June 2, 1931. T. F. PINDER 1,808,476

PRINTING

Filed Jan. 12, 1929

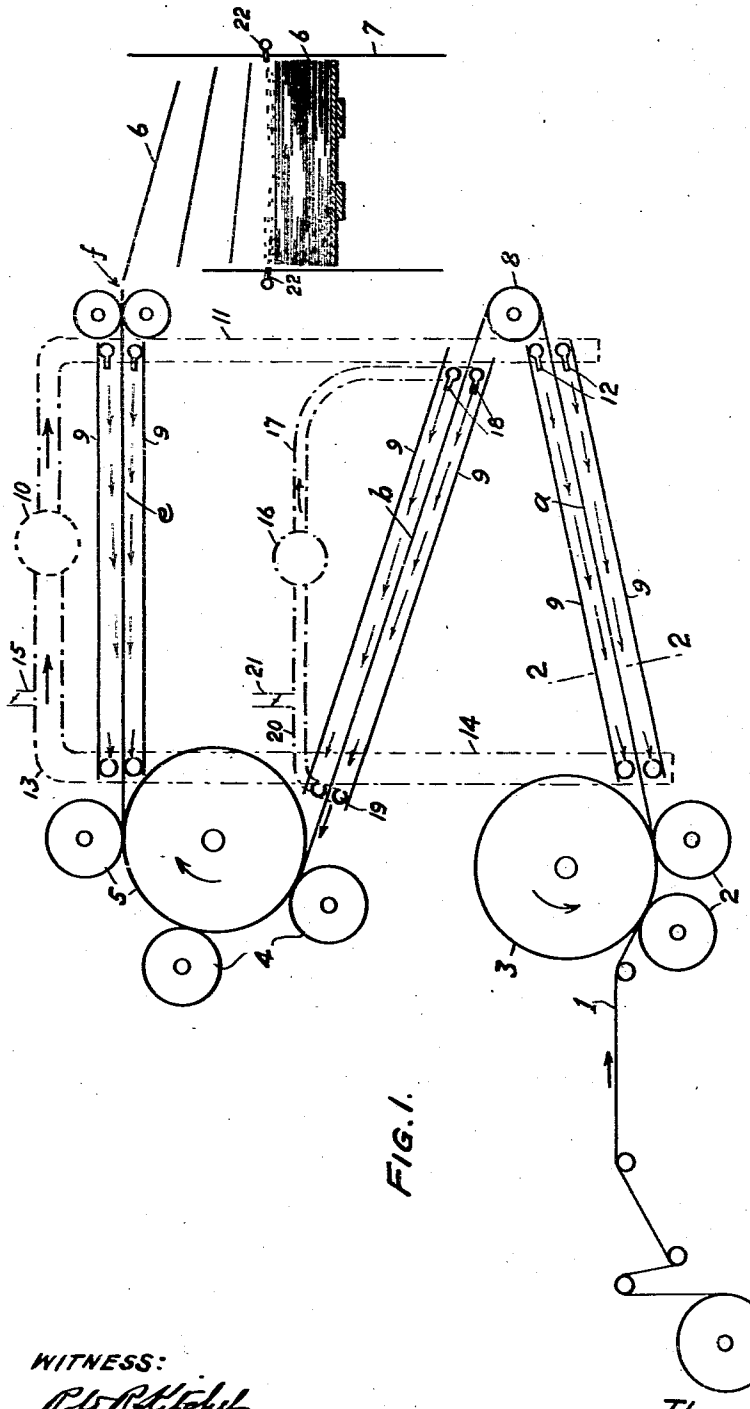

FIG. 1.

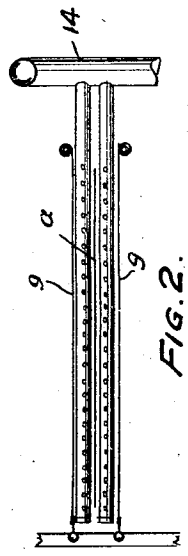

FIG. 2.

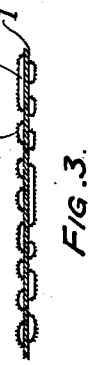

FIG. 3.

WITNESS:

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UNITED STATES PATENT OFFICE

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PRINTING

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The principal object of the present invention is to improve the operation of printing on perfecting sheet delivery presses in such a way that offset is avoided or minimized without requiring the use of an offset web, or any special covering on the impression surface and without requiring the use of slip sheets, while at the same time the paper of the finished sheets contains the proper quantity of moisture or water and the ink thereon is in all cases superficially dry, and in some cases completely dry.

Generally stated the invention comprises a method of preventing offset of the freshly printed sides of a paper web travelling between plate and packing cylinders, and of delivering the web in the form of printed sheets of paper of proper moisture content, which consists of subjecting a travelling web of paper having freshly printed ink thereon to mechanical, and chemical actions, whereby the freshly printed ink as well as the paper is conditioned to positively prevent offsetting and produce a finished sheet having characteristics meeting all requirements of the trade. I first subject the ink to the simultaneous effects of vibration and heat, the latter creating a polymerizing effect on the ink content, considerably facilitated by vibration; and then I subject the partially conditioned ink to a chilling oxidizing action accomplished by subjecting the partially conditioned ink to an application of cold air laden with ozone, the reaction between the treating fluids and the ink being greatly facilitated by the vibratory motion of the web of paper; and finally I subject the web of paper to a treatment identical with the first mentioned treatment, taking place after the second printing process.

The invention also comprises the improvements to be presently described and finally claimed.

In the following description reference will be made to the diagrammatic and schematic drawings forming part hereof and in which

Figure 1 is a diagrammatic view more or less in elevation illustrating schematically the practice of the invention.

Fig. 2 is a cross sectional view taken on the line 2—2 of Fig. 1, and

Fig. 3 is illustrative on an exaggerated scale of features hereinafter referred to.

Having reference to the drawings 1 indicates a paper web traveling between plate cylinders and packing cylinders. 2 and 3 indicate complemental plate and packing cylinders arranged to print on what may be referred to as the bottom side of the web, and 4 and 5 represent plate and packing cylinders adapted to print on what may be referred to as the top side of the web. The web is delivered in the form of sheets 6 which are collected in the receptacle 7. In the foregoing description there is briefly described the operation of a perfecting sheet delivery press. In the drawings the web after leaving the described printing mechanism 2 and 3, which prints on its lower face, traverses the guide roll 8 and then passes to the printing mechanism 4 and 5, which prints on the other face of the web. In that instance there are two reaches *a* and *b* of web printed on one face thereof. At reach *a* the web is subjected to the action of a current of oxidizing fluid, more specifically hot air. For this purpose the web may be passed between spaced curtains 9, Fig. 2, mounted on spring rollers, such as are employed with fabric shades.

Such curtains are convenient in that they afford ready access to the parts enclosed between them. There is a source of supply of heated air and it is indicated in dash and dot lines because the figure is diagrammatic and schematic. 10 indicates a blower and heater and its function is to pass hot air in the direction of the arrow to the pipe 11, and thence to the discharge nozzles 12. It also sucks air through the pipes 13 and 14 back to the blower 10. Twice as much air may well be withdrawn through the pipes 13 and 14 as is discharged at the nozzles 12. 15 is a vent provided with a damper for controlling the air circulation. In Fig. 3 it is diagrammatically illustrated that the ink *c* is superficially oxidized as indicated at *d*. Of course the web in traversing the reach *a* is heated illustratively to perhaps 300° F. and deprived of moisture. The reach "*b*" is also fitted with

curtains as described, and is subjected to the action of a stream or current of cold air that may contain ozone. 16 indicates a blower that circulates air and ozone through the pipe 17, nozzle 18, reach *b*, and pipes or intakes 19 and 20. 21 is a vent provided in the pipe 20. In this instance the quantity delivered through the nozzles 18 may be half the quantity withdrawn at the intake 19.

In traversing the reach *b* the web is also cooled sufficiently so that it does not interfere with the operation of the printing mechanism 4 and 5. The web now printed on both sides, traverses the reach *e* and in doing so is subjected to a current of heated air supplied from the pipes 11 and 14 similar to the arrangement described in connection with reach *a*. In traversing the reach *e* the freshly printed side of the paper or web is treated so that it will not offset when cut into sheet form at *f* and delivered to and stacked in the receptacle 7. The sheets 6 have been dried or deprived of moisture and in the container or holder 7 they are subjected to a mist or spray of water with or without ozone. For this purpose nozzles 22 may be provided, thus the sheets are restored to their proper content of moisture, and when ozone is employed it facilitates the final treatment of the ink.

From the foregoing description, it is evident that two primary phases are involved in the treating of the ink, one relating to a polymerization treatment of the ink, and the other relating to an oxidization treatment of the ink, the former accomplished in the presence of heat, and the latter accomplished in the presence of cold. As a secondary phase, the paper and ink thereon is subjected to a final treatment for properly conditioning the same for subsequent operations, such as for binding, folding and various other processes involved in the commercialization of the printed sheets.

The first phase of the treatment consists in the opening up of the pores of the paper web, through the application of heat, which also immediately renders the ink more limpid and facilitates the absorption of the ink by the paper, thereby expediting the solidification of the ink. This application of heat may be applied in any well known form, such as through the application of hot air, which speeds up the oscillation of the oil molecules contained in the ink, thus causing them to meet more often in unit time, and polymerize, that is to say, build up multiple molecular groups more rapidly, and thus expedite movement of the ink toward a solidified state. Due to the fact that the heat is applied in the presence of oxygen, considerably speeds the oxidation of the molecules of oil which encounters the oxygen, and as this oxygen reaches the surface of the ink with the heated air, changes take place upon the surface of the ink which expedites solidification, and produces an ink surface formation that enables the same to properly resist any distorting effects the same may be subject to during the well known printing processes. As the treating fluids are in contact with the entire surface of the passing web of paper, a rapid vibratory action is created therein which speeds the effects, and more rapidly brings into contact with the surface of the ink, oxygen for a quicker oxidation of the surface molecules.

As the vibratory motion of the paper, and the direct application of heat and oxygen to the freshly printed ink takes place simultaneously it will be appreciated that polymerization and oxidation of the entire content of the ink, and surface treatment of the ink is greatly facilitated thereby materially reducing the time element in the conditioning of the ink, which is of very vital importance in view of the speed of modern printing presses.

In the subjecting of the web of paper with the ink thereon, to the second primary phase of treatment, the previously treated ink, as set forth above is subjected to a cold treatment which may be cold air, laden with ozone. This action accomplishes the rapid oxidation of the oil content of the ink and further produces a surface hardening effect of the ink to enable the same to more effectively resist distortion which assures a clean printed surface, and positively prevents offset. As the ozone is oxygen in an extremely active condition, it will be appreciated that the oxidizing action is considerably increased and a chilling effect created for accomplishing a tough surface for the ink.

It is well known in the art that linseed and China-wood oils are the principal oils used in printing ink, and as these oils include carbon elements, the molecules of which have the property of uniting chemically, it will be appreciated that molecular groups are developed of solid characteristics which produces solidification of the ink.

Summarizing the above statements, I wish to lay considerable stress upon the fact I treat the freshly printed ink by two absolutely new methods, either separately or simultaneously, that is to say, a polymerization method and an oxidizing method, the former accomplishing a uniform treatment of the ink contents thereof, and the latter accomplishing a more or less surface treatment, which when combined with the polymerization treatment assures proper solidification of the ink, and a surface formation that will enable the ink to withstand all stresses to which the same is subjected in the usual printing processes. The polymerization of the ink, and the oxidizing thereof is greatly facilitated through the subjection of the printed web of paper to a vibratory ac-

tion, of vital importance in view of the controlling influence time has upon the successful utilization of any method depending upon the rapid type of printing machines now in use. As a final treatment, the cut printed sheets are subjected to a spray of moisture with or without ozone, for reconditioning the sheets, and finally conditioning the ink. It will also be appreciated that the printed sheets are in the proper condition to be subjected to additional processes necessary to the successful commercialization of the printed sheets. It will, of course, be understood that the web of paper may be vibrated in various ways, and the polymerization treatment, and the oxidization treatment accomplished with various apparatuses designed considerably different from that illustrated in the drawings, and besides other fluids or treating elements may be substituted as set forth herein, the basic features of my invention residing in the treatment of freshly printed ink in a manner to take advantage of the natural properties of the ink to polymerize and oxidize, and thereby resist all distorting effects and prevent offset. Therefore, I do not desire to be limited in protection in any manner whatsoever, except as set forth in the claims.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of procedure and arrangement and matters of mere form without departing from the spirit of the invention which is not limited to such matters or otherwise than the prior art and the appended claims may require.

I claim:

1. A method of preventing offset at the freshly printed sides of a paper web traveling between plate and packing cylinders and of delivering the paper of proper moisture content, which consists in first superficially oxidizing the ink on the first freshly printed side of the web by contacting the web with a current of hot air and then with a current of cold air, second superficially oxidizing the ink on the second freshly printed side of the web by contacting the web with a current of hot air, and thirdly subjecting the superficially oxidized ink and dried paper in sheet form to contact with a mist or spray of water.

2. A method of preventing offset at the freshly printed sides of a paper web traveling between plate and packing cylinders and of delivering the paper of proper moisture content, which consists in superficially oxidizing ink on the first freshly printed side of the web by contacting the web with a current of hot air and then with a current of cold air and ozone, superficially oxidizing the second freshly printed side of the web by contacting the web with a current of hot air, and subjecting the superficially oxidized ink and dried paper to contact with a mist or spray of water and ozone.

3. A method of preventing offsetting in printing presses consisting in first subjecting a freshly printed web of paper successively to the direct action of a blast of hot and a blast of cold air laden with ozone in passing from one set of printing rolls to the next set of printing rolls and then subjecting the printed web to the direct contact of hot air currents in leaving the printing rolls, and finally subjecting the web to the action of moisture.

4. A method of preventing offsetting in printing presses which consists in subjecting a printed web of paper to vibratory action in the presence of heat and cold.

5. A method of preventing offsetting in printing presses which consists in subjecting a printed web of paper simultaneously to vibratory action and successive applications of hot and cold treatments.

6. A method of preventing offsetting in printing presses which consists in first subjecting the web of paper after its first printing operation to the action of a hot blast of air contacting simultaneously with both sides of a web of paper, secondly to a blast of cold air contacting with both sides of the web of paper, thirdly after subjecting the paper to its second printing operation to a blast of hot air contacting with both sides of the web of paper, and finally to the action of a spray of moisture.

7. A method of preventing offsetting in printing presses which consists in subjecting a freshly printed web of paper in its passage from one set of printing mechanism to the other set of mechanism directly to the successive action of a heated fluid and a cold fluid including ozone.

8. A method of preventing offsetting in printing presses which consists in first subjecting the web of paper after its first printing operation to the action of a hot blast of air contacting directly with the web of paper, secondly, directly to a blast of cold air containing ozone, and thirdly, subjecting the web of paper after a second printing operation to a blast of hot air.

9. A method of preventing offsetting in printing presses which consists in subjecting the freshly printed web of paper directly to the action of a hot air blast and immediately thereafter while the web of paper is in a heated condition to a blast of chilled ozone.

THOS. F. PINDER.