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Madigan

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[54] **INK TRANSFER ROLLER FOR PRINTING PRESSES**

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[52] **U.S. Cl.** **101/148;** 101/348

[51] **Int. Cl.** **B41f 7/36;** B41f 31/26

[58] **Field of Search** ..... 101/147, 148, 349, 350, 101/348, 351, 352, 205–209; 29/121 H, 126, 127, 128

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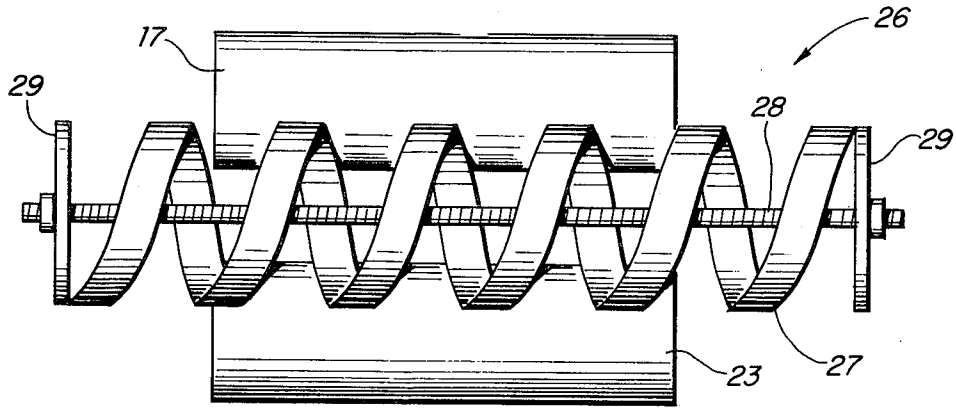
[57] **ABSTRACT**

A transfer roller for providing improved control over the application of ink and dampening fluid to the printing cylinder of a lithographic printing press. The transfer roller according to a preferred embodiment consists of a flat band formed into an elongated helical shape and positioned in contact with inking and dampening fluid form rollers to transfer controlled amounts of fluid therebetween. By being formed as a helical band having a plurality of spaced windings, the roller will present less surface area to the form rollers and, hence, excessive quantities of fluid transfer will be avoided. In addition, because of its helical construction, the windings of the roller will sweep across the surfaces of the form rollers at it rotates to ensure greater uniformity in the fluid transfer. Structure is also provided to longitudinally expand and contract the helical band roller to adjust its surface area in contact with the form rollers to thereby control the quantity of fluid transfer therebetween.

3 Claims, 3 Drawing Figures



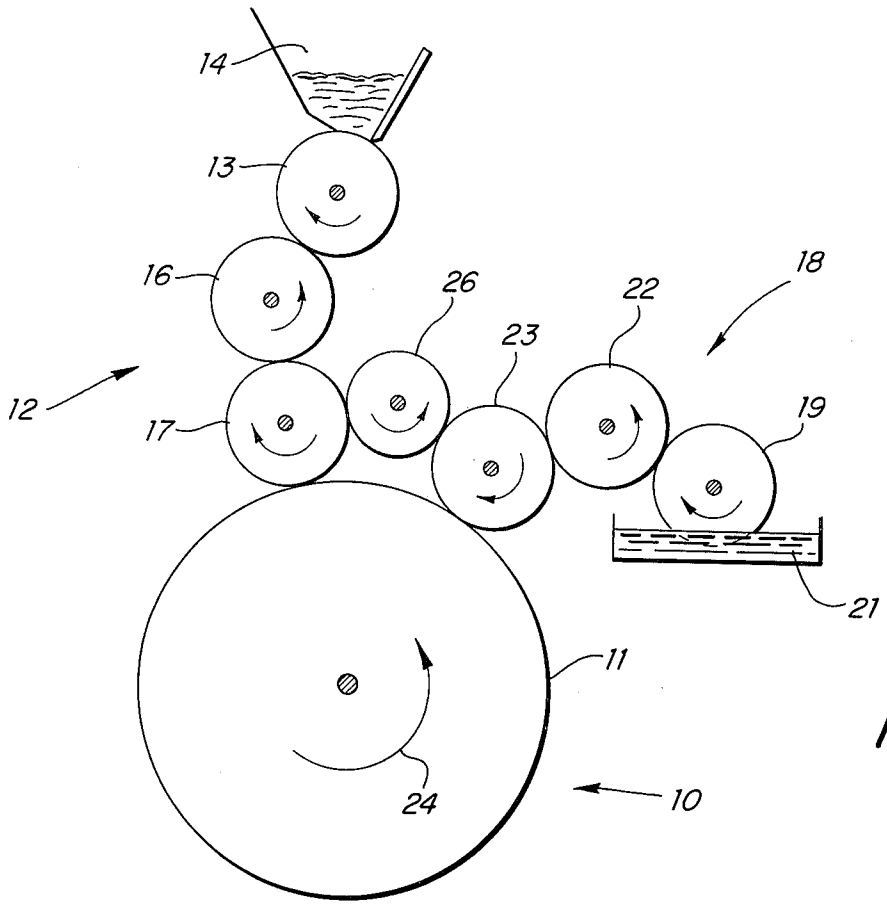


FIG. 1.

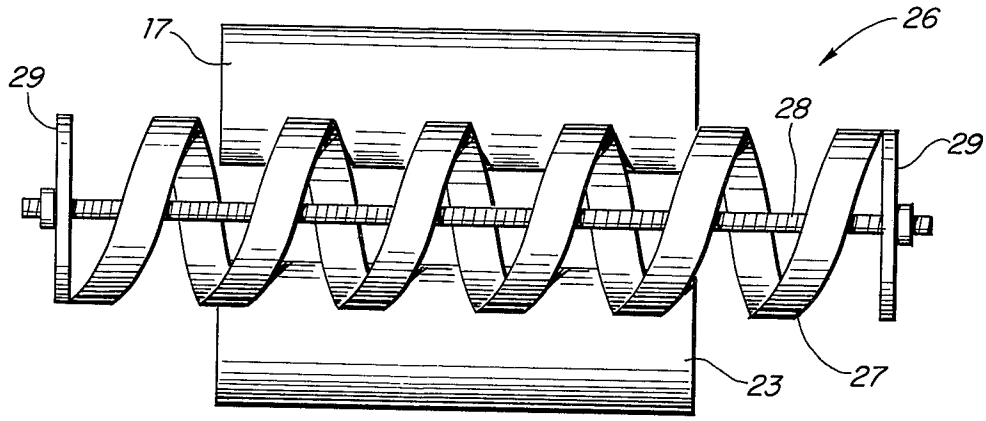


FIG. 2.

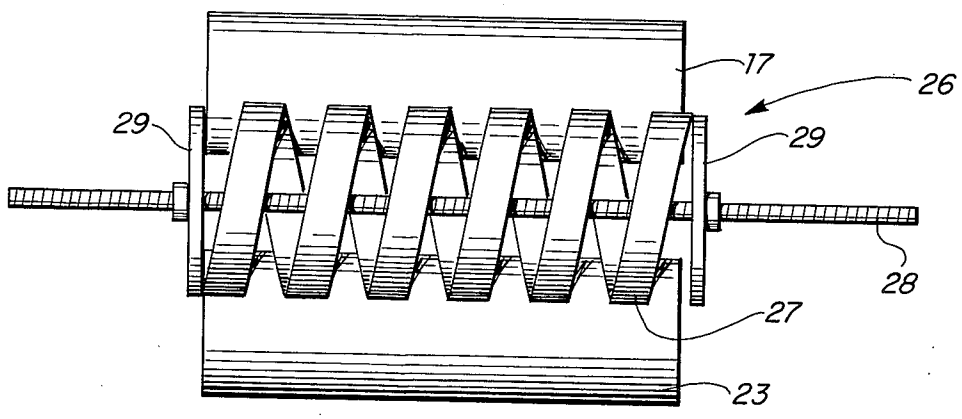


FIG. 3.

INK TRANSFER ROLLER FOR PRINTING PRESSES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to fluid handling apparatus for use in printing presses. More specifically, the present invention relates to a transfer roller for providing improved control over the application of ink and dampening fluid to the printing cylinder of a lithographic printing press.

2. Description of the Prior Art

In lithographic printing, a printing plate containing images to be printed is wrapped around a printing or plate cylinder and utilized to print directly onto a sheet of paper or, alternatively, onto an offset cylinder which, in turn, transfers the images to the paper. More specifically, the printing plate is provided with ink receptive areas to be reproduced and water or dampening fluid receptive areas not to be printed, and, in operation, the plate is first moistened by a system of dampening rollers and then inked by a system of inking rollers such that ink will be retained only on the ink receptive areas of the plate and be repelled from the dampening fluid receptive areas.

In order to consistently produce high quality copies with the abovedescribed process, care must be taken to ensure that ink and dampening fluid are applied to the printing plate uniformly and in the proper amounts over substantially the entire surface of the plate, and it is in this area that conventional press constructions are inadequate. A principal cause of this inadequacy results from the fact that as the system is operating, ink is picked up from the printing plate by the dampening fluid form roller and accumulates on it in a nonuniform manner. This nonuniform ink layer tends to prevent dampening fluid from forming evenly on the form roller and, hence, prevents it from being uniformly applied to the printing plate with resultant deterioration in the quality of the printed copies. Also, this ink that accumulates on the dampening fluid form roller is not fresh ink, but rather is ink that has not been transferred to the paper. As such, it is likely to have paper impurities mixed in with it. These impurities accumulate on the dampening fluid form roller and eventually deposit back on the plate, and the result is blinding which is a loss of transfer of ink to the plate and a reduction in copy quality. At the same time, the inking form roller similarly picks up nonuniform amounts of dampening fluid from the printing plate and this produces similar problems.

In order to improve the fluid transfer characteristics of the press it has become the practice to utilize a transfer roller positioned between and in contact with the two form rollers to directly transfer fluid therebetween and in this way, maintain greater uniformity in the accumulation of ink and dampening fluid on each of the form rollers and insure more uniform fluid transfer to the plate cylinder. In particular, the use of a transfer roller reduces the possibility of blinding in that fresh ink will always be supplied to the dampening fluid form roller so that instead of being a collector of ink, the dampening fluid form roller will become an additional fresh ink distributor preventing the accumulation of impurities. Experience has shown, however, that conventional transfer rollers are still not fully adequate.

For one thing, with conventional transfer rollers, excessive amounts of fluid are often transferred between the form rollers, and when this happens several problems occur. For example, when the dampening fluid form roller has too much ink on it, background tinting often results on the printed copies reducing their quality. Also, when excessive dampening fluid is transferred to the inking form roller, it tends to work its way back through the inking roller system into the ink supply reservoir and, in a relatively short period of time, cause the ink to become watery and lose its ability to form good quality images. Finally, with conventional transfer rollers there is no adequate way of controlling or adjusting the rate or quantity of fluid transfer between the roller systems which is often desirable to maximize performance and to accommodate different conditions of press operation.

SUMMARY OF THE PREFERRED EMBODIMENT OF THE PRESENT INVENTION

In accordance with a preferred embodiment of the present invention, many of the above problems have been obviated by providing a novel transfer roller with which improved fluid transfer characteristics may be obtained. More specifically, the transfer roller in accordance with a preferred embodiment consists of a flat band wound into an elongated helical shape and positioned to contact the inking and dampening fluid form rollers and transfer fluid therebetween. By being formed as a helical band having a plurality of spaced windings, the transfer roller will present less surface area to the form rollers than conventional transfer rollers and thus transfer lesser amounts of fluid back and forth between the form rollers. This will avoid the accumulation of excessive amounts of ink or dampening fluid on the form rollers and the resultant problems produced thereby. Furthermore, because of its helical construction, the windings of the transfer roller will sweep across the surfaces of the form rollers as they rotate against each other, and, in this way, spread the fluids out more uniformly across the roller surfaces. This will ensure that uniform and consistent layers of ink and dampening fluid are applied to all areas of the printing plate.

In accordance with a further aspect of the invention, structure is provided to permit the helical transfer roller to be longitudinally compressed or expanded. This will permit the operator to adjust the number of windings of the band that contact the form rollers and hence to adjust the surface area in contact with the form rollers. In this way, the rate or quantity of fluid transfer back and forth between the form rollers may be varied or adjusted to accommodate diverse operating conditions and to maximize performance.

The above and other features of the invention as well as alternative embodiments thereof will be described in greater detail hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 schematically illustrates a portion of a lithographic printing press employing a transfer roller in accordance with the present invention.

FIGS. 2 and 3 illustrate a preferred embodiment of the transfer roller of the present invention in greater detail.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a lithographic printing press of generally conventional construction within which the transfer roller of the present invention may be employed. This press includes a printing or plate cylinder **10** having a peripheral printing surface **11** containing the impressions to be transferred to a sheet of paper either directly or through an offset cylinder as is well-known by those skilled in the art. Peripheral surface **11** is generally provided on a printing plate wrapped around cylinder **10,** however, in some embodiments it may be formed directly on the surface of the cylinder itself and it should be understood that the terms "printing cylinder" or "plate cylinder" are intended to encompass both of these forms as well as other constructions.

Inking of the plate cylinder is accomplished through an inking system generally designated by reference number **12** and including a fountain roller **13** for receiving ink from a reservoir **14,** an intermediate roller **16,** and an inking form roller **17** in contact with the surface **11** of the plate cylinder **10.**

In a similar manner, dampening fluid is also applied to the surface **11** of plate cylinder **10** through a dampening fluid roller system **18** including a fountain roller **19** for receiving fluid from a reservoir **21,** an intermediate roller **22** and a dampening fluid form roller **23** also in contact with surface **11** of the plate cylinder. Roller systems **12** and **18** may be of conventional construction and may also be arranged in many other configurations as recognized by those skilled in the art.

In operation of the printing system shown in FIG. **1,** plate cylinder **10** rotates in a counterclockwise direction as indicated by arrow **24** such that dampening fluid from form roller **23** will be applied to surface **11** in advance of the ink applied by form roller **17.** In order for the ink to be applied properly to surface **11** so that high quality copies may be obtained, it is first necessary that the dampening fluid be applied uniformly and evenly across the entire length of the plate cylinder **10.** This is difficult to accomplish, however, because rotation of the plate cylinder against the form rollers not only causes fluid transfer to the plate cylinder but also results in ink being picked up by the dampening fluid form rollers **23** and dampening fluid being picked up by the inking form roller **17.** Furthermore, the accumulation of these fluids on the form rollers is not very uniform and may be somewhat contaminated and this tends to affect the later transfer of fluids to the surface **11.** In particular, it interferes with the transfer of dampening fluid from form roller **23** to the plate cylinder and causes nonuniform layers of dampening fluid to be applied to the plate cylinder which reduces the quality of the printed copies.

To provide better uniformity, it has become the practice in the prior art to add to the system a transfer roller such as illustrated at **26** in FIG. **1** positioned between the inking and dampening fluid form rollers and in contact therewith to permit a direct transfer of fluids back and forth between the form rollers, the theory being that greater uniformity of the fluid layers formed on the rollers may be maintained. As explained previously, however, conventional transfer rollers do not completely solve the problem and, in fact, introduce some new difficulties. For one thing, it has been found that conventional transfer rollers often cause excessive amounts of fluid to be transferred back and forth between the rollers and, for example, when too much ink is distributed over the dampening fluid form roller, a tinted or shadow background often results on the printed copies. In addition, when excessive dampening fluid is transmitted to inking form roller **17** it tends to work its way back through the inking roller system into the ink reservoir **14** and water down the ink and cause it to lose it tackiness thus requiring frequent replacement of the ink. Furthermore, the layer of ink transferred to the dampening fluid form roller **23** is often still not sufficiently uniform to ensure proper dampening of the plate cylinder. Finally, existing transfer rollers do not provide any adequate means of controlling the rate or quantity of fluid transfer to accommodate diverse operating conditions of the press.

It is to overcome these problems that the novel transfer roller of the present invention has been designed. A preferred embodiment of this transfer roller is illustrated in FIGS. **2** and **3.** As shown, the transfer roller **26** consists of a flat band **27** of metal or metal having an attached resilient surface of rubber or the like formed into a helix of several spaced windings to define a generally cylindrical roller. The number of windings or the width of the band are not critical and can be varied within wide limits.

By employing a transfer roller constructed in this manner, significantly improved performance is obtained. For one thing, since the transfer roller surface consists of a plurality of spaced windings or zones rather than one continuous surface, there is less contact area between the transfer roller and the form rollers **17** and **23** than in the prior art, or, in other words, the "duty cycle" (i.e. the ratio of form roller surface area in contact with the transfer roller versus the total surface area of the form roller) is less than **1.** This reduced contact means that lesser amounts of fluid will be transferred back and forth between the form rollers thus avoiding excessive fluid accummulations and the above-mentioned problems it creates.

Furthermore, because of the helical construction of the transfer roller, it may be easily expanded and contracted to adjust the duty cycle for maximum performance. In FIG. **2,** the roller is shown in a substantially expanded state such that there will be substantial spacing between the windings and hence fewer windings in contact with the surface of the form rollers **17** and **23.** In this condition, therefore, the rate of fluid transfer will be quite low. To increase the duty cycle of the system and thereby increase the rate of fluid transfer, it is only necessary to compress the transfer roller as shown in FIG. **3** such that the spacing between the windings will be reduced and more windings will contact the rollers **17** and **23.**

Changing the duty cycle can readily be accomplished with a variety of control structures. One simple form is schematically shown in FIGS. **2** and **3** and consists of an axial screw **28** having end plates **29** attached thereto. By merely screwing the end plates back and forth along the screw. The roller **26** may be expanded or contracted within wide limits as desired to obtain the preferred duty cycle. In many cases, especially in systems wherein the transfer roller is not readily accessible, appropriate structure would be included to permit external pushbutton control of the duty cycle, however, as this can be accomplished in many ways, a detailed description of such a system is not believed to be neces-

sary. In a typical printing operation, a duty cycle of about **50%** (substantially as shown in FIG. **3**) is usually effective to provide the right amount of fluid transfer.

Because of the helical configuration of the transfer roller, its rotation relative to the form rollers also creates a longitudinal wiping action across the surface of the form rollers. This wiping action ensures that the fluid will be spread out along the entire length of the form rollers in a much more uniform manner, thus insuring uniform application of fluids to the entire surface of the plate cylinder. Transfer roller **26** is preferably driven in rotation by the action of the form rollers rotating against it although it could be independently driven if desired.

It should be recognized that the embodiment illustrated in FIGS. **2** and **3** is intended to be a preferred embodiment only and that the transfer roller could take many other forms. For example, the helical band **27** could be wrapped around a conventional roller to provide it with increased support. Alternatively, roller **26** could be a solid rubber roller having a helical groove cut in its surface. Also, the roller could consist of a plurality of circular bands arranged in substantially parallel spaced relationship. In this type of embodiment, the circular bands could be mounted around a bellows-like structure capable of being expanded and contracted to vary the spacing between the bands and hence the duty cycle of the system. It should also be clear that the roller of the present invention could also be positioned in other locations along the train of rollers other than between the form rollers as well as in other types of fluid handling systems. Therefore, it should be understood that the present invention should be limited only as required by the scope of the following claims.

I claim:

1. In a printing press including a printing cylinder having a peripheral printing surface, inking means including an inking form roller in contact with said printing surface for transferring ink thereto, dampening fluid means including a dampening fluid form roller in contact with said printing surface for transferring dampening fluid thereto, and transfer means positioned between said inking form roller and said dampening fluid form roller and having a contacting peripheral surface in contact with said form rollers for transferring ink and dampening fluid therebetween; the improvement comprising wherein said transfer means comprises a substantially flat metal helical band having a plurality of spaced windings arranged to form a generally cylindrical shaped roller, and means coupled to said helical band for expanding and contracting said helical band for, respectively, increasing and decreasing the spacing between the windings thereof to vary the area of contact between said transfer means and said form rollers for controlling the amount of fluid transfer between said form rollers.

2. A printing press as recited in claim **1** and further including a resilient surface attached to said flat metal band.

3. Fluid transfer apparatus comprising:

a. first and second rollers having peripheral surfaces for carrying fluid;

b. a transfer roller in contact with the peripheral surfaces of said first and second rollers for transferring controlled amounts of fluid therebetween, said transfer roller comprising a substantially flat metal helical band having a plurality of spaced windings arranged to form a generally cylindrical shaped roller; and

c. means for selectively expanding and contracting said helical band for selectively increasing and decreasing the spacing between the windings thereof to vary the area of contact between said transfer roller and the peripheral surfaces of said first and second rollers for controlling the amount of fluid transfer therebetween.

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