

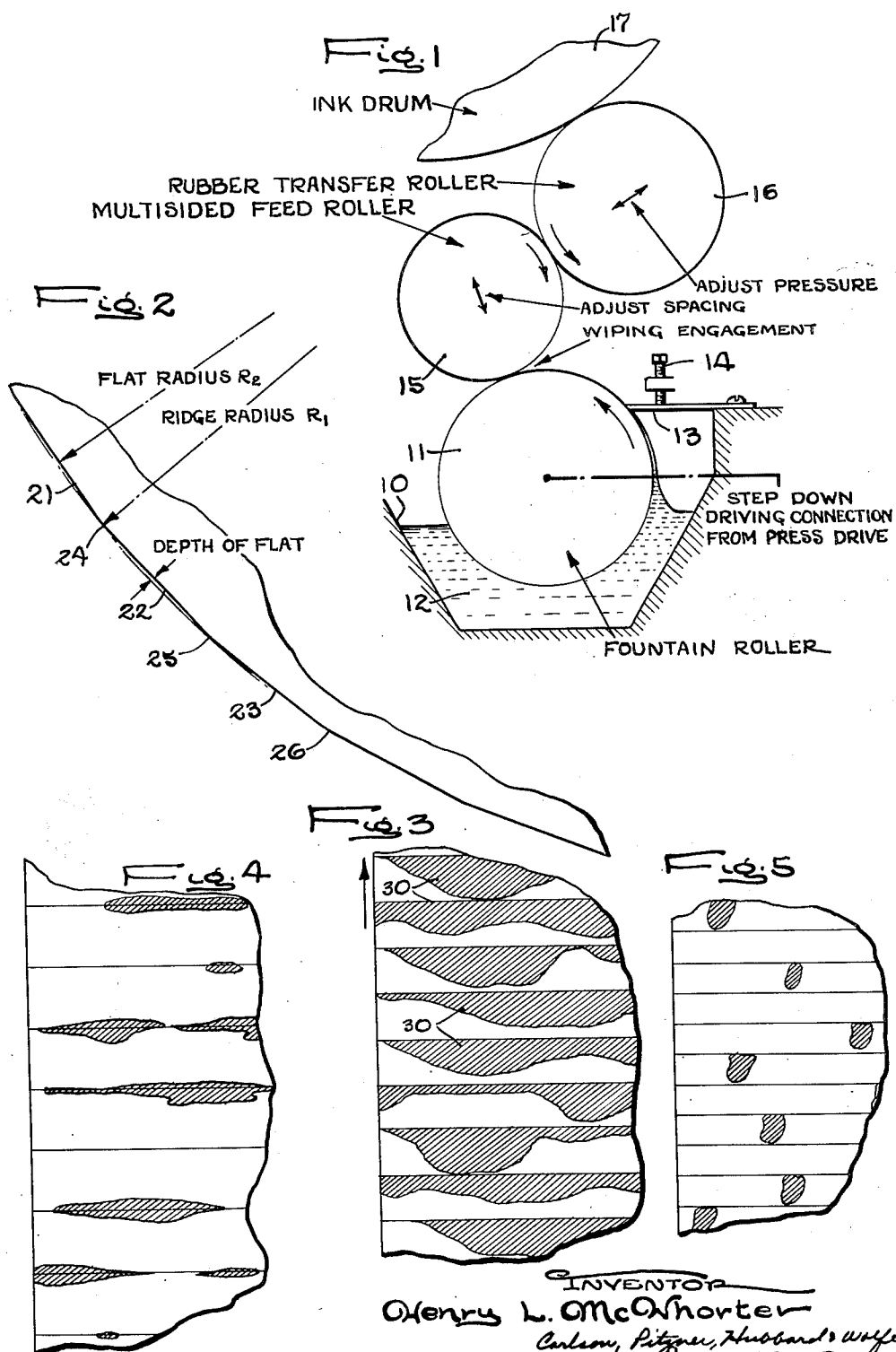
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INKING ARRANGEMENT FOR PRINTING PRESSES

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INKING ARRANGEMENT FOR PRINTING PRESSES

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4 Claims. (Cl. 101—350)

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The present invention relates to printing presses and more particularly to an improved arrangement for creating a film of ink suitable for application to the printing cylinders.

The problem of inking in a printing press is deceptively simple. It consists merely in maintaining a film at the point of contact with the printing plate which is substantially constant in thickness and of proper average thickness in spite of variables such as the extent of "solid" areas to be printed, the speed, and the type of ink. Unfortunately the cohesive viscous nature of both absorbent ink and heat-set ink is not conducive to film formation. In the first place the layer of ink which clings to a smooth cylindrical fountain roller is normally too thick and too irregular for rolling out into a satisfactory film. Attempts to reduce the thickness by using a cylindrical transfer roller in wiping engagement with the fountain roller have not been successful because the ink tends to be picked up in uneven patches rather than as a smooth film. The inking arrangements in present commercial use and that use fountain rollers have endeavored to reduce the film to a practical thickness and to effect even spreading primarily in two ways. The first is by use of a ductor roller which touches the fountain roller only intermittently, transferring the ink thus picked up to a series of rollers which serve both as a spreading agent and as a reservoir for storing ink between successive contacts. The second involves a feed roller having geometrical raised portions such as a spiral ridge to which the ink clings in the form of a narrow ribbon. In the former the intermittent inking of the ductor roller tends to produce corresponding variations in the film which is undesirable. In the latter the spiral ridge or other design tends to print out in the solidly inked areas.

In conventional newspaper presses the above disadvantages as well as the phenomena known in the art as "ghosting" and "starvation" are tolerated since they are, for the most part, masked by the extreme opacity of the ink. However, in color presses using transparent process inks high quality has been secured only by resorting to complicated filming arrangements using many ink rollers both stationary and vibrating, and by employing no less than four form rollers on the plate cylinder. The multiplicity of rollers in these presses takes up so much space that special carriages are required to support them and to retract them for access to the plate cylinder. This is the main reason that a color press costs approximately twice as much as a newspaper

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press of the same capacity. The elaborate inking system causes an additional complication, namely, that the area of exposed film plus the agitation produced by the vibrating rollers results in excessive evaporation of the volatile ink. This gives rise to the operating dilemma that if inks of low volatility are used an excessively large drying oven must be employed while the use of inks of higher volatility results in drying on the rollers and form and makes frequent cleaning necessary.

Accordingly it is an object of the present invention to provide an inking arrangement for forming an ink film which is of uniform thickness and in which the feeding is continuous, eliminating both the variation characteristic of intermittent feeding devices and the disadvantages of conventional continuous feed fountains. It is another object to provide an inking arrangement employing a smaller number of rollers in the primary ink path than normally required and making it unnecessary to provide a large number of auxiliary rollers for vibrating the ink or for serving as a reservoir for the ink film. It is a further object to provide a device for forming a film of ink and which is capable of handling ink of a wide range of viscosity and in which successful operation may be achieved using easily attained dimensional tolerances.

Other objects and advantages of the invention will become apparent as the discussion proceeds taken in connection with the accompanying drawing, in which:

Figure 1 shows a simplified inking arrangement constructed in accordance with the present invention.

Fig. 2 is a fragmentary enlarged view of the periphery of the multi-sided feed roller shown in Fig. 1.

Fig. 3 shows a typical ink feed pattern readily obtained in the practice of the present invention.

Fig. 4 shows the appearance of the ink applied to the transfer roller when employing "flats" on the feed roller which are deeper than the optimum amount prescribed herein while Fig. 5 shows the tendency toward globule formation and irregularity when the flats are too shallow.

While the invention is susceptible of various modifications and alternative constructions and uses, I have shown in the drawings and will herein describe in detail only the preferred embodiment of the invention. It is to be understood, however, that I do not tend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions

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and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to Figure 1 there is shown an inking arrangement constructed in accordance with the invention. It includes an ink trough 10 and a fountain roller 11 for picking up a layer of ink from the supply 12. The amount of ink available for transfer to the remaining rollers in the system is determined in the conventional manner by the fountain blade 13 having a series of adjusting screws of which only one screw 14 is shown. Any desired step-down driving connection may be provided for rotating the fountain roller at a speed which is only a small fraction, for example one hundredth or less, of the peripheral speed of the remaining rollers in the printing press.

Arranged alongside the fountain roller is an improved feed roller 15. Although shown circular, this roller, in accordance with the present invention, has a cross section in the shape of a polygon having a large number of sides or "flats" formed thereon and running the length of the roller. As will become apparent as the discussion proceeds this feed roller rotates at the peripheral velocity of the press and is spaced from the fountain roller at such distance as to wipe off at least a portion of the ink which is carried on the latter roller from the blade to the region of transferring engagement.

To continue the ink path, the feed roller 15 is in rolling engagement with a rubber transfer roller 16 which in turn contacts an ink drum 17. An additional series of rollers (not shown) conveys the film of ink in the conventional manner from the ink drum to the form rollers which apply the film to the surface of the printing plate.

The polygonal surface of the feed roller 15 is clearly shown in the enlarged fragment set forth in Fig. 2. The feed roller has a radius R_1 which may be on the order of $2\frac{1}{2}$ inches. The successive flats 21, 22 and 23 formed thereon have a minimum radius R_2 . This gives a differential or depth of flat of approximately 0.007 inch in the preferred embodiment. In the case of a feed roller having a $2\frac{1}{2}$ inch radius, this corresponds to a polygon having 40 sides of equal length. In operation, as the feed roller 15 rotates, the ridges indicated at 24, 25 and 26 are successively brought into wiping engagement with the fountain roller 11 and a certain amount of the ink therefrom wipes off and is spread by the transfer roller over the flat area lying rearwardly of the upraised edge. As indicated at 30 in Fig. 3, the ink is in the form of a series of rather closely spaced strips extending longitudinally of the roller and having trailing edges which are somewhat irregular.

It might be expected that ink thus fed in the form of strips parallel to the roller axis would produce a corresponding variation of ink on the rubber transfer roller, ink drum and on the other rollers in the ink path. It might also be expected that a feed roller having flat sides would be less suitable and less efficient than a roller having a perfectly cylindrical outer surface. On the contrary, practical use has clearly demonstrated the importance of the arrangement and has confirmed that the differential radius of R_1 minus R_2 may vary only within relatively narrow limits on each side of the apparently optimum value of 0.007 inch without sacrificing the primary advantages of the arrangement. More specifically, it has been found that the differential radius may

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vary within the range of 0.003 inch to 0.010 inch before any marked change in the character of the film applied to the ink drum is noted. If desired, the range of depth of the flats may be stated in terms of a number of flats per inch of roller diameter. Specifically, it has been found that polygonal feed rollers having from 6 to 12 sides per inch of feed roller diameter produce a satisfactory ink film.

If, however, the differential radius is increased to 0.013 inch by forming 30 instead of 40 sides on a five-inch feed roller, the ink tends to gather in irregular globs along the ridges and very little of the ink is spread over the adjacent flat. Such a roller, illustrated in Fig. 4, tends to cause the printing of horizontal stripes in the solidly inked areas, stripes extending perpendicular to the direction of movement of the web. If, on the other hand, a circular cylinder is more closely approached by milling an excessive number of sides on the roller each having a depth less than 0.003 inch while keeping the radius the same, the effect illustrated in Fig. 5 occurs. Contrary to expectations the ink does not spread smoothly over the shallow flats but instead tends to cling to the flattened area in the form of spaced patches or globules which are generally circular in shape. Further the patches are not distributed evenly over the surface but tend to be localized in certain areas. As a result the film applied to the plate cylinder is not uniform but includes areas of concentration which are especially apparent in the regions of solid inking.

Where the differential is in the central portion of the above range, i. e. about 0.007 inch, it is found that the ink film transferred to the ink drum 17 by the transfer roller is substantially uniform with the strips of ink set forth in Fig. 3 smoothed out to form a continuous film which is equivalent to the film formed when using conventional inking arrangements having many times the number of rollers. Apparently the irregularity noticed in the trailing edges of the strips 30 tends to average out over a number of successive strips. For best results it has been found that the transfer roller should be adjusted relative to the multi-sided feed roller so that there is firm rolling engagement at the ridges 24—26 and with at least sufficient pressure at the flat areas to spread the ink in a substantially continuous film over said transfer roller. The pressure is not especially critical so long as this requirement is met and the rubber of which the transfer roller is formed may be of medium firmness as employed in rollers of conventional inking arrangements. In order to make the film just as even as possible the rubber transfer roller and feed roller should differ in circumference by an amount which is not equal to the cyclical width of the flats or any multiple thereof so that strips of ink successively applied to the transfer roller do not register with one another. A certain amount of effective change in circumference may be brought about by varying the pressure exerted by the transfer roller in the feed roller within the available limits.

Experiments have been conducted on the arrangement discussed above in order to determine the reasons for the striking improvement in the uniformity of ink film. It is believed that the improvement may be ascribed at least partly to the fact that feed rollers of the type covered herein do not have ridges which are so high relative to the flats as to cause ink to

be retained at the ridges nor so low as to produce continuous wiping of the surface of the feed roller and the production of irregular patches as when perfectly cylindrical feed rollers are employed. The action of the ridges of the feed roller upon the ink carried by the fountain roller is somewhat analogous to the action of a milling cutter in which successive teeth do not remove metal from a milled surface continuously but rather discontinuously in small cuts or bites following one another in quick succession. In any event, use of even the present simplified roller arrangement causes ink-lay on the paper which is so uniform as to make it substantially impossible to detect variations of density in the solid areas even when employing transparent process inks. Tests have shown that a newspaper press equipped with the inking arrangement disclosed herein is capable, from an inking quality standpoint, of producing high grade magazine work.

While steel and rubber rollers in addition to those in the drawing may be used, no reservoir system, as such, is required. The exposed film area and the agitation of the film by vibrating rollers is thus minimized. When employing heat-set inks having a volatile solvent the possibilities of drying on the rollers on the one hand and the necessity for extensive oven arrangements on the other are eliminated. A more quickly dried heat-set ink can be used which not only reduces oven cost but permits of higher press speeds.

The multi-sided feed roller is actually cheaper to make than one having a spiral ridge since 40 strokes of a planer may be employed to finish the outer surface, the roller being rotated one step for the successive cuts by any suitable indexing head. While the cross section of the ink transfer roller is, in the embodiment discussed above, a substantially perfect polygon the invention is not necessarily limited thereto but includes inking arrangements in which the flattened strips on the transfer roller are somewhat separated from one another. For example, in one manufacturing procedure the transfer roller is constructed of a cylindrical blank which is coated lightly with Prussian blue or the like. Flats are then planed on the roller to the prescribed depth while maintaining a narrow ridge of blue indicating slight separation of the flats. It is found that ink tends to cling to the ridges even though they are rounded, rather than sharply defined. Further, the so-called flats may depart slightly from a plane surface with only a small effect on the film forming properties.

One of the features of the present device which may not be immediately apparent even to one skilled in the art is that satisfactory inking may be achieved even though ordinary dimensional tolerances are maintained. It has been found that where a multi-sided feed roller rotates about an axis which is not precisely true, substantially all of the ridges will continue to pick up ink and the resulting film will be quite uniform. This is contrasted with a smoothly cylindrical feed roller in which the slightest amount of eccentricity causes the ink to cling to the high areas with a resulting starvation or lack of ink at the low areas, usually on the opposite side of the feed roller.

The improved inking arrangement may be used with almost any type of ink from the most viscous to the most fluid employed in maga-

zine and newspaper work with consistently good results and using the same multi-sided feed roller.

What I claim is:

1. In an inking arrangement for a printing press having a slowly rotating fountain roller and a more rapidly rotating transfer roller of rubber or the like, a feed roller interposed between said fountain roller and said transfer roller, said ink feed roller having a cross section in the form of a substantially regular polygon with the differential between the corner radius and the flat radius thereof in the range between 3 and 10 one-thousandths of an inch, and means for supporting said feed roller in rolling engagement with said transfer roller but slightly spaced from said fountain roller so that ink is removed from said fountain roller primarily by the corners on said feed roller.

2. In an inking arrangement for a printing press having a slowly rotating fountain roller and a more rapidly rotating transfer roller of rubber or the like, a feed roller interposed between said fountain roller and said transfer roller, the surface of said feed roller having a plurality of flats formed thereon from end to end, said flats having a constant maximum depth in the range between 3 and 10 one-thousandths of an inch, and means for supporting said feed roller in rolling engagement with said transfer roller but slightly spaced from said fountain roller so that ink is removed from said fountain roller primarily by the corners on said feed roller.

3. In an inking arrangement for a printing press having a fountain roller and a more rapidly rotating transfer roller of rubber or the like, a feed roller arranged in face-to-face engagement with the transfer roller and having limited clearance with respect to the fountain roller for wiping off ink from the surface thereof, said feed roller being substantially polygonal in cross section with a number of sides in the range of 6 to 12 per inch of feed roller diameter.

4. In an inking arrangement for a printing press having a slowly rotating fountain roller and a more rapidly rotating transfer roller of rubber or the like, an ink feed roller interposed between said fountain roller and said transfer roller and in rolling engagement with said transfer roller, said feed roller being in the shape of a substantially regular polygonal prism, and means for spacing said feed roller relative to the slowly moving fountain roller so that the ridges on said feed roller successively engage and wipe away succeeding disconnected portions of the ink film from said fountain roller, the number of said ridges being sufficiently great as to enable said transfer roller to pressingly engage the entire area of said feed roller to reform the ink into a substantially continuous film on said transfer roller.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,207,259	Wood	Dec. 5, 1916
2,213,419	Taylor	Sept. 3, 1940
2,354,981	Barber	Aug. 1, 1944
2,435,452	Linn et al.	Feb. 3, 1948