March 28, 1939. C. L. HENDERSON 2,151,969

INKING APPARATUS AND METHOD

Filed June 9, 1938 3 Sheets-Sheet 1

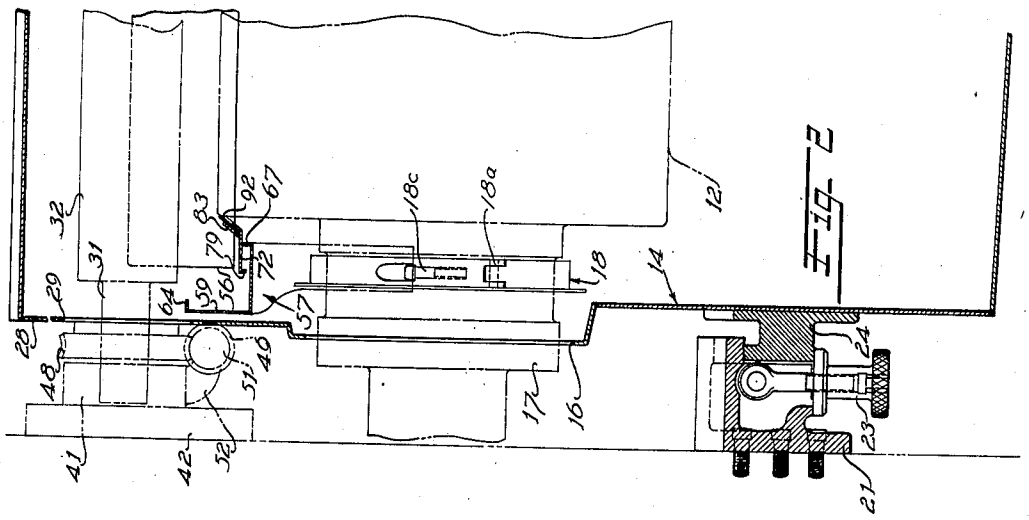


Fig. 2

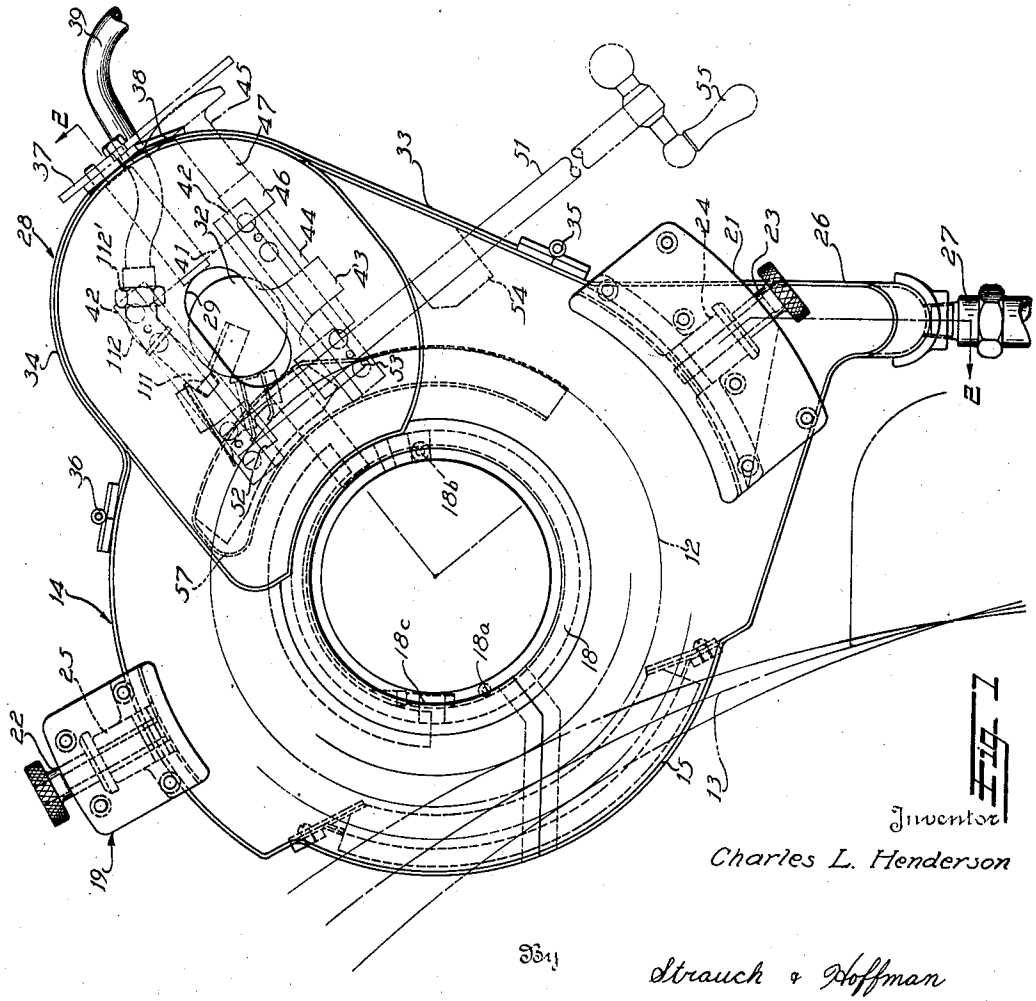


Fig. 1

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INKING APPARATUS AND METHOD

Filed June 9, 1938 3 Sheets-Sheet 2

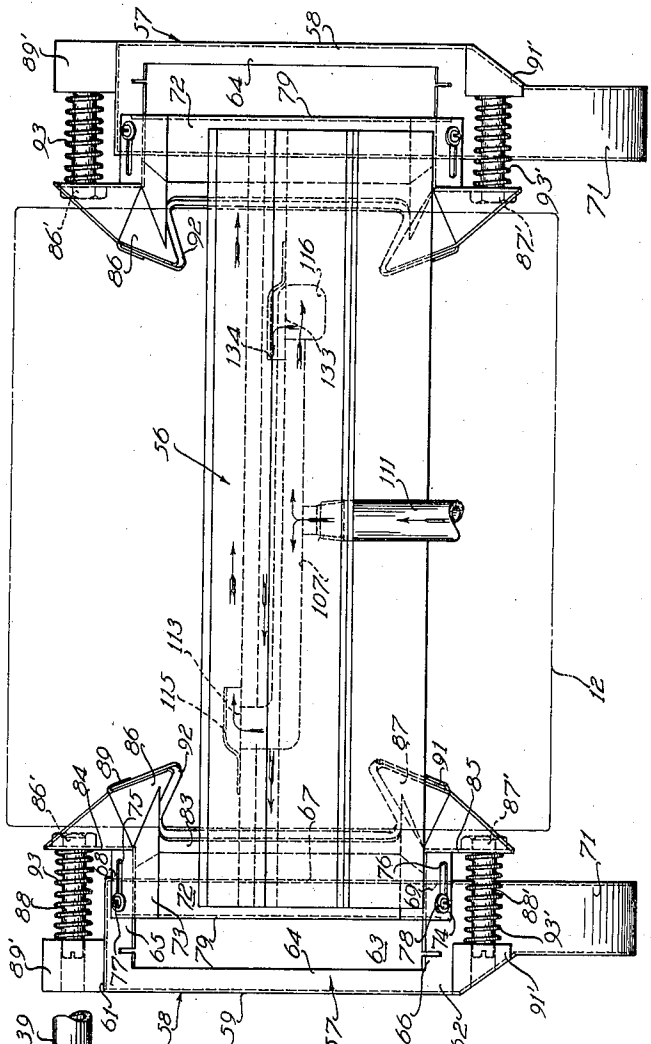


FIG. 3

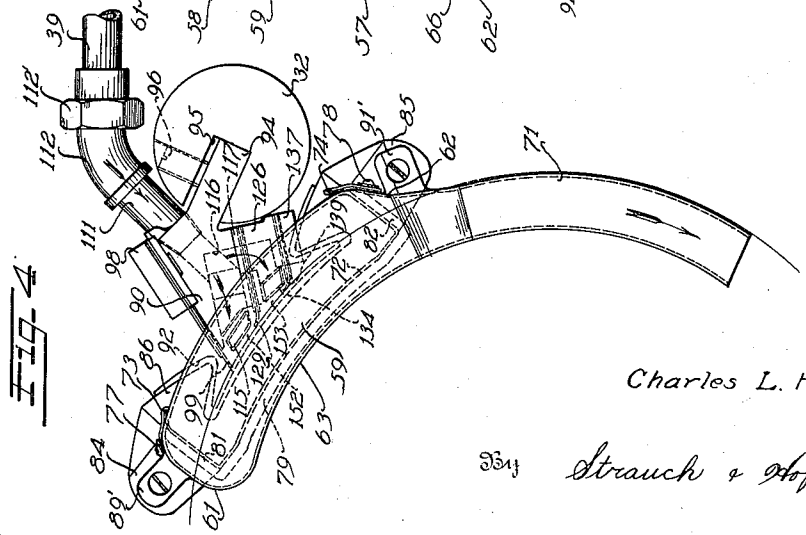


FIG. 4

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March 28, 1939. C. L. HENDERSON 2,151,969

INKING APPARATUS AND METHOD

Filed June 9, 1938 3 Sheets-Sheet 3

Fig. 5

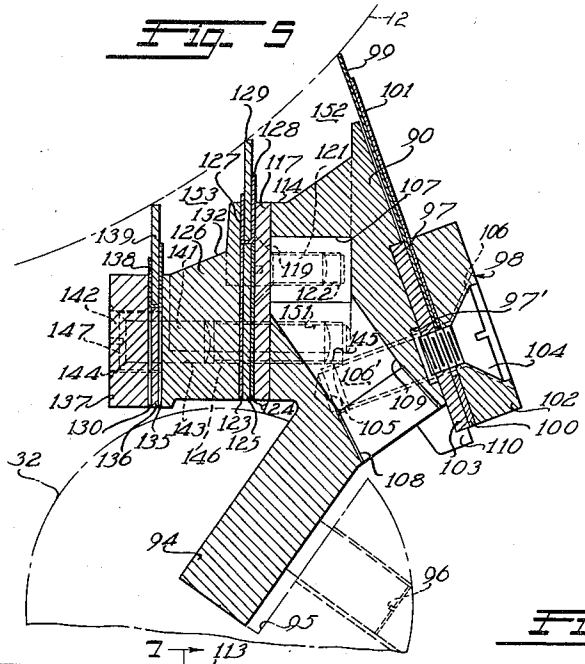


Fig. 7

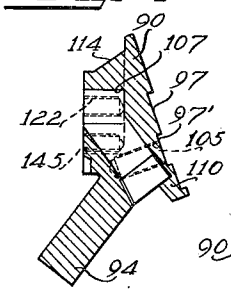


Fig. 6

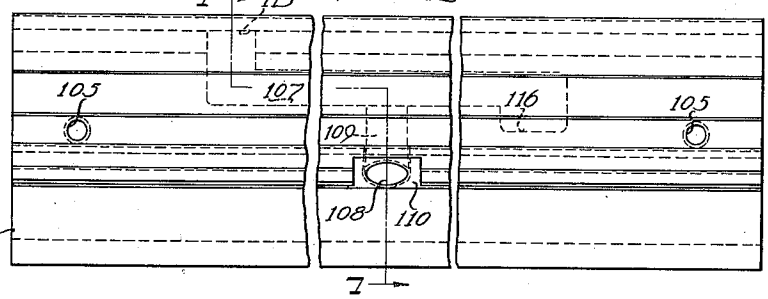


Fig. 9

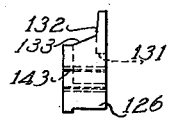
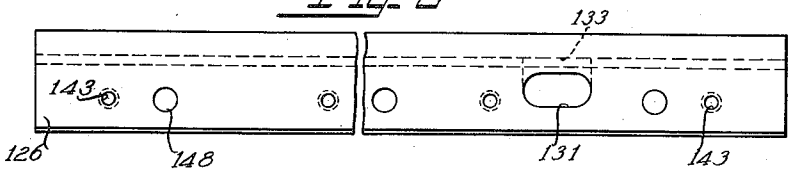


Fig. 8



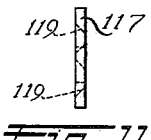


Fig. 11

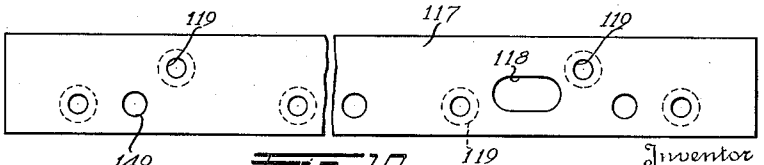


Fig. 10

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UNITED STATES PATENT OFFICE

2,151,969

INKING APPARATUS AND METHOD

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Application June 9, 1938, Serial No. 212,793

20 Claims. (Cl. 101—157)

My invention relates to printing presses and is more particularly concerned with inking arrangements for providing ink at moving printing surfaces. This application is a continuation in part of my copending application Serial Number 92,801, filed July 27, 1936.

In printing presses of the type employing moving printing surfaces, especially in high speed, multicolor, rotogravure presses in which a plurality of printing cylinders are grouped around a single impression drum, it is necessary to supply ink to the printing surfaces quickly and thoroughly between successive printing operations. This high speed printing requires the use of quick drying ink which must be applied in such a manner that it will not evaporate or dry before the impression is made and clog the etched portions of the printing surface. Furthermore, much trouble has been occasioned, especially in high speed rotogravure and intaglio printing presses, due to the fact that air is usually entrapped at the printing surface by the quickly applied ink and some of this air occupies space on the printing surface which should be taken up by printing ink. For example, small amounts of air are often entrapped in the cells between the lines on a rotogravure printing surface. These cells should be completely filled with ink to gain best results in printing and the entrapped air obviously prevents the cells from receiving sufficient ink with the result that the printing is often poor in places.

Accordingly, it is a major object of my invention to provide novel inking arrangements for high speed printing presses having moving printing surfaces wherein the ink is applied quickly and evenly to the printing surfaces while the surfaces are in motion.

A further object of my invention is to provide novel inking apparatus and methods for printing presses having moving printing surfaces in which the moving printing surfaces are subjected successively to a plurality of agitated bodies of ink extending along the printing surfaces transversely of the direction of motion of the surfaces.

A further object of my invention is to provide novel inking apparatus and methods for printing presses having moving printing surfaces in which the moving printing surfaces are subjected successively to a plurality of relatively narrow streams of ink flowing transversely of the direction of motion of the surfaces. Preferably a plurality of these streams are provided to flow in opposite directions.

Still a further object of my invention is to provide novel inking apparatus and methods for printing presses employing moving printing surfaces in which the moving printing surfaces are subjected successively to a plurality of oppositely flowing streams of ink directed substantially transversely of the direction of motion of the printing surfaces. In specific attainment of this object as applied to a rotary printing press, two open ended ink passages are preferably disposed longitudinally of each printing cylinder and oppositely directed streams of ink are continuously introduced into the passages adjacent opposite ends thereof.

It is a further object of my invention to provide novel ink fountain structure designed to maintain at least two circumferentially spaced agitated bodies of ink against the printing surface on a moving rotary printing cylinder. A doctor blade is also preferably supported upon the fountain so that a complete unit for uniformly applying the ink and removing surplus ink is provided.

A further object of my invention is to provide a novel fountain and doctor blade support unit which cooperates with a moving printing surface to provide a plurality of open-ended ink passages extending substantially transversely of the direction of motion of the printing surface. Specifically the doctor blade and fountain unit is preferably made up of a plurality of separable elements so that it may be readily taken apart for cleaning.

A further object of my invention is to provide novel ink receiving means for use at opposite ends of a rotating printing cylinder to collect ink which flows over the ends of the cylinder. In specific attainment of this object each ink receiving means is preferably provided with a resiliently mounted mouth which forms a fluid tight path between the printing surface and the ink receiving means.

Further objects of the invention will presently appear as the description proceeds in connection with the appended claims and the annexed drawings, in which:

Figure 1 is an end view partly in section of one printing cylinder of a multicolor printing press provided with a preferred form of inking arrangement according to my invention. For the purpose of illustration, the cylinder selected is above the horizontal axis of the impression roller on the entry side of the web and may be termed the No. 1 cylinder.

Figure 2 is a partially diagrammatic view of a section taken along line 2—2 of Figure 1 illustrating a preferred form of ink directing and

collecting means at one end of the printing cylinder;

Figure 3 is a side elevation of the printing cylinder of Figure 1 with the ink collecting pan omitted to illustrate the ink flow arrangements and the preferred structure of the end guards at each end of the printing cylinder;

Figure 4 is an end elevation partly in section illustrating a preferred manner in which the doctor fountain is applied to the printing cylinder, and further illustrating the end guard arrangements;

Figure 5 is a section taken laterally of the doctor fountain illustrating a preferred form of the ink chamber arrangement. This showing of the doctor fountain is in connection with the so-called No. 2 cylinder of the press which is below the horizontal axis of the impression cylinder on the entry side of the web;

Figure 6 is a plan view illustrating a preferred form of the ink channel arrangement in one of the elements of the doctor fountain;

Figure 7 is a section taken along line 7—7 of Figure 6;

Figure 8 is a plan view of another element of the doctor fountain illustrating further a preferred ink channel arrangement;

Figure 9 is an end view of the doctor fountain element of Figure 8;

Figure 10 is a plan view of still another element of the doctor fountain illustrating a further embodiment of ink channel arrangement; and

Figure 11 is an end view of the element of Figure 10.

Referring to Figures 1 and 2, a multicolor or rotogravure printing cylinder 12 is designed to print upon a sheet or web (not shown) passing between its peripheral surface and the surface of a large impression roll 13, the cylinder and roll being supported on a suitable frame not shown. Preferably, two or more printing cylinders, substantially identical with cylinder 12, are spaced about the periphery of roll 13 and each is provided with inking arrangements substantially the same as will be described in connection with cylinder 12. While the present description will be limited to one cylinder assembly, it is to be understood that the features of this invention are readily applicable to other cylinders of a multi-cylinder press in different positions by relatively simple modifications as to the supporting means and the proportions of the various elements.

Printing cylinder 12 is almost completely housed by an ink pan generally designated at 14 which is cut away at 15 to allow printing contact between cylinder 12 and roll 13. At each end of cylinder 12, ink pan 14 is apertured at 16 to permit passage of the printing cylinder shaft ends 17 which are journaled on suitable supports on the frame. A removable collar, designated at 18, is secured about the cylinder shaft interiorly of the ink pan. Collar 18 is of such size that it serves as a baffle to prevent ink from the interior of the ink pan from being thrown outwardly through aperture 16 and is preferably formed in sections as shown pivoted at 18a and 18b and secured together at 18c by a suitable screw and threaded lug arrangement.

Ink pan 14 is removably mounted upon the frame by means of a pair of suitable brackets 19 and 21 which are provided with pivoted locking latches 22 and 23, respectively. Brackets 19 and 21 are bolted or otherwise suitably secured to the frame and lugs 24 and 25, which are rigidly attached in any suitable manner, such as welding to pan 14, project laterally from the ink pan to be clamped between jaws formed by brackets 19 and 21 and latches 22 and 23, respectively. It will be understood that brackets substantially similar to brackets 19 and 21 are provided at the end of cylinder 12, not shown in Figures 1 and 2.

The lower end of ink pan 14 tapers to form a socket 26 which is secured in fluid communication with a pipe 27 leading to a pump chamber or reservoir, or a suitable ink straining system. At its upper end, ink pan 14 is provided with a housing extension 28 having aligned apertures 29 to permit passage of the end portions 31 of the doctor blade fountain support 32. Doors 33 and 34 which preferably extend longitudinally the whole length of pan 14 are hinged at 35 and 36, respectively, so that the doctor blade fountain may be examined or repaired without removal from the press, or may be quickly removed if it is desired to replace the blades or other parts. Doors 33 and 34 are preferably provided with suitable latch means shown at 37.

Door 33 is preferably provided with an aperture surrounded by a rigid reenforcing collar 38 welded or otherwise suitably secured thereto. The opening provided at collar 38 permits passage of a flexible ink supply conduit 39 through the ink pan to the doctor blade fountain later to be described.

End portions 31 of the doctor blade fountain support 32 are journaled in a suitable manner upon slides 41 mounted for movement along suitable guides 42 bolted or otherwise secured to opposite frame portions. Each slide 41 is provided with an internally threaded lug 43 for receiving the threaded shank 44 of an adjustment screw 45. Screw 45 extends in threaded engagement through a lug 46, secured to guide 42 or a frame portion as desired, and is provided with an enlarged portion 47 beyond lug 46. When screws 45 are rotated, the whole assembly mounted on support 32 is displaced along guides 42 substantially normally to the surface of cylinder 12. Enlarged portions or shoulders 47 on screws 45 limit the inward travel of support 32 by abutting against lugs 46 and thus prevent the doctor blade fountain from being accidentally pressed too tightly against the printing surface. To insure positive travel of slides 41 in both directions, screw 45 may have a removable collar on the portion 44 to abut against the underside of lug 46. Such a collar would cooperate with shoulder 47 to prevent longitudinal movement of screw 45 and may be secured to screw 45 by a set screw or similar means.

As shown in Figure 2, one end portion 31 of the doctor blade fountain support is provided with a worm gear 48 non-rotatably secured thereto and engaged with a worm 49 adjacent one end of a doctor blade pressure control lever 51. Lever 51 is journaled and supported upon spaced arms 52 and 53 extending laterally from slide 41 and cooperates intermediate its ends with a supporting bracket 54 on the frame to prevent it from bending. A suitable control handle 55 is secured to the outer end of lever 51. Rotation of lever 51 causes rotation of the doctor blade support 32 about its axis to vary the pressure of the doctor blade against the printing surface on cylinder 12.

The doctor blade fountain unit, designated at 56, preferably extends a substantial distance

beyond the opposite ends of cylinder 12 and has its opposite ends disposed within a pair of ink collecting and deflecting end guards 57 which are substantially identical except for necessary changes made to adapt the guards to the different ends of the cylinder.

End guards

Each end guard 57, see Figures 2, 3 and 4, comprises an arcuate hollow body member 58 preferably extending substantially concentrically with the printing cylinder and having an outer side wall 59, upper and lower end walls 61 and 62 and a bottom wall 63. Body member 58 is preferably removably mounted upon the end wall of ink pan 14 by a suitable bracket or other support (not shown). The top of member 58 is open and provided with a side lip 64 extending inwardly from the top of wall 59, and two end lips 65 and 66 extending inwardly from the top edges of walls 61 and 62, respectively.

At its inner side, member 58 is provided with an opening defined by bottom lip 67 extending upwardly from wall 63, and end lips 68 and 69 extending inwardly from end walls 61 and 62, respectively. Member 58 is also preferably provided with an arcuate nozzle extension 71 of reduced cross section. Nozzle 71 may be a separate element secured in any suitable member about an opening in wall 62 but preferably is an integral extension of the side, bottom and lower end walls of member 58 as shown in Figure 4.

An ink deflecting member 72 is slidably mounted on member 58. Member 72 is provided with upper and lower end walls 73 and 74 which extend arcuately a substantial distance toward each other and are then bent back along the outer surfaces of lips 65 and 66, respectively, as shown in Figure 4. Walls 73 and 74 are preferably provided with elongated slide guide slots 75 and 76, respectively, through which extend the shanks of screws 77 and 78, respectively. Screws 77 and 78 are secured in threaded apertures in lips 65 and 66, respectively, and are provided with enlarged heads engaging the outer surface of walls 73 and 74, respectively, adjacent the slots. Obviously, other types of securing means may be employed.

Within members 58, member 72 is provided with a downwardly extending lip 79 and outwardly extending end lips 81 and 82 for a purpose later to be described. Externally of member 58, member 72 is provided with an upwardly and laterally extending wall 83. At opposite ends, member 72 is provided with end lugs 84 and 85 from which tapered tongues 86 and 87, respectively, extend laterally in converging relation. A continuous substantially U-shaped socket extends from one end 89 at the top edge of tongue 86 downwardly along the external surface of tongue 86, arcuately along the external surface of wall 83, and thence upwardly along the external surface of tongue 87, terminating at the end portion designated at 91. This socket is adapted to receive a projecting sealing strip 92 of rubber, rubber and fabric, or any other suitable material which is flexible and preferably will not deteriorate due to chemical action from the inks.

Sealing strip 92 is preferably cut to follow substantially the contour defined by the lateral edges of tongues 86 and 87 and wall 83, but preferably extends beyond those edges as shown in Figure 3. Strip 92 need not be a single strip but may be made of a plurality of sections suitably joined in fluid tight relation to form a laminated structure.

End lugs 84 and 85 are provided with apertures surrounded by internally threaded bosses 86' and 87', respectively. Studs 88 and 88' are mounted in bosses 86' and 87' and extend laterally into apertured lugs 89' and 91', respectively, which are suitably secured to, or integral with, body member 58. Coil springs 93 and 93' surround studs 88 and 88', respectively, and extend between the respective lugs on members 58 and 72 and thus tend to laterally separate those members since studs 88 and 88' are slidably disposed within lugs 89' and 91', respectively.

As shown in Figure 3, each end guard is positioned at the opposite ends of cylinder 12 in such a manner that ink deflecting member 72 is urged axially of cylinder 12 by the force of springs 93 and 93' and provides a mouth for leading ink which flows past the ends of the cylinder into member 58. Body member 58 is preferably rigidly secured to ink pan 14 by a suitable bracket (not shown). Sealing strip 92 is pressed against the peripheral surface of cylinder 12 adjacent tongues 86 and 87 and against the end wall of the cylinder along the periphery thereof adjacent wall 83. Those portions of strip 92 which engage the peripheral surface of cylinder 12 are designed to remove excess ink from that surface in addition to their ink directing and sealing functions.

Cooperating lips 67, 68, 69 on member 58 and 79, 81 and 82 on member 72 prevent escape of ink from within members 72 and 58, and screws 77 and 78 act as stops for limiting axial movement of member 72 to prevent separation of the members. Ink flowing axially of cylinder 12 in doctor fountain 56 as well as the ink scraped off the peripheral surface of the cylinder by strips 92 is directed through the mouths formed by tongues 86 and 87 onto members 72 and into member 58, from whence it flows through nozzles 71 into ink pan 14.

By mounting each member 72 resiliently for axial sliding movement with respect to cylinder 12, an ink tight conduit is provided between the rotating cylinder 12 and the ink collector body 58. If desired a suitable cover (not shown) may be provided to extend over the top of each end guard to prevent dust and dirt from entering therein if the end guard extends axially beyond pan 14 but such is not necessary when the end guards are wholly within the ink pan 14 as shown in Figure 2.

Doctor blade fountain

The doctor blade fountain 56 (see Figures 4 and 5) comprises main body portion 90 provided with a rearwardly extending leg 94 which fits within a longitudinal slot 95 in support 32 and is held securely therein by a suitable means such as screws 96. Body 90 is provided with a shallow longitudinal groove 97 (Figure 5) for seating a doctor blade assembly generally designated at 98.

This assembly (Figure 5) comprises a doctor blade 99 of a suitable flexible sheet material such as tempered steel and a stiffening blade 101 of the same spring metal or the like which are clamped together between two relatively narrow and thick strips 102 and 103. A suitable filler strip 100 having a thickness equal to the combined thickness of the doctor and stiffening blades is placed between strips 102 and 103 behind the blades. A plurality of screws 104 hav-

ing enlarged heads fitting within countersunk portions of strip 102 extend into threaded engagement with cooperating apertures in strip 103 to secure doctor blade 99 and stiffening blade 101 in position.

The doctor blade assembly, with screws 104 tightened to hold the parts together, is placed in groove 97. A second shallow groove 97' is formed at the bottom of groove 97 to accommodate the projecting tip ends of screws 104. Adjacent opposite ends, body 90 is provided with tapped holes 105 (Figure 6). Screws 106 are provided with enlarged heads fitting within countersunk portions of strip 102 and the threaded shanks 106' of screws 106 extend through apertures in the doctor blade assembly into tapped holes 105. When screws 106 are tightened, the doctor blade assembly is rigidly supported on body 90.

Body 90 is preferably provided with a centrally disposed longitudinally extending passage 107 which is preferably designed to terminate just beyond the opposite edges of the printing surface area on cylinder 12. A tapered socket 108, formed with a passage 109 extending angularly through body 90 into communication with passage 107, is designed to receive a suitable tapered inlet nozzle 111 (see Figure 1). Nozzle 111 is secured to a suitable rigid pipe fitting 112 which is fastened, as by a suitable coupling means 112', to the end of flexible conduit 39. Preferably, nozzle 111 fits into socket 108 with a force fit so that the connection is ink tight but can be easily broken manually by grasping fitting 112 with a combined pulling and twisting motion. A threaded connection can be used at 108 if desired. The rear edge of body 90 is cut away at 110 to provide a suitable socket connection area.

At one end, passage 107 extends longitudinally to a point adjacent one end of the fountain where it turns forwardly substantially normally and terminates in an aperture 113 in the front wall 114 of body 90. A suitable strip 115 (see Figure 3) of metal or other rigid material is secured, as by soldering or welding, to wall 114 and extends upwardly and forwardly over aperture 113 to provide a longitudinally extending tubular nozzle, the purpose of which will be later described.

At its other end, passage 107 extends longitudinally to a point adjacent the end of the fountain opposite aperture 113 and turns rearwardly substantially normally to form an enlarged chamber 116. Passage 107 and chamber 116 are both open along the bottom surface of body 90. A rigid rectangular strip 117 (Figure 5) extends along the bottom surface of body 90 to form a closure for the bottom of passage 107, but is provided with an elongated aperture 118 registering with chamber 116. Strip 117 is provided with a plurality of staggered countersunk portions 119 for receiving the enlarged heads of screws 121 whose threaded shanks fit within tapped holes 122 in body 90. When screws 121 are tightened, strip 117 is secured to body 90.

A pair of sheet metal strips 123 and 124 having a strip of flexible material 125 disposed between them, extend along the bottom surface of strip 117. Strips 123, 124 and 125 are narrower than strip 117. An elongated block 126, whose top edge 127 is disposed coextensively with strip 117, extends along strip 123. The top edge of block 126, the inner ends of strips 123, 124, and 125 and the bottom surface of strip 117 cooperate to form a socket for a longitudinal U-shaped clip 128 carrying a sealing strip of flexible material 129 which projects therefrom to contact with the peripheral surface of cylinder 12 and extends the whole length of the fountain.

Block 126 is provided with a downwardly extending passage 131 which registers with aperture 118 and turns substantially normally toward the front wall 132 of block 126 where it terminates in an aperture 133. A strip of sheet metal or the like 134 (see Figure 3) is secured to wall 132 adjacent aperture 133 and extends upwardly and forwardly thereover to form a longitudinally extending nozzle directed oppositely to the nozzle at 115 for a purpose later to be described.

A pair of sheet metal strips 130 and 135 having a strip of flexible material 136 disposed therebetween extends along the bottom wall of block 126; and a rigid longitudinal strap 137, disposed coextensively with the bottom wall of block 126, extends along strip 134. The bottom wall of block 126, strap 137 and the end portions of strips 130, 135 and 136 cooperate to form a longitudinal socket for a substantially U-shaped clip 138, carrying a sealing strip of flexible material 139 which projects therefrom to contact with the peripheral surface of cylinder 12 and extends the whole length of the fountain.

A plurality of screws 141 having enlarged heads 142 disposed in countersunk portions of strap 137 extend through suitable apertures in strips 130, 135, 136 and have their threaded shanks fitted into tapped holes 143 in block 126. Tightening of screws 141 secures strap 137 and block 126 rigidly together and clamps sealing strip 139 between them.

Strap 137 is further provided with a plurality of enlarged apertures 144 which are aligned with apertures of smaller diameter extending through strips 130, 135, 136, block 126 and strips 123, 124, and 125. A plurality of tapped holes 145 are provided in the bottom wall of body 90 also in alignment with apertures 144. A plurality of bolts 146 having enlarged heads 147 disposed in apertures 144 extend through the holes in strips 130, 135 and 136 through apertures 148 in block 126, through suitable holes in strips 123, 124 and 125 and through apertures 149 in strip 117 to terminate in threaded end portions 151 fitted in tapped holes 145 in body 90. When bolts 146 are tightened, the unit containing block 126 and strap 137 is secured rigidly to body 90, and at the same time sealing strip 129 is clamped between strip 117 and block 126.

From the above it will be seen that the doctor blade fountain is comprised of a plurality of elements which are easily and quickly taken apart for cleaning and like purposes and for replacement of the doctor blade, the sealing strips or blades 129 and 139. Any suitable flexible material may be used for strips 129 and 139. Preferably, such material should be resistant to any chemical action from the ink or any cleaning fluid used to clean the fountain.

Ink distribution

The flow of ink in the doctor blade fountain is indicated by arrows in Figures 3 and 4. Ink is supplied to each printing cylinder 12 through flexible conduit 39 which is connected at one end to a suitable source of ink. Flow of ink through conduit 39 is maintained by a pump or by gravity or in some other suitable manner. The ink passes from conduit 39 through the pipe fitting 112 and nozzle 111 into passage 109. Since passage 109 opens into the central part of passage 107, the main ink body will there be divided into two ink

streams generally tending to flow in opposite directions in passage 107 toward opposite ends of passage 107.

One ink stream will pass along passage 107 through aperture 113 and discharge into the open-ended ink chamber 152 defined by wall 114 of body 90, doctor blade 99, the peripheral surface of cylinder 12, sealing blade 129 and the end of strip 117. Since nozzle 115 is disposed over aperture 113, this ink stream will be caused to flow generally from left to right within chamber 152 along the whole peripheral surface length of cylinder 12. When this ink stream reaches the right-hand end of the cylinder, it flows over the cylinder end into the right-hand end guard 57. Sealing strip 92 prevents leakage of the ink adjacent the cylinder ends.

The other ink stream flows generally to the right along passage 107 (Figure 3) into chamber 116, from whence it flows downwardly through aperture 118 and passage 131 to discharge through aperture 133 in the block 126 into the open-ended ink chamber 153 defined by wall 132 of block 126, sealing strip 129, the peripheral surface of cylinder 12 and lower sealing strip 139. Since nozzle 134 extends over aperture 133, this ink stream will be caused to flow generally from right to left within chamber 153 along the whole peripheral surface length of cylinder 12. When this ink stream reaches the left-hand end of the cylinder, it flows into the left-hand end guard 57 which also has a sealing means 92 to prevent leakage.

Nozzles 115 and 134 are preferably disposed adjacent opposite edges of the printing plate or other printing surface on cylinder 12 so that the entire printing surface will be subjected successively to oppositely flowing ink streams.

Nozzles 115 and 134 are preferably of about the same cross-sectional area so that substantially equal amounts of ink flow in opposite directions along the peripheral surface of cylinder 12. Furthermore, nozzles 115 and 134, as shown clearly in Figure 4, are preferably substantially smaller in cross-sectional area than chambers 152 and 153, respectively, so that a swift, continuous, substantially unobstructed flow of ink may be maintained in each chamber. Chambers 152 and 153 are so designed by reason of their open ends that while they are maintained full of ink to effect proper inking of the cylinder, the ink bodies are not maintained under appreciable pressure, the pressure being only sufficient to maintain the chamber filled.

A study of the problems involved in the inking of moving rotogravure surfaces discloses that much of the trouble in the prior art is caused by the fact that ordinary methods of inking such surfaces permit a substantial amount of air to be entrapped with the ink in the cells between the screen lines on such printing surfaces as has been previously stated. For best printing results, these cells should be completely filled with ink and should have no air pockets. By using the above described method of my invention it has been found that the relatively swiftly moving successively acting ink streams, flowing in opposite directions and substantially transversely of the direction of motion of the printing surface, completely eliminate the pocketed air from the ink cells and cause these cells to be completely filled with ink. This results in practically perfect printing which can be accomplished at a higher rate of speed than in the prior art because of the fast inking procedure.

As has been described above the ink streams in chambers 152 and 153 preferably flow substantially parallel to each other and in opposite directions. Sealing strip 129 maintains the streams in separated relation and sealing strip 139 prevents escape of ink at the bottom end of the fountain. Doctor blade 99 operates in the well known manner to remove surplus ink from the moving printing surface to prepare it for printing operations.

While the ink streams are oppositely directed in chambers 152 and 153, some ink may flow in each chamber opposite to the direction of the stream. This ink will merely flow along the chambers over the edges of the cylinder into end guards 57. If desired, good inking action can be obtained by subjecting the moving ink surface to successively acting streams of ink flowing in the same direction or agitated in some other suitable manner, but preferably the oppositely flowing successively acting streams above described are used for best results.

Another advantage arising from the use of rapidly moving ink streams over the printing surface is unusually fast inking of the surface accompanied by a scouring action tending to remove and dissolve dried ink residues on the printing surface. To further this scouring action, a suitable mechanism for intermittently increasing the flow of ink at intervals may be provided if desired.

Since the entire fountain is enclosed except at its discharge ends within the end guards and since the ink flows therethrough relatively swiftly, a considerable saving in ink is realized due to the fact that the volatile ink solvents can not easily escape.

The above described methods and apparatus are preferably used in an inking system of the continuous type wherein the ink received in guards 57 is discharged into ink pan 14 from whence it flows through pipe 27 to a suitable strainer or reservoir where it is prepared for recirculation through the system. Continuous high speed inking as described above not only results in a better quality of printing but enables the quantity of printing on a given press to be materially increased with no sacrifice in quality.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A method of inking a moving printing surface which comprises the steps of subjecting that surface to a plurality of successively acting agitated bodies of ink extending substantially transversely of the direction of movement of said printing surface and then removing surplus ink from said surface.

2. A method of inking a moving printing surface which comprises the steps of subjecting that surface to a plurality of successively acting streams of ink flowing substantially transversely of the direction of movement of said printing surface, at least two of said streams of ink flowing in opposite directions, and then removing surplus ink from said surface.

3. A method of inking the printing surface on a rotary printing cylinder which comprises the steps of subjecting a portion of said printing surface to a plurality of successively acting streams of ink flowing along said printing surface substantially longitudinally of said cylinder and then removing surplus ink from said printing surface.

4. A method of inking the printing surface of a rotary printing cylinder which comprises the steps of subjecting a portion of said printing surface to a plurality of successively acting streams of ink flowing along said printing surface substantially longitudinally of said cylinder, at least two of said streams of ink flowing in opposite directions, and then removing surplus ink from said printing surface.

5. A method of inking the printing surface of a rotating printing cylinder which comprises the steps of introducing ink streams adjacent opposite ends of said cylinder at circumferentially spaced points about said cylinder, directing each of said ink streams along said printing surface substantially longitudinally of said cylinder to discharge over the end of the cylinder opposite to that adjacent which it was introduced, and removing surplus ink from said printing surface.

6. A method of continuously inking the printing surface of a rotary printing cylinder comprising the steps of conducting ink from a reservoir to circumferentially spaced points adjacent opposite ends of said cylinder, directing the flow of said ink from said points along the printing surface substantially longitudinally of said cylinder toward the opposite ends of said cylinder, collecting said ink adjacent opposite ends of said cylinder, and returning the ink to said reservoir to be recirculated.

7. Apparatus for inking a moving printing surface comprising means providing a plurality of separate chambers containing bodies of ink in contact with said surface and extending substantially transversely to the direction of movement of said surface, means for introducing ink into said chambers and means permitting withdrawal of ink from said chambers.

8. Apparatus for inking a moving printing surface comprising means providing a pair of ink containing chambers extending substantially transversely of the direction of movement of said surface, portions of said surface serving as wall means for said chambers, means for introducing ink into one chamber adjacent one edge of said surface, means for introducing ink into the other chamber adjacent the opposite edge of said surface, and means for removing surplus ink from said surface.

9. Apparatus for inking the printing surface of a rotating printing cylinder comprising means providing a plurality of separate chambers for ink extending along said printing surface substantially longitudinally of said cylinder, means for introducing ink into said chambers and means for removing surplus ink from said surface.

10. Apparatus for inking the printing surface of a rotating printing cylinder comprising a plurality of ink containing chambers extending along said surface substantially longitudinally of said cylinder, portions of said printing surface serving as wall means along one side of said chambers, means for introducing ink into one chamber adjacent one end of said cylinder, and means for introducing ink into another chamber adjacent the other end of said cylinder.

11. In a printing press, a rotating cylinder provided with a printing surface, means providing an ink chamber extending along said printing surface substantially longitudinally of said cylinder, means for continuously introducing ink into said chamber, ink deflecting means adjacent at least one end of said cylinder into which ink is discharged continuously from said chamber, and sealing means between said cylinder and said ink deflecting means.

12. In a printing press, a rotating cylinder having a printing surface, means providing a chamber for ink extending along said surface substantially longitudinally of said cylinder, means for supplying ink to said chamber, means adjacent at least one end of said cylinder for receiving ink flowing from said chamber, sealing means between said ink receiving means and said cylinder, and means urging said sealing means toward said cylinder.

13. In a printing press, an ink receiving member adapted to be positioned adjacent one end of a rotary printing cylinder, said member comprising a hollow body portion, ink deflecting means on said body portion adapted to engage said cylinder adjacent said one end, and means for maintaining a fluid tight connection between said cylinder and said ink deflecting means.

14. In a printing press of the type defined in claim 13, said last-named means comprising sealing means between said ink directing means and said cylinder, and means for urging said ink directing means toward said cylinder.

15. In a printing press, an ink receiving member adapted to be positioned adjacent one end of a rotary printing cylinder, said member comprising a stationary body portion having a discharge outlet at its lower end, an ink deflecting member movably mounted on said body portion and provided with sealing means for engaging the cylinder adjacent said one end thereof and resilient means for urging said ink deflecting means toward said cylinder.

16. In a rotogravure printing press, a cylinder having a printing surface, means providing an open-ended inking chamber extending along said printing surface substantially longitudinally of said cylinder, said printing surface defining a wall of said chamber, means adjacent one end of said cylinder for introducing a stream of ink into said chamber in such a manner as to promote flow of ink along said chamber toward the opposite end of said cylinder, sealing means extending longitudinally along said cylinder to define another wall of said chamber, and means for removing sulplus ink from said printing surface extending along said cylinder to define a further wall of said chamber.

17. For use in a printing press having a moving printing surface, a fountain member extending transversely of the direction of movement of said printing surface and means defining a plurality of substantially parallel transversely extending ink chambers between said fountain member and said printing surface.

18. For use in a printing press having a moving printing surface, a fountain member extending transversely of the direction of movement of said printing surface, an open-ended transversely extending ink chamber having opposite walls defined by a portion of the printing surface and a portion of the inner surface of said member respectively, transversely extending sealing means defining another wall of said chamber and means for removing surplus ink from said printing surface defining a further wall of said chamber, a second open-ended transversely extending ink

chamber having opposite walls defined by a portion of said printing surface and a portion of the inner surface of said member respectively, said transversely extending sealing means defining another wall of said second chamber and further transversely extending sealing means defining a further wall of said second chamber.

19. Apparatus for use with a moving printing surface comprising a fountain member, a plurality of spaced flexible blade means extending transversely of the direction of motion of said printing surface and projecting from said member into contact with said printing surface to define a plurality of transversely extending open-ended ink passages, and means on the fountain for introducing ink adjacent opposite ends of said passages.

20. In the apparatus defined in claim 19, one of said flexible blade means being a doctor blade for removing surplus ink from said printing surface.

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