The present invention relates to a novel and improved apparatus for printing with inks having highly volatile solvents which tend to dry rapidly on the press.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious heretofore, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 is a schematic view of an illustrative form of printing mechanism for carrying out my present process; and

Figure 2 is a developed enlarged view showing a portion of the surface of one of the cylinders shown in Figure 1.

The present invention has for its object the provision of a novel and improved process of printing with highly volatile or rapid-drying inks. A further object is the provision of a process by which the ink on the inking mechanism may be maintained in optimum printing condition, even under adverse operating conditions.

In the use of rapid-drying printing inks on high speed rotary printing presses, the room temperature and the temperature increase due to the running of the inking mechanism often cause the ink solvent to evaporate much too rapidly so that the ink is too viscous as it is applied to the printing surface. To overcome this, additional solvent may be added to the ink, but this requires thorough mixing of the ink and often results in improper feed of the ink. Alternatively, a higher boiling point solvent may be used, but this slows down the drying of the ink and thereby reduces the productivity of the printing press.

In the use of water-base printing inks, glycerine is sometimes added to reduce the rate of evaporation, or in the use of petroleum solvent, rapid-drying inks, a higher boiling fraction may be used as the solvent, so as to reduce evaporation on the press. However, these expedients are highly disadvantageous as pointed out above.

According to the present invention, an ink having a highly volatile solvent is fed in the usual manner to the inking mechanism and printing surface, and even those solvents which are more rapid in evaporation than conventional solvents may be used. The ink is fed from the ink fountain to a distributing drum and from that to the other rollers and drums of a conventional inking mechanism, after which it is taken and applied by the form rollers to the letterpress plates on the plate cylinder. As the ink is fed, the thickness of the ink film is greatly reduced and while it may be of the order of one-thousandth of an inch at the doctor roll, it is usually only a few hundred-thousandths of an inch thick at form rollers, resulting in a great increase in the surface area of the ink and correspondingly greater evaporation. Intermediate the fountain and form roller is a solvent fountain which is provided with a fountain roller, doctor blade and feed rollers by which solvent may be fed to the inking mechanism at the desired, regulable rate so as to compensate for any original lack of solvent in the ink or for any solvent lost by evaporation from the relatively large surface area of the inking rollers.

The fountain roller for the solvent feed is preferably a cylindrical roller having a uniformly grained or cellular surface by which a regulable amount of solvent is fed as it rotates in the solvent fountain.

As the solvent is fed to the ink distributing system, the solvent is distributed and worked into the ink to a certain extent, but in the early stages the solvent is concentrated at the outer layer of the ink film, so that it is the added solvent rather than the solvent originally contained in the ink which is first subject to evaporation, thereby maintaining the ink in excellent printing condition as it is fed and applied to the printing surface.

Preferably, the solvent is fed upwardly from the fountain to the inking mechanism and is applied to one of the ink drums at a point where the drum has given up a normal quantity of ink to an inking roller which is to feed the ink to the printing surface.

In the use of water base inks, in which the ink comprises essentially a thixotropic suspension of carbon black in water, the added solvent is water and the rate of feed is such as to maintain a normal amount of water in the ink as the ink is applied to the printing surface. The rate of feed of the ink is regulated in the usual manner in accordance with the speed of the press and the type of subject being printed, and the rate of water fed from the solvent fountain is
3 determined in accordance with air temperature of the inking system and the humidity and rate of air flow over the rollers, enough water being fed so that when the ink is applied to the letterpress plate it is of proper printing consistency.

Where rapid-drying oil inks are employed, the solvent fed will be determined by the composition of the ink. Usually, such inks comprise a pigment, binder, varnish, or binder and varnish. In most such inks, the solvent is a narrow boiling petroleum fraction, boiling from 280°C to 300°C, or thereabouts, and in such a case the separate solvent fed would be such a petroleum solvent. Alternatively, a more volatile solvent could be used both in the ink and in the special solvent feed so that the ink would dry even more rapidly than normal after it had been applied to the paper.

Where special lacquer inks are employed, comprising a pigment or dye, a nitrocellulose ester as the binder, a plasticizer and a highly volatile solvent such as butyl or amyl acetate, the solvent fed from the solvent fountain may be amyl or butyl acetate or other suitable compatible and highly evaporative solvent.

It is understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

The drawings illustrate a typical embodiment of an inking mechanism in accordance with the present invention and particularly adapted for carrying out the novel process of the invention. In this mechanism the printing surfaces to be inked are supported upon a plate cylinder which cooperates with an impression cylinder and the paper to be printed is passed between these and receives ink from the surface of the letterpress printing plates conventionally mounted on the plate cylinder. The inking mechanism comprises an ink trough which is slowly rotated a fountain roller, the thickness of the ink film fed from the fountain roller being regulated by means of an adjustable blade in the manner of a conventional over-shot ink fountain. Ink is transferred from the fountain roller to a distributing drum by means of a periodically oscillating ducor roller so that relatively thick patches or stripes of ink are fed from the fountain roller to the surface of the distributing drum. A second distributing drum is provided and receives ink from the first distributing drum to the form rollers by means of the transfer rollers and the form distributing drums. All of the rollers and drums are driven in contact with each other and some or all of these rollers and drums may be vibrated to improve the distribution and thorough mixing of the ink. The fountain roller operates at a very slow speed and while the form rollers are adapted to rotate at the same surface speed as the cylinder and drums, and are preferably driven at progressively increasing speeds so that the relatively thick film of ink transferred by the ducor roller is progressively thinned out as it is fed forward toward the printing surface. A transfer and distributing roller is also provided and rolls in contact with one of the inking rollers or drums and is preferably located to contact with a central inking roller or drum at a point where the drum has delivered most of the ink carried by it. In the form shown the roller is positioned below and in contact with the ink drum and between the last of the transfer rollers and the first of the transfer rollers. Means are provided for feeding ink solvent from a solvent fountain to an intermediate portion of the series of inking drums and preferably to the central rotary inking member, in this case ink drum. As embodied, a solvent trough is provided which is partially filled with a petroleum distillate or other appropriate solvent, and has mounted in it a rotatable fountain roller which is continually rotated at a slow speed during the operation of the press. The ducor blade regulates the amount of solvent retained on the surface of the roller and available for feeding to the inking mechanism while the feed of solvent from the roller to the transfer and distributing roller may be further regulated by variation of the rapidity of oscillation and dwell of the ducor roller, the roller periodically contacting first with the solvent fountain roller and then with the transfer and distributing roller so as to feed solvent from the solvent fountain to an intermediate member of the series of inking rollers and drums.

As the inking rollers and drums move during the operation of the press, ink and solvent are continuously fed to the inking mechanism and the solvent loss by evaporation from the relatively large surface of the inking mechanism is continuously replenished by the added solvent fed from the solvent fountain, while the solvent and ink are continuously mixed due to the working of the ink and solvent by the various rollers and drums at their points of contact as well as by the difference in speeds between the various rollers and drums.

Figure 4 is a detailed fragmentary and enlarged view showing a preferred form of surface of the cylindrical roller and as shown in Figure 2 the surface of the roller is provided with minute cellular cavities which are preferably of regular shape (usually square), and may be of the order of ten thousandths of an inch per side and of a depth of the order of one thousandth of an inch, although these dimensions and the specific shape of the cellular cavities is purely illustrative.

The form of the inking mechanism shown insures a continuous, uniform and regulable replenishment of the solvent so that the rate of feed of the solvent may be accurately controlled as required by the operating conditions of the press, particularly the temperature of the various rollers and drums of the inking mechanism is such as continued operation of the press causes considerable heat to be generated in the rollers and drums some or all of which are made of resilient material such as rubber.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What is claimed is:
1. An inking mechanism for high speed rotary printing presses including in combination an ink fountain, a plurality of ink transferring and distributing rollers contacting with each other to feed ink as they rotate and to apply a film of ink to a rotary printing surface, a solvent fountain, and means for feeding solvent at a regulable rate from said fountain to an intermediate one
of said rollers to compensate for loss of ink solvent by evaporation said solvent feeding means comprising transfer rollers between the solvent fountain and one of the inking rollers, said solvent transfer rollers applying the solvent to one of the inking rollers after the inking roller has transferred its film of ink.

2. An inking mechanism according to claim 1 in which the solvent fountain includes a minutely cavitated rotatable cylinder running in a trough which may be filled with solvent.

GEORGE CRAMER.

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