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2,733,653

DAMPENING SYSTEM AND METHOD OF USING SAME

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8 Claims. (Cl. 101-147)

This invention relates to an improvement in the application of repellent to the surface of a lithographic printing plate and it relates more particularly to apparatus used in connection with a lithographic printing press for the application of repellent to the plate surface.

The principles underlying the operation of a lithographic plate are well recognized and the same whether the plate be formed of the old lithographic stone etched metal plate or the more recently developed coated paper lithographic plates. In theory, the imaged portion of the plate becomes ink receptive and water repellent while the non-imaged portion forming the remainder of the plate surface is hydrophilic in character and preferentially receives water and repels the oily or greasy ink compositions.

In operation, an aqueous repellent is first applied to wet the surface of the plate. When present in the desired amounts, the repellent wets only the hydrophilic, non-imaged portion so that greasy inks will be repelled thereby and received only by the imaged portion for transfer onto the offset blanket for the production of copy. It is generally recognized by those skilled in the art that the critical conditions in the operation of a lithographic plate in planographic printing resides in the maintenance of a desired balance of repellent on the plate surface. Much of this difficulty stems from uncontrolled factors characteristic of present dampening systems. When too much repellent is present on the surface of the plate, the imaged portion becomes wetted, in part, and the copy "grays," while insufficient repellent on the surface of the plate causes the entire surface of the plate to take ink, whereby the image becomes "blacked out" and copy of acceptable quality is incapable of being produced.

It is believed that the basic difficulty which prevents any possibility of maintaining the desired balance of control in present systems is due in part to the fact that when the plate dampeners are wet sufficiently to prevent any transfer of ink from the plate image, they, at the same time, are too wet to print properly. As a result, it has been necessary to strike a compromise. In practice, the form roller is wet sufficient to prevent scumming but not enough to repel the ink entirely. As a result, the dampening form roller becomes progressively contaminated with ink and requires increasing amounts of repellent to prevent scumming on the plate.

In addition to the above, the present dampening system is subject to a number of other objections, a few of which will hereinafter be specifically mentioned. (1) Because of the requirement for having the dampening rollers properly wet out with repellent before contact with the surface of the plate, it is impossible to start operation to produce copy until several cycles have been made properly to condition the dampening roller. (2) It is necessary to maintain an accurate adjustment between the dampener and the plate surface for application of sufficient repellent without excessive contamination of the form roller or damage to the image on the plate surface.

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(3) In effect, the control through the dampening system is limited to one direction only. While additional water can be applied when necessary, no means is available for cutting back on the amount of moisture on the plate surface other than to dissipate the excess in use gradually by cutting down on the supply until the desired conditions are temporarily secured. In the meantime copy of poor quality is being produced. (4) The presence of the dampening roller in contact with the lithographic surface constitutes a source of wear and damage to the image and can materially affect the number of copies which can be produced. (5) Because of the contamination factor and the removal of ink by the molleton or dampening rollers operating in contact with the surface of the plate, the molleton covers must be replaced or cleaned periodically and additional press operations are required to break the dampeners in for proper use.

The objectionable features of present dampening systems which make use of a molleton roller or other dampening form roller have been substantially completely eliminated by the new and improved dampening system of the type described and claimed in the Mullen Patent No. 2,604,848, which issued on July 29, 1952. Briefly described, the Mullen system makes use of a water roll which applies an excess of water onto the surface of the plate in advance of the inking form roller. The excess moisture is removed from the surface of the plate by an air blade which operates continuously across the plate and may be adjusted substantially completely to remove the water from the imaged areas of the plate while leaving a film of water of minimum thickness over the non-imaged areas. The described Mullen system provides an exact control of moisture for each revolution of the plate cylinder and independently of the amount of moisture present on the surface of the plate in the previous cycle. Thus it is possible to achieve proper wetting in the first cycle of the machine for the production of copy and it is also possible to achieve immediate adjustment in the amount of moisture on the plate surface without juggling the ratio of water to ink as the printing operation continues. Once the amount of moisture for best operation has been established, it is possible to maintain the desired conditions substantially indefinitely during the operation of the machine. By reason of the fact that the moistening roll applies an excess of water without contact with the surface of the plate, wear on the plate is eliminated as a factor and no ink is capable of being transferred back from the surface of the plate thereby to eliminate the problems incident to the transfer of ink to the dampening roller as in the present systems. Because the air blade removes all entangling water from the dot image and establishes essentially a dry dot image, this system is better adapted to the reproduction of sharper as well as full inked dots in tone and half-tone printing.

The dampening system of the type described differs basically from the present systems in that it is not dependent upon the amount of water repellent applied to the surface of the plate but relies upon the application of a controllable excess of repellent to the plate and the reduction of the excess water film by adjustment of air pressure to provide a minimum quantity on the non-printing areas and substantially complete absence of moisture on inked areas at the point of contact between the plate and the ink form rollers.

While the described air blade system for plate dampening provides a vast improvement in the operation of a planographic printing machine, it is an object of this invention to provide still further improvements in the dampening system of the type described.

It is an object of this invention to provide a dampening system of the type described in which problems incident

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INKING AND REPELLENT SYSTEM FOR PLANOGRAPHIC PRINTING MACHINES

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This invention relates to improvements in printing or duplicating machines of the planographic type and it relates more particularly to improvements and simplification in the process and apparatus for conditioning lithographic plates for printing.

In lithographic printing, the lithographic plate having an ink receptive and water repellent image anchored onto the ink repellent and hydrophilic surface is first engaged by a repellent applicator for wetting the non-imaged portion of the plate and is then engaged by an ink roller for applying ink composition which is received only by the imaged portion of the plate and repelled by the non-imaged portion. In direct printing, the inked plate reproduces the image on the surface of the copy sheet when pressed against the surface of the plate by means of a platen roller or the like. In indirect or offset printing, the inked plate is engaged by an offset blanket for transfer of the ink in mirror image to the surface thereof and from which the transfer is reproduced as a direct image onto a copy sheet as it passes under compression between the offset blanket and a platen roller.

In a rotary duplicating machine of the offset or direct type, the lithographic plate is mounted on a cylinder or drum. A repellent system is provided for applying the aqueous repellent to the surface of the plate in a desired amount and a separate ink distributing system is provided for applying a uniform and desired distribution of ink onto the surface of the wetted plate for inking the imaged area.

It is necessary to provide means for adjusting the concentration of ink and achieving a desired distribution of ink in order to produce copy of good quality and it is also necessary to provide means for adjusting the amount of repellent applied to the surface of the plate and to balance the amount of repellent and ink for continuous operation.

If the amount of repellent is insufficient, the lithographic plate or master will tone or ink up and ink will be caused to transfer to areas other than those that are imaged and produce undesirable copy. If the amount of repellent is excessive, then the imaged portion will become wet and spotty and imperfect copy will result and emulsification may also take place to prevent subsequent use of the ink composition.

The repellent system in general used to the present includes a ductor roller which periodically reciprocates back and forth between a roller submerged in a bath of repellent and a molleton roller positioned to engage the surface of the lithographic plate. The repellent roller turns slowly in the bath and transfers aqueous repellent from the surface thereof to the ductor roller upon contact. The molleton roller is provided with a molleton cover in the form of a cotton sleeve or the like for absorbing the repellent from the ductor roller and distributing same over the surface for transferring uniform concentrations to the surface of the plate. Because of the ink remaining on the imaged portion of the plate, the molleton roller soon becomes loaded with ink composition to the extent that periodic replacement is necessary for desired operation.

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It will be apparent that the separate systems for applying ink and repellent, the controls necessary to regulate the amount and distribution thereof, and the systems for spreading the ink and repellent over the respective rollers of the systems require the use of considerable equipment, space and necessitate the employment of expert labor in order to succeed in the production of copy of good quality. These requirements handicap the utility of prior machines and their adaptability for use in office duplication work and it is a general object of this invention to overcome the objectionable characteristics of the present machines.

It is an object of this invention to produce a planographic printing machine of the type described which is more adaptable to office copy work and it is a related object to produce a machine of the type described which is more compact; which is simple in operation; which provides for simple and expedient adjustment for balancing the amount of repellent and ink; which eliminates the need for skilled labor in order to produce copy of good quality, and which eliminates many of the time consuming and undesirable operations characteristic of ink and repellent systems of the type heretofore employed.

A further object is to produce a rotary planographic duplicating machine embodying a new and improved system for transfer of repellent to the surface of the lithographic plate and it is a related object to provide a repellent system of the type described in which the amount of repellent advanced to the plate may be easily and quickly adjusted to provide a simple and expedient control and in which replacement of a molleton is avoided thereby to eliminate the nuisance, dirt and effort characteristic of present repellent systems.

A still further object is to provide a lithographic duplicating machine of the type described in which ink and repellent are applied from a single system without noticeable emulsification and which embodies means for easily and quickly adjusting the amount of ink and repellent advanced to the plate for maintaining the desired balance required for continuous operation in the production of copy of good quality.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of this invention is shown in the accompanying drawing in which—

Figure 1 is an elevational perspective view of a part of a rotary lithographic machine embodying features of this invention;

Figure 2 is a sectional elevational view taken substantially along the line 2—2 of Figure 1, and

Figure 3 is a schematic elevational view of the repellent rollers, taken as indicated by a line 3—3 in Fig. 2.

Description will now be made of an assembly embodying the features of this invention for use in a conventional type of rotary lithographic press suitable for office use in the production of copy from metal or paper lithographic plates by direct or offset technique. It will be understood that the features of this invention are equally applicable to larger installations for the production of copy by lithographic process. As shown in the drawing, 10 indicates a frame work for the machine including upright side walls 11 and 12 between which a master or plate cylinder 13 of relatively large diameter is mounted for rotational movement with shaft 14. Means are provided, such as clamps 15 and 16, for mounting a lithographic plate 17 about the periphery of the drum 13 and on which the desired image has been formed for the production of copy. Apparatus of this character usually has another cylinder of substantially equal dimension for mounting an offset blanket in contacting relation with the plate during turning movement to enable ink in the imaged portion of the plate to be transferred in reverse onto the blanket and then onto copy sheets as such copy

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plate mounted for movement in one direction on a support, means for applying an excess of liquid repellent onto the surface of the plate and means for removing repellent from the imaged areas of the plate and the excess repellent from the non-printing portions of the plate including an air nozzle having an outlet opening extending continuously crosswise of and in closely spaced relation with the surface of the plate, said air nozzle being positioned to direct the stream of air as a continuous air blade onto the surface of the plate at an angle of less than zero but greater than -30° with the normal to the plate whereby the excess repellent on the surface of the plate and repellent on the imaged portions thereof is displaced rearwardly onto the oncoming portions of the plate, means for removing the repellent displaced rearwardly onto the plate comprising a housing having an inlet opening aligned with the outlet opening of the air nozzle and in closely spaced parallel relation therewith and in closely spaced relation with the plate surface to remove repellent displaced rearwardly onto the surface of the plate, means for introducing air into the air nozzle for passage through the outlet opening as an air stream of high velocity, and means for withdrawing air from the suction housing to withdraw repellent through the inlet opening from the surface of the plate.

4. A dampening system as claimed in claim 3 which includes means for adjusting the pressure of the air introduced into the blade housing to adjust the pressure of air in the air blade extending across the surface of the plate.

5. A dampening system as claimed in claim 3 in which the air nozzle is positioned to direct the air blade onto the plate at an angle between -10° and -30° .

6. The method of dampening a planographic printing plate by the use of apparatus of the type described which comprises moving the printing plate continuously in one direction, applying a liquid repellent onto the surface of the plate in excess of the amount required for use in the printing operation, directing a stream of air which extends continuously crosswise of the plate as a blade onto the surface of the plate at an angle less than zero but greater than -30° with the normal to the plate whereby the

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excess repellent on the non-printing portions of the plate and repellent on the imaged portions is displaced rearwardly onto the plate from the line of contact between the air blade and the plate and removing repellent displaced rearwardly onto the plate by suction means having its inlet opening aligned with the blade and positioned immediately rearwardly thereof.

7. The method of dampening a planographic printing plate by the use of apparatus of the type described which comprises the steps of moving the plate continuously in one direction, applying liquid repellent onto the surface of the plate in excess of the amount required for use in the printing operation, directing a stream of air extending continuously crosswise of the plate as a blade onto the surface of the plate from an air nozzle having its exit opening extending continuously crosswise of the plate and positioned to direct the air stream onto the blade at an angle less than zero but greater than -30° to the normal of the plate whereby the excess repellent on the non-printing portions of the plate and repellent on the imaged portions is displaced rearwardly from the point of contact, and removing repellent displaced rearwardly onto the plate by suction means through a housing having its inlet opening co-extensive with an aligned with the exit opening of the nozzle and spaced immediately rearwardly thereof, introducing air into the nozzle for issuance under pressure from the exit opening as a continuous blade, and withdrawing air from the housing to such the excess repellent displaced rearwardly by the blade through the inlet opening into the housing for removal.

8. The method as claimed in claim 16 in which the air nozzle is positioned to direct the stream of air as a blade onto the surface of the plate at an angle between -10° and -30° with the normal.

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repellent to pass as a spiral film with the rollers through the nip for transfer from roller 31 to the form roller.

The amount of repellent carried through the nip depends upon the pressure between the rollers, as previously pointed out, and the frequency of such amounts being carried through depends upon the number of droplets or the frequency of droplets traveling down the incline. Thus two separate and distinct means, each of which may be accurately and quickly adjusted, are available for varying the amount of repellent that is advanced to the form roller and onto the lithographic plate.

By increasing the frequency of droplets, the amount of repellent may be increased and by adjustment of valve 48 to decrease the number of droplets, the amount of repellent fed to the lithographic plate may proportionally be decreased.

By screwing in the bolt members 36, the pressure between rollers is increased to cause a proportional decrease in the thickness of the film of repellent that remains on the inner roller 31 for transfer to the form roller. Loosening of the bolts permits the outer roller 30 to shift outwardly and increase the amount of repellent which is fed to the lithographic plate. It will be understood that the pressure between the roller 31 and the form roller 26 is kept sufficient to maintain surface contact between these rollers, despite the inclination of the rollers 30 and 31 relative to the horizontal axis of the form roller.

It will also be apparent that by travel of the droplets from one end to the other in the crotch between ink rollers, repellent will have been applied uniformly through the length of the roller. Thus it is possible by the greatly simplified system described herein to secure uniform application of repellent and to achieve accurate and rapid adjustment for maintaining the desired balance of ink and repellent for continuous operation. When the amount of repellent is intentionally reduced to cause the plate to tone, normal conditions for good duplication can be quickly restored by increasing the feed rate of repellent and the excess ink on the surface of the plate is completely and quickly removed.

It will be understood that the concepts of this invention which provide for a quick and easy adjustment of repellent to ink composition and which eliminates many of the undesirable features, expense and space requirements of prior processes may be embodied in lithographic machines of different types wherein ink and repellent are required to be supplied to the printing surface in varying but predetermined proportions.

It will be further understood that instead of mounting the repellent rollers 30 and 31 for transfer of repellent directly to the form roller, or as previously pointed out to distributing rollers for ultimate transfer to the form roller or plate, the repellent rollers may be adapted to contact practically any roller in the ink distributing system for transfer with the ink to the form roller or the plate, and that other changes may be made in the specific means for adjusting the spaced relation between rollers and for supplying the repellent dropwise to the crotch between the repellent rollers without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. Apparatus for applying ink and repellent to a planographic printing plate mounted on the periphery of a horizontal rotating drum comprising a form roller mounted for rotational movement about a horizontal axis and in surface contact with the plate, means for supplying ink in uniform distribution to the form roller, means for feeding repellent to said form roller for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween, means mounting one end of the repellent rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis

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of said form roller, means for feeding repellent in drops into the crotch at the higher end in excess of the amount to be transferred to the form roller whereby drops travel down the crotch during rotation of the repellent rollers, and a contacting relation between one of the repellent rollers and the form roller to transfer repellent passing through the crotch to the plate.

2. Apparatus for applying ink and repellent to a planographic printing plate mounted on the periphery of a horizontal rotating drum comprising an ink train including a series of inking rollers mounted for rotational movement about horizontal axes for supplying ink in uniform distribution to the plate, means for feeding repellent to said ink train for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween with one of the repellent rollers in surface contact with one inking roller in said train, means mounting one end of the repellent rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis of said one inking roller, and means for feeding repellent into the crotch at the upper end of the repellent rollers whereby the repellent travels down the crotch during rotation of the repellent rollers and some of the repellent is carried through the crotch for transfer to the one inking roller and to the plate.

3. Apparatus for applying ink and repellent to a planographic printing plate mounted on the periphery of a rotating horizontal drum comprising an ink train having a series of inking rollers mounted for rotational movement about horizontal axes for supplying ink in uniform distribution to the plate, means for feeding repellent to said ink train for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween with one of the repellent rollers in surface contact with one of said inking rollers, means mounting one end of the repellent rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis of said one inking roller, means for feeding repellent in drops into the crotch at the upper end of the repellent rollers in excess of the amount to be transferred to the inking roller whereby the drops travel down the crotch during rotation of the repellent rollers and some of the repellent is carried through the crotch for transfer to the inking roller and to the plate, and means for adjusting the rate of dropwise feed of repellent into the crotch between the repellent rollers thereby to adjust the frequency of the drops and correspondingly the amount of repellent which passes through the crotch to the inking roller.

4. Apparatus for applying ink and repellent to a planographic printing plate mounted on the periphery of a rotating horizontal drum comprising a form roller mounted for rotational movement about a horizontal axis and in surface contact with the plate, means for supplying ink in uniform distribution to the form roller, means for feeding repellent to said form roller for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween with one of the repellent rollers in surface contact with the form roller, means mounting one end of the repellent rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis of said form roller, means for feeding repellent in drops into the crotch at the upper end of the repellent rollers in excess of the amount to be transferred to the form roller whereby the drops travel down the crotch during rotation of the repellent rollers and some of the repellent is carried through the crotch for transfer to the form roller and to the plate, and means for adjusting the other repellent roller in the direction toward and away from the one repellent roller in surface contact with the form roller to vary the pressure between the repellent rollers and thereby correspondingly to adjust the amount

of repellent carried through the crotch to the form roller.

5. Apparatus for applying ink and repellent to a planographic printing plate mounted on the periphery of a rotating horizontal drum comprising an ink train including a series of inking rollers mounted for rotational movement about horizontal axes for supplying ink in uniform distribution to the plate, means for feeding repellent to said ink train for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween with one of the repellent rollers in surface contact with one inking roller in said train, means mounting one end of the repellent rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis of said one inking roller, means for feeding repellent in drops into the crotch at the upper end of the rollers in excess of the amount to be transferred to the ink train whereby the drops travel down the crotch during rotation of the repellent rollers and some of the repellent is carried through the crotch for transfer to the ink train and to the plate, means for adjusting the rate of dropwise feed of repellent into the crotch between the repellent rollers thereby to adjust the frequency of the drops and correspondingly the amount of repellent which passes through the crotch to the ink train, and means for adjusting the other repellent roller in the direction toward and away from the one repellent roller in surface contact with said one inking roller to vary the pressure between the repellent rollers and thereby correspondingly to adjust the amount of repellent carried through the crotch to the ink train.

6. Apparatus for applying ink and repellent to a plano-

graphic printing plate mounted on the periphery of a rotating horizontal drum comprising an ink train including a series of inking rollers mounted for rotational movement about horizontal axes for supplying ink in uniform distribution to the plate, means for feeding repellent to said ink train for transfer with the ink to the plate comprising a pair of repellent rollers mounted in side by side relation to form a crotch therebetween with one of the rollers in surface contact with one inking roller in said train, means mounting one end of the rollers at a higher level than the other to provide a gradual tilt of said repellent rollers relative to the horizontal axis of said one inking roller, means for feeding repellent in drops into the crotch at the upper end of the repellent rollers in excess of the amount to be transferred to the ink train whereby the drops travel down the crotch during rotation of the repellent rollers and some of the repellent is carried through the crotch for transfer to the ink train and to the plate, and a drip pan underlying the repellent rollers for collecting the excess repellent which drains from the crotch.

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