Oct. 21, 1952 G. R. BRODIE 2,614,492

METHOD OF AND APPARATUS FOR PRINTING

Filed Dec. 17, 1947

FIG. 1

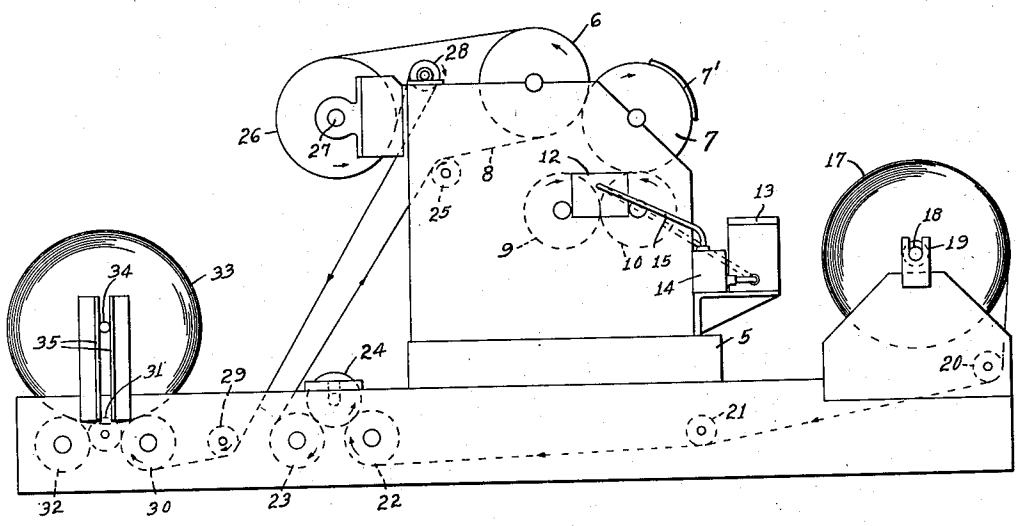


FIG. 2

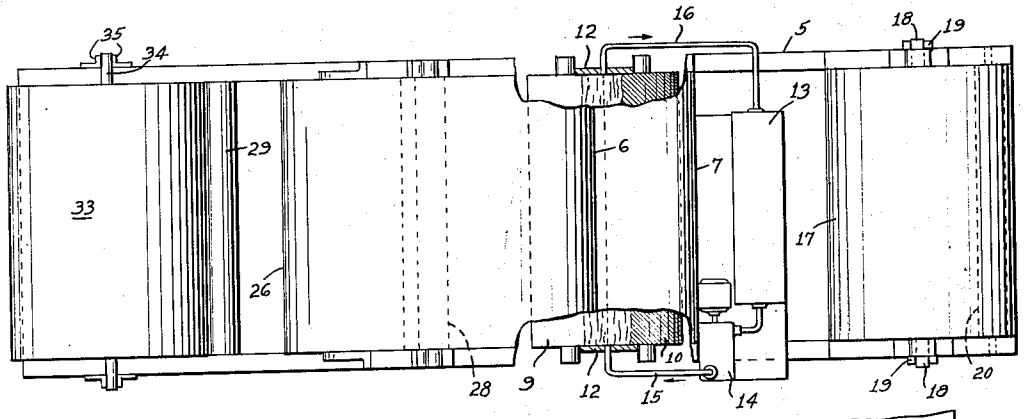
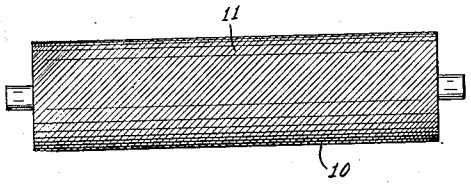


FIG. 3



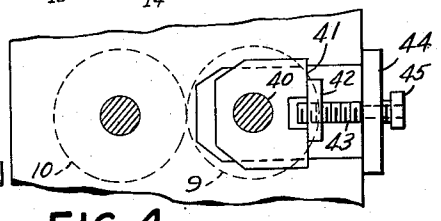


FIG. 4

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METHOD OF AND APPARATUS FOR PRINTING

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5 Claims. (Cl. 101—350)

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This invention relates to printing, and particularly to an improved method of and apparatus therefor.

Printing has been conducted heretofore for many years with stereotype and electrotype plates. In the web press, such plates are customarily semi-cylindrical in form and are fastened to a rotatable plate cylinder which bears against an impression cylinder. The web of paper passes between the cylinders to form the impression.

Inking of the plates on the plate cylinder is accomplished by means of a train of upward to 20 rollers extending from the plate cylinder to the inking fountain. The large number of rollers is necessary to secure proper distribution of the ink, and the train of rollers is usually quite complicated. Use of such mechanism materially retards the speed at which the press may be operated.

In recent times, rubber plates have been substituted for stereotype and electrotype plates for a limited class of printing work in the so-called aniline press. The rubber plates are formed by first impressing thermoplastic resinous material with the type form to provide a matrix, and thereafter compressing a sheet of rubber into the matrix and vulcanizing it. Such rubber plates have an advantage in that they are light and easily shaped about the cylinder and may be secured thereto with adhesive material. However, such plates have required the use of so-called aniline inks, which consist of pigmented varnishes made up of shellac and alcohol. Inks of this type are very expensive, extremely quick drying, and in many other respects are unsatisfactory. Hence, rubber plates have been used heretofore only for printing "cellophane" wrappers, paper bags, boxes and the like.

It is the object of the present invention to provide a method of printing in which rubber printing plates are used with inks of the type consisting of a pigment suspended in a varnish made up of a resin and a volatile solvent which is adapted to be vaporized rapidly upon the application of heat to the printed impression. Quick drying inks of this type are used extensively in printing magazines and have superseded linseed oil inks during the past fifteen years.

Another object of the invention is the provision of an improved inking mechanism and a printing press including such mechanism.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and the accompanying drawing, in which

Fig. 1 is a side elevation of a press embodying the invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a plan view of one of the inking

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rollers, showing the knurled surface thereof; and

Fig. 4 is a detail view of the manner of controlling the amount of ink which is applied to the printing plates.

I have discovered that, contrary to views heretofore held by printers, it is possible to print successfully at high speed with rubber plates using an ink which previously has been utilized only in printing from metallic plates. Moreover, in such an operation, it is possible to avoid the long trains of inking rollers which have been utilized heretofore, thereby permitting press operations at higher speeds than have been possible with conventional printing methods.

The invention depends primarily upon the method of delivering ink to the printing plates. Heretofore, a solid steel roller has been used in aniline presses and rubber or glue glycerine in other types of letter presses. It is not desirable or necessary to use a soft roll to deliver the ink to a rubber plate and the use of a solid steel roll gives a resulting printing that displays a so-called halo, i. e., the edges of the type are inked but the body of each letter does not receive and convey ink to the impression. Thus the body of the letters may appear particularly white with an ink outline.

To avoid this difficulty, I employ an inking roller of metal having a knurled surface. The knurling must be disposed at an angle, preferably 45°, to the line parallel to the axis of the roller. The knurling may vary in dimensions, but preferably is about 175 lines to an inch, with a depth not exceeding 0.002 inch. If the knurling is too coarse, the desired effect is not obtained, but it may be finer than indicated with excellent results.

The precise action of the knurled roller upon the rubber plate is not entirely clear. However, by transferring the ink from a knurled roller of the type described to the type surface on the rubber plate, uniform inking over the surface is obtained, and hence no halo appears in the resulting impression.

To obtain the best results, the knurled roller should be engaged by a hard rubber roller having a hardness of above 65 durometer. The pressure between the two rollers may vary from a few pounds to 10,000 pounds per square inch. The effect of the rubber roller is to assure an ink layer of the desired depth on the knurled roller, but its action is entirely different from that of a doctor which has been used heretofore with knurled inking rollers. The doctor blade inevitably scores the knurled surface and renders it useless. The rubber roller, on the other hand, creates no wear and effetcively limits the ink layer uniformly for an indefinite time.

My invention is characterized, moreover, by the elimination of the conventional fountain and

ink train. Instead, the ink is supplied to the bight or nip between the rubber and knurled rollers, and a considerable body of ink is maintained therein. It may be supplied continuously at a regular rate. The surplus may be withdrawn to the source and recirculated, for example by a pump.

It is to be noted that in the conventional letter press printing unit with the conventional fountain and ink train, it is necessary to have a number of keys across the width of the press so as to control the ink flow in increments across the web. This is necessary since the average printed form does not consume a uniform amount of ink across the width of the web. In those portions across the width of the web where the ink is not heavily consumed, the ink tends to build up back along the train of rollers and the fountain keys back of those points have to be tightened down to level off the flow. With the inking mechanism described in this invention, the ink is taken directly out of the fountain, applied to the plate and any excess left on the inking roll is returned to the fountain immediately. Thus there is no opportunity for a surplus amount of ink to build up back of light portions on the form and it is possible to print a uniform film of ink across the entire width of the web even though the form may vary from one extreme to the other across the web. The fact that the inking roll is continuously taking ink out of the fountain, applying it to the plate and then taking the reserve back into the fountain also makes it impossible to have ghost printing or to have heavy and light densities of ink film which sometimes result from the use of too few form and distribution rollers in the conventional inking mechanism.

For the purpose of the invention, I employ ink of the quick drying type consisting of a pigmented vehicle made up of a resinous binder and a petroleum hydrocarbon having a relatively low boiling point and a high vapor pressure when subjected to a temperature above normal atmospheric temperature. A characteristic ink of this type is made in accordance with the following formula:

Alkali blue base	2.00
Zinc resinate	15.30
Petroleum hydrocarbon, B. P. 450° F	22.60
Water	0.10
Gilsonite	0.75
Rosin	0.68
Petroleum hydrocarbon, B. P. 503° F	1.07
Wetting agent (Tallicin 105)	3.20
Carbon black	16.00
Calcium carbonate pigment	6.30
Petroleum hydrocarbon, B. P. 381° F	32.00
	100.00

It is to be understood that in describing this typical ink the invention is not thereby limited, because it is apparent that numerous combinations involving substitutions of resins, pigments, and other ingredients of the ink may be made. Thus, the ink may be of any desired color, by substituting suitable pigments. There are numerous resins which are adapted to be dissolved in the solvent to produce varnishes suitable for the purpose. All of this is well within the skill of ink makers, who have been supplying inks of the character described to magazine printers for the past fifteen years.

The ink should, however, have a flowing characteristic somewhat different from ordinary magazine inks such as are used with extended ink trains, the ink employed in accordance with the present invention being somewhat softer. The preferred constants for the ink are determined at 25° F. The plastic viscosity is 10.1 poises and the yield value is 57.3 dynes per square centimeter. This again is merely illustrative and is subject to variation. Such variation is obtained by modifying the proportions of the solvent in the composition above described.

Referring to the drawing, **5** indicates the frame of a printing press. Suitably journalled therein are an impression cylinder **6** and a plate cylinder **7** to which rubber printing plates **7'** are adapted to be attached. The cylinders **6** and **7** are adapted to be rotated in opposite directions as the web **8** passes between them to receive the printed impression from the rubber plate or plates secured to the surface of the plate cylinder **7**. Beneath the cylinder **7**, two inking cylinders **9** and **10** are journaled for rotation in the frame to rotate in opposite directions. The cylinder **9** is preferably a hard rubber surface of approximately the hardness hereinbefore specified. The cylinder **10** has a knurled surface as indicated in Fig. 3. It will be noted that the knurling **11** is disposed at an angle of approximately 45° to a line parallel to the axis of the cylinder. The fineness of the knurling should be approximately that hereinbefore specified. The journals of the cylnders **7**, **9** and **10** are mounted in adjustable devices of the usual type employed in presses, in order that the pressure exerted between the cylinders and between the inking rolls may be adjusted to meet the desired conditions.

End plates **12** are disposed at the ends of the rollers **9** and **10** to provide, in the bight or nip between the two rollers, a reservoir space which is adapted to receive or to hold a quantity of ink of the selected composition. The ink may be supplied continuously from the reservoir **13** by a pump **14** and pipe **15**. The overflow may be returned through a pipe **16** to the reservoir **13**. Thus, continuous circulation of the ink is maintained and the body of ink is held in the bight or nip of the rollers **9** and **10**. As the latter rotate, a film of ink is carried on the peripheral surface of the roller **10** and delivered to the rubber plates on the plate cylinder **7**. The ink is continuously transferred to the web **8** as the cylinders **6** and **7** rotate, thus forming the printed impression.

The web, in the form of a roll **17**, is supported on trunnions **18** in supports **19** on the frame **5**. It is delivered around guide rollers **20** and **21** to the web feeding mechanism, consisting of rollers **22**, **23**, and **24**. It passes then over guide roller **25** to the cylinders **6** and **7**. Thence it passes over a drum **26** supported for rotation at **27** on the frame **5**. The drum **26** may be heated in any suitable manner, for example by steam supplied from a convenient source, so that the drum is maintained at an elevated temperature such that as the web passes around it the solvent is vaporized from the printed impression and the latter is dried. It has been found that a twelve-inch steam drum will effect the drying of the printed impression, whereas in standard magazine presses a steam drum 6 or more feet in diameter is usually required.

From the drum **26**, the web passes over a roller **28** and thence over a roller **29** to the rewind consisting of rollers **30**, **31** and **32**, which engage the surface of the roll of web **33** as the latter is formed about a mandrel **34**, slidably supported in guides **35**.

Instead of rewinding the web after a single impression, the web may be prefected by printing on the opposite side thereof in apparatus which duplicates that previously described. In other words, two units, as disclosed in Fig. 1 of the drawings, with appropriate guide rollers, constitute a web perfecting press in which both sides of the web may be printed before the web is rewound or cut in the usual manner.

The relative adjustment of cylinders 9 and 10 to control the amount of ink carried by the knurled cylinder 10 to the type of the rubber printing plate 7' may be obtained by any conventional adjusting means such as that shown in Fig. 4, where each journal 40 of roller 10 is mounted in a bearing block 41 which is slidable on the main frame of the press. To this end, each bearing block carries a block 42 having a female thread into which a threaded adjusting screw 43 is threaded. The adjusting screws are rotatably anchored in anchor blocks 44 and each carries a hand wheel 45 at its outer end. Rotation of the hand wheels causes a sliding of the bearing blocks 41 with corresponding adjustment of the pressure with which the knurled roller 10 bears against the relatively softer roller 9.

Among the advantages of the apparatus is the relative inexpensiveness and ease of handling of rubber printing plates. They may be applied to the plate cylinder of the press by means of adhesive, thus avoiding the complicated clamping devices which are essential where heavy metal printing plates are used. Furthermore, the press, due to the method of printing, is much faster than presses heretofore known. The elimination of the complicated inking train permits markedly increased speed of operation with the production of satisfactory impressions. The method and the apparatus are adapted for printing a wide variety of materials, including books, magazines, newspapers, catalogs, telephone directories and the like.

Various changes may be made in the details of the procedure as described and in the apparatus employed, without departing from the invention or sacrificing the advantages thereof.

I claim:

1. The method of printing which comprises rotating a cylindrical knurled hard surface in rolling contact with a smooth relatively softer cylindrical surface, applying an ink consisting of a pigmented vehicle made up of a resinous binder and a solvent therefor having a boiling point below about 450° F. directly to the bight between the cylindrical surfaces, constantly maintaining the ink throughout the length of the bight, controlling the depth of the ink layer remaining on the knurled surface after leaving the bight by adjusting the pressure between the two cylindrical surfaces, passing the knurled surface carrying the layer of ink in rolling contact with a rubber printing plate to ink the plate and transferring the inked impression of the plate to a traveling web.

2. The process of claim 1 further characterized in that the smooth cylindrical surface is of hard rubber.

3. A printing press comprising an impression cylinder, a rubber printing plate carried by the plate cylinder, a knurled inking roller having a relatively hard surface disposed to engage the rubber printing plate carried by the plate cylinder, a smooth-surfaced relatively softer roller disposed to engage the surface of the knurled roller, means for supplying ink to and constantly maintaining it throughout the length of the bight between the knurled roller and the smooth-surfaced roller, the two rollers being adapted to rotate in opposite directions, each toward the other at their upper sides, and means for adjusting the pressure between said rollers to control the depth of the layer of ink carried by the knurled roller to the rubber printing plate.

4. A printing press as defined in claim 3 in which the smooth-surfaced roller is of hard rubber.

5. A printing press as defined in claim 3 adapted to the passing of a web between the plate cylinder and the impression cylinder and provided with means for heating the web after it leaves the plate and impression cylinders.

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