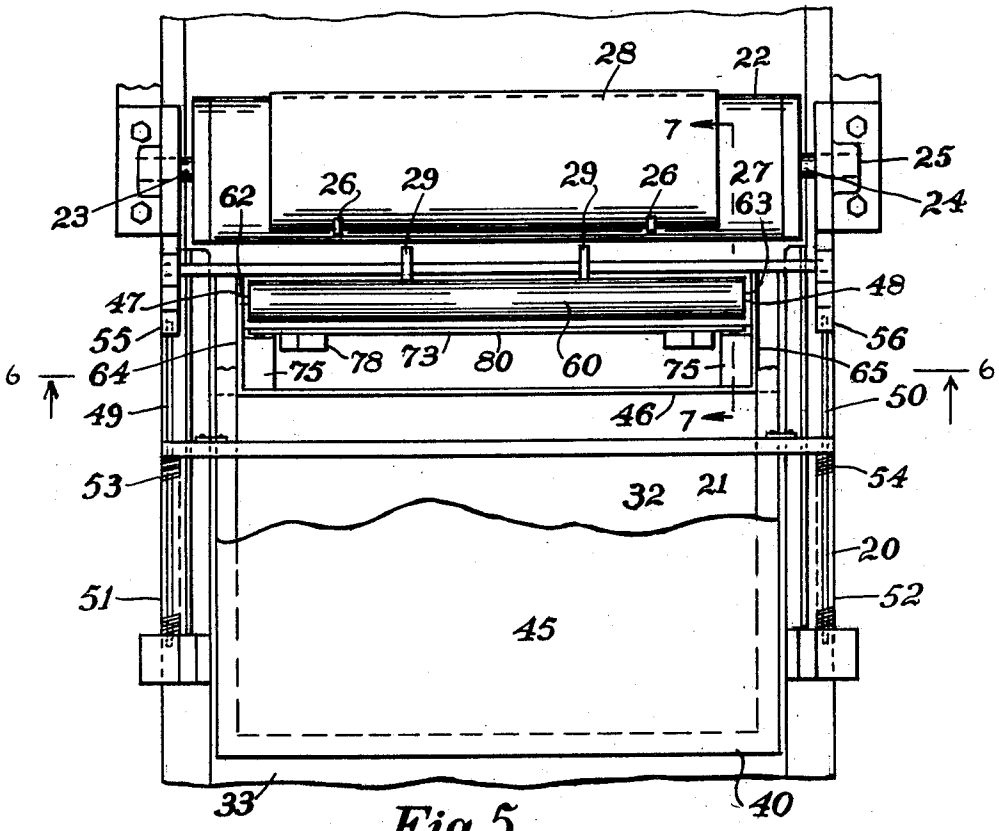


Fig. 5.

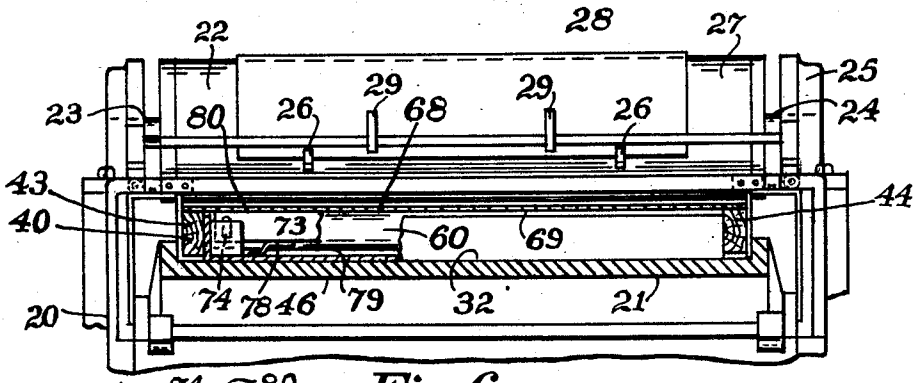


Fig. 6.

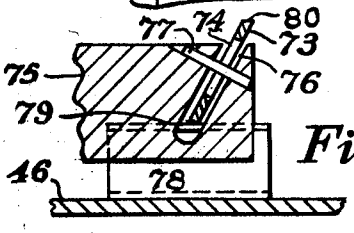


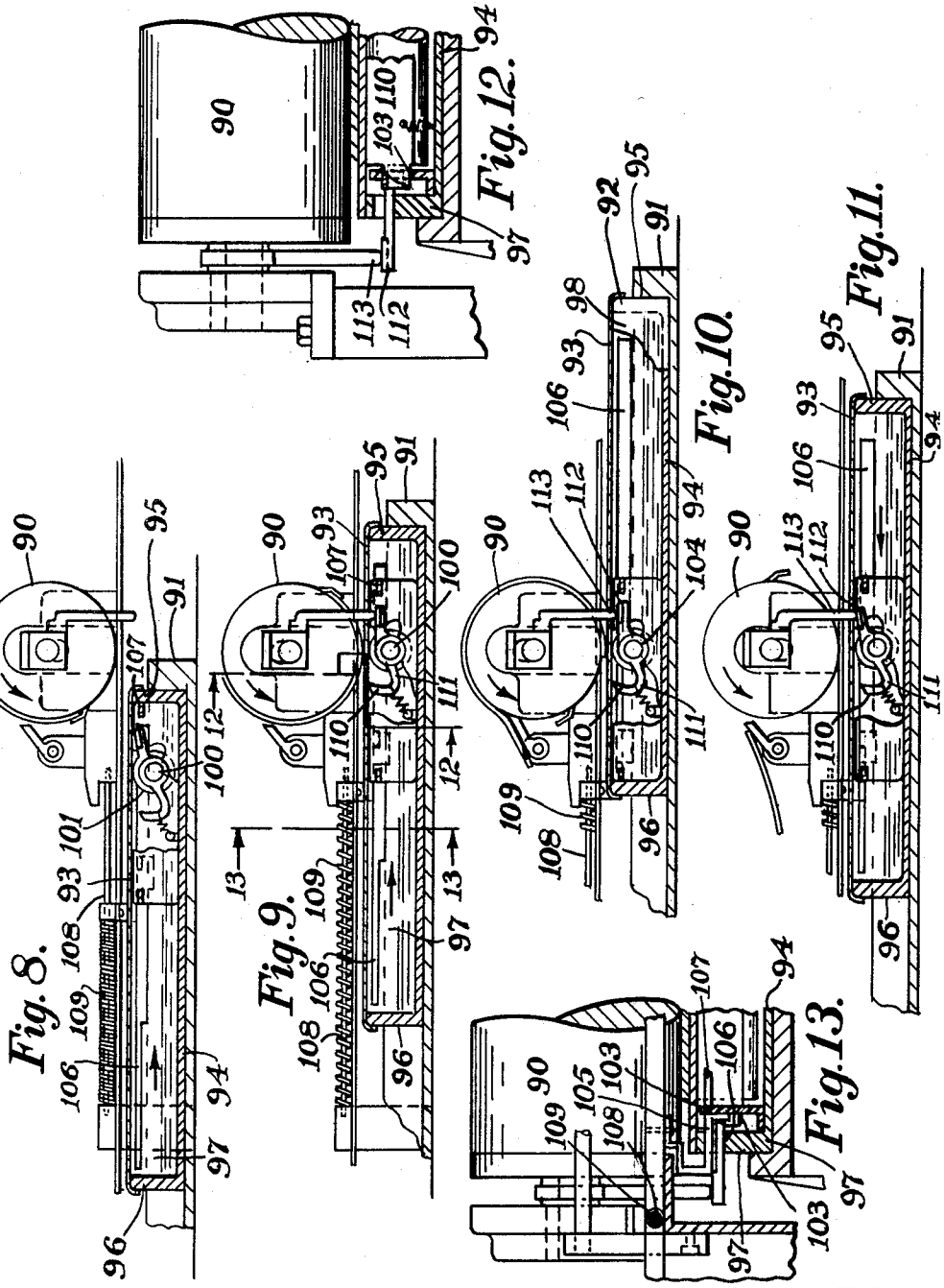
Fig. 7.

INVENTOR.
GEORGE W. LUPPOLD
BY
Pearson & Pearson
ATTORNEYS

Dec. 16, 1958 G. W. LUPPOLD 2,864,308

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INVENTOR.
GEORGE W. LUPPOLD
BY
Pearson & Pearson
ATTORNEYS

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SILK SCREEN PRINTING APPARATUS

George W. Luppold, Lowell, Mass., assignor, by mesne assignments, to T. John Caveney, Lowell, Mass.

Application March 29, 1955, Serial No. 497,547

8 Claims. (Cl. 101—124)

This invention relates to automatic stencil printing apparatus wherein individual sheets are successively printed with a predetermined design in liquid such as ink by forcing the liquid through the perforations of a stencil onto each sheet. It particularly relates to silk screen printing, now usually accomplished manually or somewhat ineffectively on automatic machinery.

It has heretofore been proposed to engage successive sheets in rolling contact between the peripheries of rotating members, the periphery of one of the members being a stencil and the ink being supplied by an inker within the stencil. It has also been proposed to move a flat stencil with an overlying flat sheet, over an inker in the form of a squeegee as in U. S. Patent 1,861,610 to Respress of June 7, 1932 or over a squeegee and a roller as in U. S. Patent 2,613,596 to Meissner of October 14, 1952.

It is an object of this invention to provide means for forcing liquid upwardly through the perforations of a stencil, said means being in the form of a roller, positioned below the stencil, and to prevent undesired spreading of the liquid on the sheet by means of the opposing pressure of a large impression roll along the line of contact.

Another object of the invention is to provide means for accurately inking a sheet on a flat stencil by rolling contact between the peripheries of smooth surfaced imperforate pressure rolls with the roll under the stencil being supplied exteriorly with ink.

A further object of the invention is to provide silk screen printing apparatus that can be used on any well known printing press of the reciprocating bed and rotating impression roll type, without substantial change in the press and with easy, rapid conversion from type printing to silk screen printing.

Still another object of the invention is to provide a detachable silk screen apparatus for printing presses having an inker in the form of a type high unyieldable, smooth surfaced, roller, the roller being freely rotatable for rolling contact with the stencil and movable from printing position to a non printing position during each cycle of the press.

A still further object of the invention is to provide a novel doctor, or scraper, blade with the above mentioned roller which scrapes the excess ink from the underface of the screen only when printing pressure is being applied to the ink roller.

Other objects of the invention will be apparent from the claims, the description of the drawings and from the drawings.

In the drawings:

Fig. 1 is a somewhat diagrammatic side elevation of screen printing apparatus according to the invention, applied to a reciprocating press with the type bed at the rear of its stroke and the ink roller moved away from the impression cylinder.

Fig. 2 is a view similar to Fig. 1 showing the beginning of the forward movement of the stroke of the type bed with the ink roller halted in printing position directly under the axis of the impression cylinder.

Fig. 3 is a view similar to Fig. 1 of the type bed at the forward end of its stroke with the ink roller still in printing position under the impression cylinder.

Fig. 4 is a view similar to Fig. 1 showing the type bed returning to its initial position with the impression cylinder raised out of contact with the sheet and stencil.

Fig. 5 is a plan view of the apparatus shown in Figs. 1 to 4 with the screen broken away and the ink roller and ink reservoir in the retracted or non printing position.

Fig. 6 is an end view in section on line 6—6 of Fig. 5.

Fig. 7 is an enlarged fragmentary side elevation along line 7—7 of Fig. 5 of the preferred mounting for the doctor blade.

Figs. 8–11 are views similar to Figs. 1–4 of a modified form of the invention.

Fig. 12 is an enlarged fragmentary end view, in section, of one side portion of the roller and blade mounting shown in Figs. 8–11, and

Fig. 13 is a similar view in section on line 13—13 of Fig. 9.

The invention is illustrated as applied to a "Kelly" Automatic Press such as are made by American Type Founders Company, the said press being well known and of the rotating impression cylinder and reciprocating bed type. In such presses the impression cylinder reciprocates downwardly to type high level to apply pressure on the sheet and type, thereby securing a clear and accurate imprint on the sheet. The sheet feeding mechanism includes a line of automatically operated grippers extending laterally across the cylinder which line of grippers are arranged not to strike the type, form or chase by suitable synchronization. In the drawings only the impression roll and bed portion are shown since the other operating mechanism of the press, or of other similar presses, is unchanged when the stencil printing apparatus of the invention is mounted on the bed thereof in place of the usual chase.

In the drawings, 20 is a typical press of the well known "Kelly" type having a reciprocating bed 21 and a continuously rotating impression cylinder 22. Impression cylinder 22 includes shafts 23 and 24 journalled in suitable bearing blocks such as 25 and the bearing blocks are vertically recirocable in stationary vertical guides all in a manner well known. Figs. 1–4, which are diagrammatic, indicate this vertical movement of cylinder 22 by dotted lines showing the shaft positions during the printing cycle.

In this type press, suitable gear racks and gears move the bed 21 from the rear position shown in Fig. 1 to the forward position shown in Fig. 3 and back again while the cylinder 22 makes two complete revolutions. A line of pivoted sheet grippers such as 26 extends axially of the smooth, imperforate, circumferential face 27 of the cylinder 22 and the grippers are operatively connected to the press mechanism to grip the leading edge portion of a sheet 28 fed thereto by mechanism not shown. The grippers are closed during the printing revolution of the cylinder and are opened during the subsequent revolution to release the printed sheet for stripping. A line of stripping fingers, such as 29, known as shooflies, are mounted adjacent the face 27 of cylinder 22 to strip each printed sheet when released by the grippers 26.

Bed 21 includes a head portion 30, a deadline 31 scribed in the flat upper surface 32 and carries suitable clamps at the rear portion 33 for tightly holding a chase containing a form of type. In addition an ink plate 34 shown

in dotted lines is carried by bed 21 which plate passes under suitable inking rollers not shown for inking a form of type carried by bed 21.

As thus far described, all of the parts specified are well known and typical of a "Kelly" press and similar parts, or their mechanical equivalent, are found in many presses now in use. It should be noted that the usual ink plate 34 and the upper face of the type carried in forms on the bed 21 are "type high" while the head portion 30 and fillers or spacers 35 are of less height. The press is therefore synchronized on the first revolution of the cylinder 22, when it is moved downward into printing position at type high level, to cause the line of grippers such as 26 to register with the low level fillers 35 to give proper clearance. The tips 36 of the grippers 26 register with the deadline 31 and printing contact is then made between the portion of sheet 28 just trailing tips 36 and the portion of the type on bed 21 just trailing the deadline. The impression cylinder remains down to apply printing pressure at type high level as the bed 21 completes its forward stroke and as the grippers rotate on the cylinder 22 to proximate the strippers 29. The printed sheet is then released by the grippers, stripped by the fingers 29 and the cylinder raised to its higher or non printing position. The grippers 26 again rotate past the bed 21 while the latter is in the forward position of its stroke, but clear the type because the cylinder is raised and, in the usual press, because the bed 21 has gone well beyond the cylinder. The cylinder remains raised, as the bed 21 returns to its rearward position, the grippers rotate through the feed station to pick up the leading edge of the next sheet and carry the sheet into printing contact with the advancing bed 21.

In this invention the ink rollers of the press are removed and in place of the usual chase and type forms, a stencil or screen carrier 40 is mounted. Carrier 40 is similar in rectangular outline and height to a chase and is positioned by suitable fillers or spacers 35 with relation to dead line 31 and clamped in place by the usual clamps on the rear portion 33 of bed 21. In Figs. 1–4 bed 21 is elongated to accommodate the carrier 40, whereby the carrier 40 does not entirely pass beyond the cylinder 22 in the forward position of bed 21, the elongation of bed 21 being accomplished by a bed extension well known and forming a standard attachment to such presses.

Carrier 40 is a rack or frame having a forward bar 41, a rearward bar 42, side bars 43 and 44 and a stencil, silk screen or similar flat sheet 45 having a pattern of perforations is stretched across the carrier at substantially type high level above the level of the upper surface 32 of bed 21. In the preferred embodiment shown in Figs. 1–4 a printing liquid reservoir 46 is mounted in the hollow space between stencil 45 and the upper surface 32 of bed 21. Reservoir 46 is at least co-extensive laterally with stencil 45 and is comparatively narrow longitudinally to occupy only a small portion of the longitudinal space between forward bar 41 and rearward bar 42 of carrier 40. As best shown in Fig. 5 each opposite end 47 and 48 of reservoir 46 is guided on one of a pair of longitudinally extending rods 49 and 50 fixed on the side frame pieces 51 and 52 of the press 20. Compression springs 53 and 54 each encircle a rod 49 or 50 and continually urge the reservoir 46 forwardly against abutments 55 and 56 but permit rearward movement of the reservoir away from the abutments against the pressure of the springs. The reservoir 46 is thus in the position shown in Fig. 1 when the bed 21 is in its rearward position but is moved forwardly to a position under the axis of cylinder 22 and against the abutments 55 and 56 when the bed 21 moves forward. The bed 21, carrier 40 and stencil 45 thus continue forwardly while the reservoir 46 is halted in the position shown in Fig. 2. Reservoir 46 remains in this position during the printing operation of the cylinder 22 and until the forward bar 41 of carrier 40 pushes it rearwardly, against the pressure of springs 53 and 54, near the end of the rearward stroke of bed 21.

An important feature of the invention is the provision of a printing roller or ink roller 60 having a smooth, imperforate, circumferential face 61 and journalled at 62 and 63 in the side walls 64 and 65 of reservoir 46. Roller 60 is preferably freely revolvable and of rigid material and its lower portion is immersed in the printing liquid 66 contained in reservoir 46 whereby as the roller revolves a continuous film of liquid is carried around the circumferential face 61. Roller 60 is positioned on reservoir 46 to locate the axis of the roller directly under the axis of the cylinder 22 when the reservoir is in its forward or printing position. Roller 60 is so mounted that, when in the printing position of Fig. 2, it is unyieldable vertically, although rotatable and movable horizontally away from the cylinder 22 by the horizontal movement of the bed 21. The meeting portion or line 68 of roller face 61 is type high, and at the same level as type face would be if being used, and thus presents an unyielding, rolling contact face covered with a film of printing liquid to the undersurface 69 of a stencil 45 passing thereover.

It will be evident that a sheet such as 28, carried on the smooth face 27 of cylinder 22, as it is carried through the nip 70 formed by the unyieldable, freely rotatable, type high roller 60 will receive a pattern of the liquid coating 66 on its underface 71, the liquid being forced upwardly through the perforations on the stencil, or screen 45. The liquid 66 may be easily flowable printing ink of any well known type, but is usually tacky and somewhat viscous to avoid spillage or smudging. It may also be merely a liquid adhesive, to which flock is later to be applied, or by any other suitable liquid desired to be applied through the apertures of a screen onto a sheet. The pressure at the nip 70 of the cylinder and roller may be very light, and merely a kissing contact, or may be the usual impression squeeze used in ordinary printing with a form of type. Because of the unyieldable, imperforate, smooth surface of the ink roller 60, rigidly supported from the type bed for free rotation, and the much larger smooth surfaced impression cylinder the tangential meeting lines at the nip 70 allow liquid to pass through the screen perforations on to the sheet but the cylinder surface pressure prevents undesired spreading of the liquid beyond such perforations to cause smearing.

A doctor, or scraper, blade 73 is preferably provided in reservoir 46, for scraping off any excess liquid applied to the undersurface 69 of stencil 45 by the roller 60. The scraper blade 73 at no time is opposite to cylinder 22 and the stencil is therefore always flexible and yieldable in the line thereof contacted by the blade. As best shown in Figs. 6 and 7 the blade 73 is co-extensive with stencil 45 and roller 60 and includes slots such as 74 at each opposite end. A pair of supporting blocks such as 75 are provided in reservoir 46 each having a forwardly inclined slot such as 76 for receiving blade 73 and each having a pin such as 77 passing through the slot such as 74 to limit the movement of the blade. A pair of springs such as 78, each bear against the lower edge 79 of the blade 73 to urge it upwardly against the undersurface 69 of stencil 45 and the upper edge 80 of blade 73 is elongated in a plane parallel to the plane of the stencil. On the forward stroke of the stencil 45 between cylinder 22 and roller 60 any liquid not forced through the stencil and remaining on undersurface 69 is scraped off by the resilient pressure of edge 80 to fall back into reservoir 46.

Another embodiment of the invention is illustrated in Figs. 8–11 which are similar to Figs. 1–4 and also show only the related portions of a typical press and in Figs. 12 and 13. In Figs. 8–13, 90 is the impression cylinder, 91 the reciprocating bed, 92 the stencil carrier mounted on the bed and 93 the stencil or screen. Instead of liquid

or ink supply means in the form of a narrow reservoir such as **46**, the carrier **92** itself forms the ink reservoir, there being an imperforate bottom **94**, front wall **95**, rear wall **96** and side walls **97** and **98** serving the double purpose of supporting the stencil while carrying the printing liquid. The level of the liquid usually is less than the level of the shaft **100** of the printing or ink roller **101** whereby the lower quadrants of the roller are immersed in the liquid. Shaft **100** of roller **101** is unyieldably journalled at **102** in the rigid side guides **103** and **104** to cause the top line of the roller to be at type high level and at the level of the stencil. Side guides **103** and **104** are slideable longitudinally on the bottom wall **94** of carrier **92** and suitably joined by cross members **107** to form a rigid, slideable unit for supporting the roller. As shown in Fig. 13 each side guide **103** or **104** includes a portion such as **105** extending through a longitudinal slot **106** in a side wall **97** and encircling a rod **108** similar to rods **49** and **50**. A spring **109**, similar to springs **43** and **54** is provided on each side of the press frame and encircling the rods to urge the roller assembly forwardly under the cylinder **90**.

A doctor, or scraper, blade **110** similar to blade **73** is provided, blade **110** being carried by a pair of arms such as **111**, each pivoted at an opposite end of shaft **100**, and each having a terminal portion **112** in the path of a finger **113**. The fingers **113** depend from the bearing blocks of cylinder **90** and are arranged to lift the blade **110** into contact with stencil **93** whenever the cylinder is in its downward position. Thus the excess liquid is scraped from the stencil during printing but the blade does not wear on the stencil during the return non printing stroke.

I claim:

1. In a printing press of the type having a horizontally reciprocating flat type bed and a vertically reciprocating, rotating, impression cylinder the combination of a stencil carrier mounted for movement with said flat type bed and supporting a perforated stencil in spaced relation above the upper face of said bed to form a hollow space therebetween; ink supply means mounted on said type bed in the hollow space below said stencil; a type high ink roller, having its circumferential surface continually fed with ink by said supply means and adapted to transfer said ink upwardly to the underface of said stencil, slideable, downwardly unyieldable, roller support means, rotatably supporting said roller with its axis parallel to the axis of said cylinder and horizontal translation means for sliding said roller into and away from a pressure nip relationship with said cylinder, directly below the cylinder axis, in synchronization with the movements of said cylinder, type bed and stencil carrier.

2. A combination as specified in claim 1 wherein said ink supply means is a shallow ink reservoir substantially co-extensive in area with said stencil carrier and supported on said type bed for movement therewith and said roller support means is horizontally slideable relative to, and within, said shallow ink reservoir.

3. In a printing press of the type having a horizontally reciprocating flat type bed and a vertically reciprocating, rotating, impression cylinder the combination of a stencil carrier mounted for movement with said flat type bed and supporting a perforated stencil in spaced relation above the upper face of said bed to form a hollow space therebetween; ink supply means mounted on said type bed in the hollow space below said stencil; a type high ink roller, having its circumferential surface continually fed with ink by said supply means and adapted to transfer said ink upwardly to the underface of said stencil, said roller being unyieldingly mounted for rotation, parallel to and directly below the axis of said cylinder in a pressure nip relationship therewith; downwardly unyieldable means for moving said roller into and away from its type high unyielding position of rotation relative to said cylinder in synchronization with the movements of said cylinder, type bed and stencil carrier, and a doctor blade, of rigid material mounted in the hollow space below said stencil in rear of said roller, the stencil contacting edge of said blade being positioned to scrape off excess ink, applied by said roller, into said ink supply means.

4. A combination as specified in claim 3 wherein said blade is yieldably mounted on a pair of flexible leaf springs carried by said ink supply means.

5. A combination as specified in claim 3 wherein said blade is spring urged upwardly into contact with the underface of the stencil, inclined forwardly in the direction of the forward stroke of said type bed and the upper edge of said blade is horizontal and in the plane of the underface of the stencil.

6. A combination as specified in claim 3 plus mechanism supporting said blade with relation to said type bed, said mechanism operatively connecting the blade with the impression cylinder to raise the blade into contact with the underface of said stencil when the impression cylinder is lowered and lower the blade away from said stencil when the impression cylinder is raised.

7. Stencil printing apparatus for use with a printing press having a reciprocating type bed and a revolving impression cylinder with sheet grippers thereon, said apparatus comprising a stencil carrier adapted to be fixed for movement with a type bed with the stencil at type high level; an ink reservoir adapted to be mounted on said type bed under the stencil of said carrier; an ink roller of rigid material, having a smooth, imperforate circumferential face adapted to transfer a film of ink from said reservoir upwardly to the undersurface of said stencil, ink roller supporting means spring loaded to maintain said roller with its stencil contacting surface portion unyieldable and at type high level in printing position directly below the sheet contacting surface portion of said cylinder, and timed actuating means sliding said supporting means and said ink roller away from said cylinder temporarily during each revolution of said cylinder to permit the passage thereby of said grippers.

8. In a printing press of the type having a horizontally reciprocating flat type bed and a vertically reciprocating, rotating, impression cylinder the combination of a stencil carrier mounted for movement with said flat type bed and supporting a perforated stencil in spaced relation above the upper face of said bed to form a hollow space therebetween; ink supply means mounted on said type bed in the hollow space below said stencil; a type high ink roller journalled at each opposite end for rotation in roller support means, said roller having its circumferential face continually fed with ink by said supply means for transfer upwardly to the underface of said stencil and being rotatable parallel to and directly below the axis of said cylinder in a type high, pressure nip relationship, and roller support means including oppositely disposed side supports of rigid material slideably and unyieldingly supported on said type bed, said side supports being spring pressed forwardly into a position wherein said roller is directly under the axis of said cylinder and adapted to be moved rearwardly away from said cylinder by the return stroke of said type bed.

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