

Oct. 6, 1936.

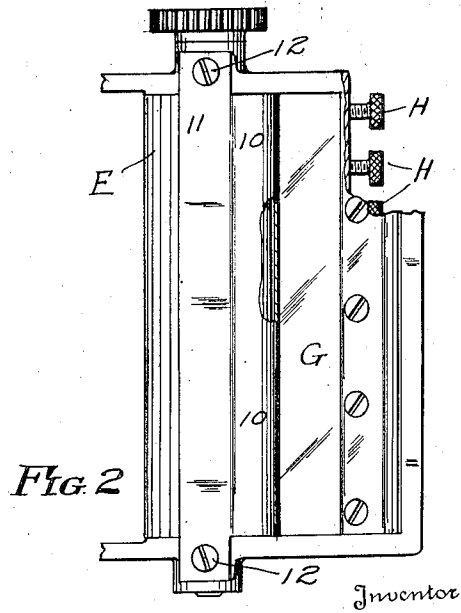
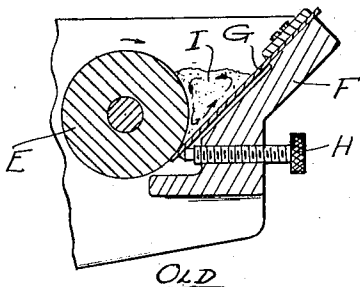
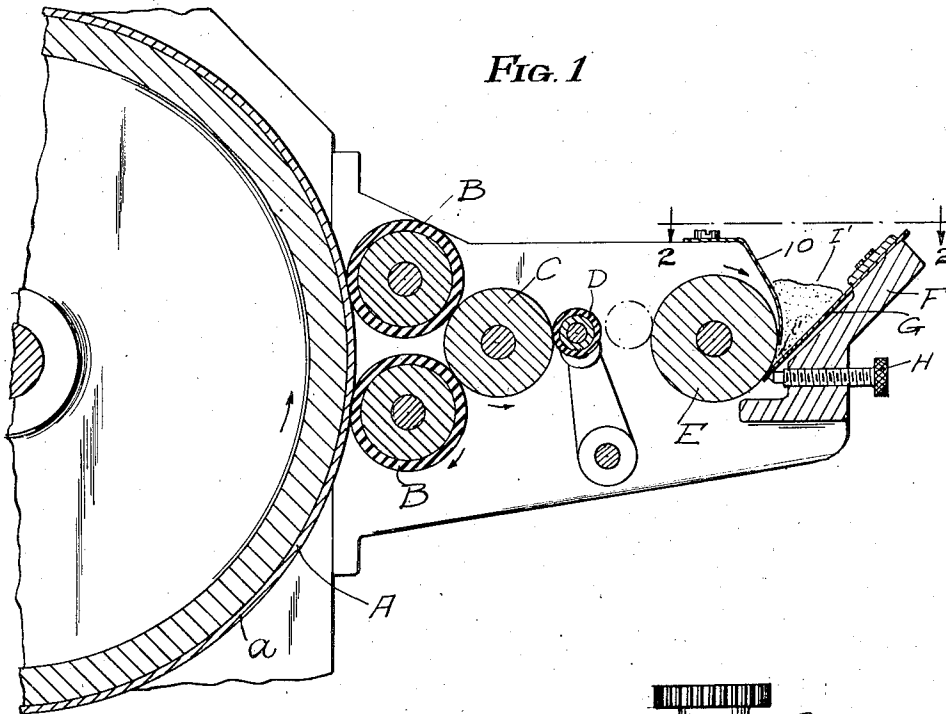
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2,056,210

MEANS FOR FEEDING EMULSOID INKS

Filed July 19, 1932

2 Sheets-Sheet 1



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UNITED STATES PATENT OFFICE

2,056,210

MEANS FOR FEEDING EMULSOID INKS

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Application July 19, 1932, Serial No. 623,383

11 Claims. (Cl. 101—350)

This invention relates to means for feeding emulsoid inks to the inking rolls of printing machines, whereby the emulsoid character of such an ink is maintained throughout the ink distributing operation; and when employed in connection with an ink fountain of the usual roll and doctor blade type, it comprises means for delivering ink to the primary ink roll, from a substantially quiescent body of ink, at a rate not appreciably greater than that at which the said roll is adapted to transfer ink past the doctor blade to the second or ductor roll, thereby preventing such countercurrent flow of ink as tends to cause demulsification thereof.

In certain printing operations, notably in the so-called dry lithographic processes, it has been found desirable to print with emulsoid inks of the water-in-oil type. Sometimes such inks have been used in ordinary printing for the sake of economy, the water component serving as an inexpensive means of extending the ink without, however, affecting its oily character or behavior in general. In so-called dry lithography, aqueous solutions are emulsified in lithographic inks for the dual purpose of rendering the non-printing areas of the printing element capable of retaining a thin film of ink-repelling moisture and of supplying the moisture thereto coincident with the inking of the printing areas, thus avoiding the use of separate dampening rolls and obviating the necessity for the high degree of skill involved in their adjustment and operation.

The usual fountain of printing machines comprises an ink-receiving trough or reservoir formed by the junction of a doctor blade and the primary ink roll, or so-called fountain roll. As the fountain roll is rotated towards the doctor blade, an amount of ink greatly in excess of that which can be carried past the doctor blade by the roll is forced down to the junction of the blade and the roll; and this causes an upward countercurrent flow in approximate parallelism to the blade. The adherence of the ink to both blade and roll is, however, so great that flow cannot take place at the surface of either; but the stirring in the body of ink itself results in a frictional rubbing between the countercurrent flow of the ink and the layers of ink inherent to the blade and roll.

In ordinary ink, comprised principally of a pigment dispersed in a more or less heavy bodied oily vehicle, such stirring is not objectionable and is usually actually advantageous in that it tends to maintain the ink in a thoroughly "worked" condition. When emulsoid inks are used in such fountains, they tend to "break", that is to say, to sep-

arate into their component phases, as the result of the frictional rubbing due to such stirring. If the only effect of the stirring were a partial breaking of the emulsion, the result would not be serious, for the expressed watery component would merely decrease the effective ratio; but it has been found that the result of the breaking produced by the forceful countercurrent flow caused by the upward motion of excess ink squeezed from the fountain roll by the doctor blade, is that droplets of the aqueous phase are forced together within the body of the ink (much as residual buttermilk is expressed from butter by kneading) until they are large enough to displace a portion of the greasy ink from the film carried by the fountain roll past the doctor blade, and thus cause a local deficiency of ink. The detrimental effect of such breaking does not stop there, however. The watery material is transferred from the fountain roll to the second or ductor roll, and thence to the distributing rolls. As the breaking increases, the various rolls increasingly "refuse" ink and the essential uniformity of ink distribution becomes impossible.

The first visual indications of breaking of an emulsoid ink appear as bright, glossy streaks on the ductor roll, where the ink has been partially displaced by the watery substances. Once such a visual indication of breaking becomes apparent, the operator is forced to remedy the resulting defective ink distribution by such a temporizing expedient as releasing the expressed watery material from the bottom of the fountain by working the ink away from the fountain roll and piling it up momentarily on the blade, thus allowing the expressed droplets to escape the pinch of the roll and blade. This escape is possible under the described conditions because of the fact that the composite ink is much more viscous than the watery component even when the latter is composed for the greater part of glycerin or glycol, which are customarily preferred. Such an expedient, while temporarily effective, is not good practice, not only because the predetermined ratio of cooperating components is—and continues increasingly to be—disadvantageously disturbed, but also because there is a consequent degradation in the quality of the resulting prints. The ratio of dispersed oil-immiscible fluid to the oily vehicle in printing ink is usually carefully adjusted, within rather narrow limits, to supply to the printing element ink containing an amount of the fluid sufficient to maintain the non-printing areas ink repellent. It will be readily understood that a diminution in the amount of oil-immiscible or

ink-repellent fluid available for the purpose must progressively lower the ink-repellency of the non-printing areas and result in an acceptance of ink by these surfaces, and hence "toning" or a degradation of the whites, or highlights, of the print. The only practical expedient heretofore available to the operator when breaking occurred to such an extent as to affect the quality of his work was to remove the ink and accumulated watery fluid from the fountain and to start over again with a fresh supply of ink.

Many attempts have heretofore been made to so stabilize the dispersed aqueous phase of emulsoid inks as to obviate breaking in the fountain; but these attempts failed, not only because stabilizing agents tend to dilute the ink and hence decrease its covering power—which is objectionable in lithographic processes generally and particularly so in offset processes, but also because the metallic soap emulsifying agents suitable for stabilizing water-in-oil emulsions are either adversely reactive with the metal printing elements or inimical to the maintenance of these surfaces in a moisture-receptive condition, as is prerequisite in the lithographic process.

It must be understood, moreover, that, in printing processes which depend upon the immiscibility of oil and water, the emulsoid inks are designed to fulfill a dual function, as stated; and that the use of any emulsifying or stabilizing agent which so stabilizes the aqueous phase dispersed in the ink as to prevent the dispersed globules at the surface thereof from breaking to the moist non-printing areas on contact therewith would therefore defeat the principal purpose of using such inks in such processes.

I have discovered a method of supplying emulsoid inks to the ink rolls of printing machines in such a manner as to avoid the separation of the dispersed phase thereof, and have devised as part of this invention means for practicing the said method.

I am aware that it is well understood by those skilled in the art that the use of emulsoid inks necessitates more careful adjustment of the various ink rolls than is required with ordinary inks, and that by such careful adjustment some emulsoid inks, and particularly those inks which either contain but small proportion of dispersed phase or are of such a very light body that the viscosity of the continuous phase differs but little from that of the dispersed phase, and are therefore more stable against de-emulsification forces than those heavy bodied inks of which the component phases are of widely differing viscosities, can be successfully used in ordinary ink fountains; but I do not know of any such prior method by which any emulsoid ink sufficiently stable to maintain its phase relationship at rest but susceptible of de-emulsification by mechanically induced frictional or countercurrent flow could be successfully fed through the inking mechanism of a printing machine without suffering such de-emulsification.

In view of the assumption that the breaking in the ink fountain of statically stable emulsoid inks was caused by the frictional squeeze of the ink between the moving fountain roll and the stationary doctor blade as the layer of ink adherent to the roll was carried by it past the end of the blade and out of the fountain, expressing and leaving behind the relatively fluid watery material, it seemed fairly obvious that there could be found no practical solution of the problem presented by inking systems comprising a doctor blade acting against an ink roll. The "blade and roll"

fountain is so universally used that no relief could be expected from any fundamental modification thereof, and the most promising compromise had seemed to lie in the direction of providing means whereby the expressed watery material could escape from the bottom of the fountain, thus eliminating the most serious effect of breaking as a factor causing defective ink distribution. I discovered, however, that, when a channel was provided whereby such watery material as was expressed could immediately escape, no such escape took place because expression of the watery material had apparently not occurred at all under these circumstances. This surprising and unexpected result demonstrated the fallacy of the assumption previously held, and afforded a complete solution of the problem rather than the compromise, or partial solution, which had been expected.

A painstaking investigation of the behavior of the ink in the fountain disclosed further unexpected facts which, for a clear understanding of the invention, are hereinafter set forth.

The slow rotary motion of the ink in the fountain has long been recognized, and, as stated, was thought to be of advantage—as it is for ordinary inks, because emulsification is customarily effected by stirring the watery material into the oily pigment-vehicle of the ink; but it was found that, when thin layers of emulsoid ink adherent to surfaces are caused to rub each other under pressure as by the relative motion of these surfaces, the resultant stirring, on the contrary, causes first an increase in the dispersed particle size and subsequently the separation of the so-formed larger particles from the continuous phase.

Microscopic examination of samples of emulsoid inks extracted from an ordinary fountain, after having been subjected therein to the de-emulsifying effect of the countercurrent stirring or rubbing action above described, but prior to the occurrence of any visual indication of breaking as described earlier herein, and comparison of such samples with samples of the same ink before such treatment, discloses the fact that the visual and detrimental effect of breaking is the ultimate result of a progressive coalescence of dispersed globules of colloidal dimensions into droplets of a sufficiently larger order of magnitude to permit their expression from the continuous oily phase of the ink by the combined pressure and rubbing forces acting thereon in the fountain. It is thought that the droplet size at which expression can take place under the influence of a given pressure rub, acting for a given time, is inversely proportional to the ratio of viscosities of the watery and the oily phases. Thus, a heavy bodied emulsoid ink, that is, one comprising viscous, partially polymerized oil or a lighter oil heavily loaded with pigment, is more sensitive to a pressure rub than are less viscous inks containing dispersed watery globules of the same average size.

To be stable, within the meaning of the term as herein used, the ratio of globule size to vehicle viscosity must be such that no appreciable separation takes place on long standing under the influence of gravity alone. The subjection of the ink to the influence of centrifugal force is considered equivalent to long standing and is therefore an acceptable means of readily determining the static stability of emulsoid inks.

The purpose of my invention is to provide means for feeding emulsoid inks to the inking mechanism of a printing machine so as to avoid detrimental breaking of such inks and thereby both to maintain the effective ratio of the com-

ponents of the ink and to obtain a uniform or desired distribution of the ink.

I accomplish the desired result by maintaining the main body of the ink supply in a substantially quiescent state, preferably though not necessarily in a reservoir formed, in an ordinary fountain, by the cooperation of the blade, fountain ends and a partition separating for the most part the roll from the ink; and by causing or allowing the ink to flow from such reservoir in a uni-directional stream to the primary roll, at a rate not appreciably greater than that at which the said roll is capable of removing the ink past the blade and is adapted to transfer the ink to the second or ductor roll, thereby substantially avoiding such accumulation of surplus ink at the junction of roll and blade as would be forced to counter-flow the feeding stream, and preventing such consequent forced rubbing as has resulted in demulsification.

Certain means for accomplishing the desired result, which means may be adjustable for the purpose of controlling the quantity of ink supplied to the roll, will now be described and are set forth in the accompanying drawings, in which:

Fig. 1 is a vertical section through a printing machine having an ink fountain in a simple form provided with one embodiment of my invention;

Fig. 2 is a plan of the ink fountain illustrated in Fig. 1;

Figs. 3 and 4 are plans of the ink fountain, illustrating means of adjusting the ink-restraining device;

Figs. 5 and 6 are cross sections on the correspondingly numbered lines on Figs. 3 and 4;

Fig. 7 is a detail of the adjustable partition of Figs. 4 and 6, being cross sections on the line 7-7 of Fig. 6;

Fig. 8 is a diagrammatic view showing an old type of roller and doctor blade fountain, this view illustrating the countercurrent flow of the ink in such fountain.

Referring first to Fig. 1, A indicates a suitable form cylinder of a press. The printing element may be a lithographic plate *a* as indicated, or some other form according to the nature of the press. BB indicates a pair of ink transferring rolls (or form rolls) contacting the form, and distributing roll C. A ductor roll D operates between the distributing roll and the fountain roll E in the usual manner. F indicates the frame of the ink fountain; G, an adjustable doctor or fountain blade therein; and H, a series of set screws for adjusting the bottom edge of this blade against the fountain roll E. This much of the construction is common in printing presses.

As shown in Fig. 8, the mass of ink I, in the old constructions, lies in the space defined by the doctor blade G and the fountain roll E. In operation, the fountain roll moving in the clockwise direction sets up the de-emulsifying countercurrent flow of ink previously described, as indicated by the arrows. In order to prevent the creation of this flow, I provide a wall 10 (see Figs. 1 and 2) which maintains the most of the ink I' out of contact with the revolving fountain roll E. The lower edge of the wall is spaced away from the blade G so that some of the ink, in this case under the influence of gravity, flows past this edge to the roll. The space between the lower edge of the wall 10 and the blade G determines the amount of ink available to the roll E which, as previously stated, should not be appreciably in excess of that removed from the

fountain by the roll. The wall 10 is provided with a horizontal top portion 11, which extends over the walls of the fountain and is secured thereto by screws 12.

While Figs. 1 and 2 show a practical form of my partition, it is desirable to make the wall adjustable to better control the inking action. One form of adjustment is illustrated in Figs. 3 and 5. In this case, I make the wall 20 in the form of a flat blade which is supported near its upper ends by a pair of studs 21, which may be bifurcated to embrace the blade and transversely pinned to it as indicated at 22 in Fig. 3. The studs 21 extend through arcuate slots 23 formed in the side plates F of the ink fountain, these slots being eccentric to the axis of the fountain roll. The studs are preferably screw-threaded beyond the fountain sides and have mounted on them nuts 25 with knurled heads.

The loosening of the nuts 25 allows the shifting of the studs with the consequent changing of position of the blade 20. Thus, the blade may stand, for instance, in such position, as shown in full lines in Fig. 5, permitting only a very small portion of the ink between it and the doctor blade G to touch the roll E, or it may occupy any of a number of other positions, as indicated by the broken lines 20^a in Fig. 5.

Figs. 4, 6, and 7 illustrate another form of adjustable ink-restraining wall. In this case I have provided, in addition to the roller-engaging wall 10 of Fig. 1, a plate 30, which is serrated at its lower edge, as shown at 31 (Fig. 7). The two members 10 and 30 may be held rigidly by screws 15 in the same manner as the plate 10 in Fig. 2. Slidably mounted on the plate 30 is a plate 32 having a serrated lower edge indicated at 33. This plate 32 is shown as having longitudinal slots 34 through it and as clamped in place by wing nuts 35 which screw onto studs 36 carried by the partition 30 and extending through the slots 34.

The construction just described provides an adjustable gate controlling the passage of the ink from the main fountain to the region adjacent the roller. The loosening of these wing nuts enables the plate 32 to be shifted longitudinally to more or less cover the openings between the teeth 31 of the underlying plate. In this manner, I regulate the quantity of ink which is permitted to pass to the fountain roll. The ink in this case, which may be moved directly by the movement of the fountain roll is that small quantity which is below the lower edge of the wall 10 and at the left of the plate 30.

While the ink controlling means above described has been found effective where the ink is of such character that it will flow under the influence of gravity at a rate commensurate to the requirements of the inking rolls, and is adequate for most emulsoid inks, and the requirements of lithographic offset printing in general, I have sometimes found it expedient, particularly when printing with stiff heavy-bodied inks, or printing large solid areas requiring ink in large amount, to cause the ink to flow to the fountain roll at a rate greater than that obtainable by the gravitational motion of the ink alone. I have found that I can increase the rate of flow of the ink, while maintaining nevertheless the reservoir-body of the ink in a state of internal quiescence by superimposing an increased gravitational load or subjecting the mass to a mechanically induced propulsive force.

It will be seen that whichever of the illustrated

forms of controlled fountain is employed the effect is to greatly reduce the portion of the ink in the fountain which is in direct contact with the fountain roll, while a reservoir is formed in which there is a mass of ink in a state of internal quiescence, which continuously feeds the ink in contact with the roller. There is a sufficient area in the connection between the lower portion of the ink and the main supply portion thereof so that the lower portion is constantly supplied by the supply portion and ink is carried by the fountain roller to the doctor roll continuously and is thereafter fed to the press in the usual manner. Accordingly, my restraining devices do not, in any manner, interfere with the continuous supply of ink from the fountain to the press, but have the decided advantage of preventing the churning action of the ink and consequent separation thereof.

The essence of my invention is the feature of maintaining the emulsoid character of the ink throughout the distribution operation. One means of attaining this result, is by the provision in an ink fountain of the well-known roll and doctor blade type of a wall limiting the arcuate surface contact of the fountain roller with the supplied ink; and a limiting wall is also employed in the pressure fountain embodiments illustrated. It will be understood, however, that I am not limited to the particular means shown and described, since other means may be employed without departing from the spirit and scope of my invention as set forth in the following claims.

I claim:

1. In an ink fountain, the combination of a fountain roll, a doctor blade, means for adjusting the latter with reference to the roll, and an ink-restraining wall extending lengthwise of the roll and having its lower edge in engagement with the roll in a region between the roll surface and the doctor blade.

2. In an ink fountain, the combination of a roll, a spring doctor blade to form the bottom of the fountain, adjusting screws to adjust the position of the blade with reference to the roller, and a longitudinal plate supported above and depending into the space between the doctor blade and roll and having its lower edge adjacent the roll a short distance above the blade.

3. In an inking fountain, the combination of a fountain roll mounted on a horizontal axis, an inclined doctor blade having its lower end in contact with the roll, means for adjusting the presentation of the lower edge of the blade to the roller, a longitudinal plate depending into the region between the convex surface of the roll and the inclined surface of the blade, said plate having its lower edge substantially in contact with the roll, which lower edge is located a comparatively short distance above the contact of the doctor blade and roll, whereby the amount of ink in actual contact with the roll is small compared to the total quantity of ink which may be in the fountain.

4. In an ink fountain, the combination of a fountain roll, a doctor blade, a plate depending into the space between the roll and blade, a movable device carrying the plate and adapted to hold it with its lower edge contacting with various regions of the roll.

5. In an ink fountain, the combination of a fountain roll, an inclined doctor blade coacting therewith, a plate depending into the space between the roll and inclined doctor blade, and means for holding said plate at various angles to the inclined doctor blade.

6. In an ink fountain, the combination of a fountain roll, an inclined doctor blade coacting therewith, walls forming the end of the ink trough, arcuate slots through such walls, eccentric of the roll and located above the ink trough, studs adjustably clamped in said slots, and a plate carried by said studs, whereby the plate may occupy various angles with reference to the inclined doctor blade and have its lower end terminate at various heights on the roll.

7. In an ink fountain, the combination of a fountain roll, means for supporting a supply of ink in contact therewith and adjustable to control the amount of ink which may be carried by the fountain roll, and means adjustable to vary the effective ink passage to the fountain roll.

8. In an ink fountain, the combination of a fountain roll, means adjustable relative thereto for supporting a supply of ink, the lower portion of which supply may engage the roll, and an adjustable wall adapted to prevent the upper portion of the supply of ink from engaging the roll while providing a variable passage for ink to the roll.

9. In an ink fountain, the combination of a fountain roll, a doctor blade adjustable with variable pressure against the roll, a wall in the region between the roll and blade, said wall being adjustable to vary the quantity of ink which may directly engage the roll.

10. In an ink fountain, the combination of a roll, a doctor blade substantially tangent to the roll, means for pressing the blade near its free end to cause the flat surface thereof to contact with the roll of variable pressure, a plate depending into the space between the roll and the blade and supported independently of the blade, said plate being adapted to be moved to adjust the position of the lower edge thereof relative to the roll, whereby the quantity of ink which has access to the roll may be regulated while the remainder of the ink is maintained quiescent.

11. In an ink fountain, the combination, with the end walls, bottom and rear of the fountain, of a fountain roll at the front of the fountain space, a plate depending into the fountain space and extending from one end wall to the other, and a pair of studs projecting from the ends of the plate through arcuate slots in which they are adjustable, whereby the plate may be held in various positions with reference to the roll.

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