June 18, 1940. A. E. GESSLER 2,204,802

MEANS FOR CONTROLLING WEB TEMPERATURES IN PRINTING

Filed June 30, 1937

Fig. 1.

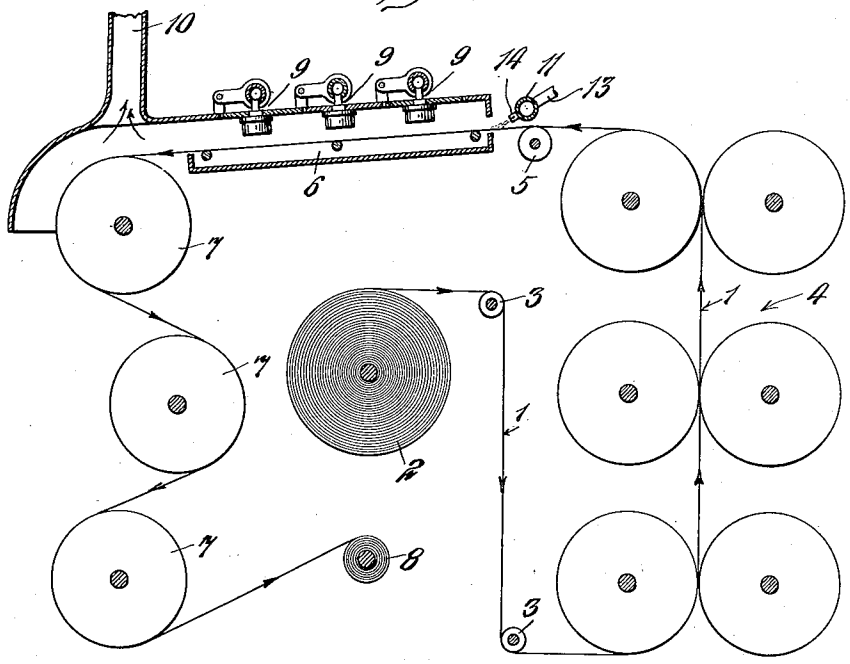


Fig. 2.

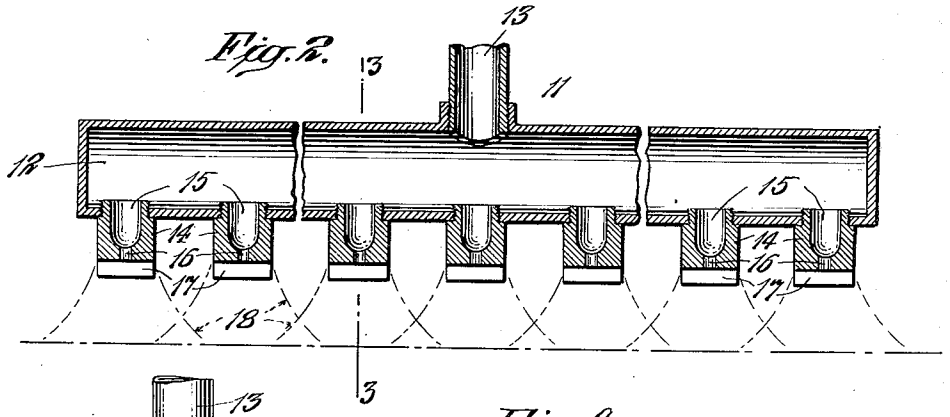


Fig. 3.

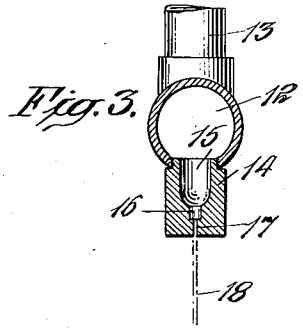
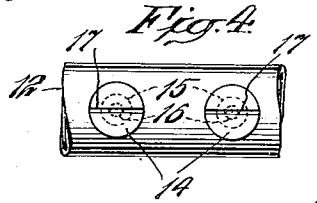


Fig. 4.



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MEANS FOR CONTROLLING WEB TEMPERATURES IN PRINTING

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Application June 30, 1937, Serial No. 151,097

8 Claims. (Cl. 34—24)

This invention relates to the printing and coating art, and has special reference to an improvement in the art of printing or coating where solvent evaporating from the printed surface is burned to hasten the drying.

In the Jeuck Patent 2,042,432, issued May 26, 1936, a method of drying printing ink is described, which comprises printing with an ink containing volatile solvents, heating the sheet and igniting the vapors to hasten the drying. Scorching of the sheet is prevented largely by its speed of travel so that the sheet never attains a temperature sufficiently high to cause scorching.

In the practice of the Jeuck method, in order to avoid an open flame in a room, it is desirable to pass the sheets or web through a furnace, the fore part of which is provided with burners to heat the sheet and ignite the vapors arising therefrom, and the rear part of which is essentially an exhaust chamber.

With non-combustible webs and heavy paper stock, little or no difficulty is encountered with scorching of the web or burning of the ink, provided means are provided for removing the burners from proximity to the web when the presses stop or slow down below a safe speed. However, with delicate papers such as breadwrapper stock, thin wrapping paper and the like, uncertain results are obtained and scorching very often occurs.

Attempts to regulate web temperatures to prevent such scorching have been rather unsuccessful. The principal difficulty with such attempts is that the line of travel of the web is not an absolute straight line, as weaving and bouncing of the web occurs, so that portions of the web may at times come closer to the burners than at others. Still another source of trouble is the difficulty of maintaining a uniform flame in gas burners to which both gas and air are fed. When the gas is turned down so low that scorching will not occur during a run due to variations in the position of the sheet, or in the gas pressure, ordinarily the heat so developed will not dry the ink completely. In addition, the heat obtained in burning the vapors adds an indeterminable factor almost impossible to control with any accuracy.

If an ink which is stable under press room conditions is to be used in printing, it is essential that fairly high web temperatures be obtained in order to insure drying. While it is impossible to measure the actual web temperatures necessary except by scorching the paper in the machine and obtain the same degree of scorching in a mercury bath, it is possible to measure the web temperatures as they emerge from the furnace; and temperatures of the order of 220° F. at the discharge end of the illustrated furnace (corresponding roughly to actual web temperatures of 400° F.) are necessary for inks having minimum press room stability, while more stable inks can be used with somewhat higher web temperatures. The more sensitive papers will scorch at web discharge temperatures of the order of 260 to 280° F. (corresponding roughly to 450 to 500° F. maximum web temperature); so that, theoretically, it should be possible to print these papers. However, in actual practice, if the gas is cut down to get an average web discharge temperature of 220° F., the variations in gas pressure coupled with the uneven travel of the sheet and the heat developed by the combustion of the vapors, will produce local overheating and scorching.

I have discovered a method of regulating web temperatures without attempting to precisely regulate the gas supply, whereby sufficiently close control can be obtained to prevent scorching while maintaining a temperature high enough to permit drying. My method comprises flowing air onto the sheet before it passes under the burners, preferably at such a rate that the air travels with the web at a speed approximating that of the web, or slightly greater. I believe the air forms a thin film which travels with the sheet and partially insulates it from the burners. Furthermore, this thin air film lifts the vapors so that combustion occurs at a distance from the sheet, rather than directly over it. I believe that when the paper weaves and bounces toward and away from the flame, the film exerts a buffering action on temperature. Where an unprotected paper web is run, the portion nearest the burner bears the full brunt of the heat, and may easily be raised above the scorching temperature; the air spreads this heat over a sufficient area to cause more uniform web temperatures in the bouncing sheet. The low air pressure used is maintained uniform with very little difficulty, so that a constant flow of air is maintained very easily.

In the accompanying drawing, I have shown diagrammatically an apparatus which may be used to practice my invention. Figure 1 is a diagrammatic layout; Figure 2 is a detailed section through the air supplying means; Figure 3 is a cross-section through line 3—3 of Figure 2; and Figure 4 is a bottom view of a portion of the air supplying means.

In the apparatus, a web 1 of paper or other material is printed in the conventional manner,

by unwinding it from a roll 2, from whence it passes over guiding rollers 3 through a printing press 4. The printed web is passed over a guiding roller 5, through a furnace 6, over cooling roller 7, and is rewound on a roll 8. The furnace is provided with radiant burners 9, so arranged as to direct a flame at the web while it is passing through at regular speeds, and swing away from the web when the speed is reduced substantially or the web stops. The burners occupy only the fore part of the oven; the balance of the furnace is merely an exhaust chamber provided with an exhaust vent 10.

The set-up described above is one which may be used commercially in the printing of paper by the flashing process, and in which heat-sensitive paper stocks are apt to be scorched.

I provide a source of air 11 adjacent the end of the oven at which the paper enters. As shown in Figure 2, this source of air may take the form of a pipe 12 into which air under slight pressure is fed from a line 13. A series of open nipples 14 permit the air to be distributed uniformly over the traveling web 1. As indicated in Figure 3, these nipples are formed with a large circular opening 15, leading into a smaller opening 16, opening into a narrow slit 17 running the full width of the nipple. The air passing through these slits comes out as a sheet 18, which expands in a lateral direction only, so that the succession of sheets of air forms a continuous sheet before the air strikes the web.

The control of web temperatures possible with my device is rather accurate. Thus, a paper stock was put through an oven at a speed such that the total time of exposure to burner heat was two seconds. The web discharge temperature was approximately 280° F. When the valve on the air line 13 was opened just enough to permit air to trickle out of the jet, a web discharge temperature of 250° F. was obtained, while about 15° variations in the web discharge temperatures were possible by further settings of the valve.

With a sensitive paper stock which scorches at 260 to 280° F., average web discharge temperatures as low as 220° F. give some scorching without an air film. With a thin film of air, I have successfully dried inks on these stocks at web discharge temperatures as high as 240° F., since the web temperature is maintained more uniform by the buffering action of the air film.

My device has made possible the successful printing of very delicate paper stocks, with press-stable inks, using the combustion process of drying; and with less sensitive stocks, it has permitted increases of the order of 30° F. in web discharge temperatures, whereby less volatile inks can be used. Furthermore, it permits web temperature control on webs other than paper, where the same is desirable.

While I have shown but one form of device for flowing a film of air onto the web, other methods of supplying the air may be used, so long as the flow of air can be readily controlled. Changes can likewise be made in other features of the device shown without departing from the spirit of my invention.

I claim:

1. The method of drying combustible web material which comprises passing it through an oven containing direct heating means of sufficient intensity to scorce the web material, at a rate of speed such that some scorching would occur in the passage of the web through the oven, and preventing such scorching by flowing air onto the side of the web exposed to the direct heat in the direction of travel of the web, before the web enters the oven at such a point and at such a rate of speed that a film of air travels with the web through the oven.

2. The method of drying combustible web material which comprises passing it through an oven containing direct heating means of sufficient intensity to scorch the web material, at a rate of speed such that some scorching would occur in the passage of the web through the oven, and preventing such scorching by flowing air onto the side of the web exposed to the direct heat in the direction of travel of the web, immediately before it enters the oven, at such a rate that the air travels through the oven with the web at a rate of speed not substantially less than the web.

3. The method of drying ink on paper which comprises passing paper carrying wet ink through an oven containing direct heating means of sufficient intensity to scorch the paper at a rate of speed such that some scorching would occur in the passage of the paper through the oven, and preventing such scorching by flowing air onto the side of the paper exposed to the direct heat in the direction of travel of the paper, before the web enters the oven at such a point and at such a rate of speed that a film of air travels with the web through the oven.

4. The method of drying ink on paper which comprises passing paper carrying wet ink through an cven containing direct heating means of sufficient intensity to scorch the paper at a rate of speed such that some scorching would occur in the passage of the paper through the oven, and preventing such scorching by flowing air onto the side of the paper exposed to the direct heat in the direction of travel of the paper, immediately before it enters the oven, at such a rate that the air travels through the oven with the web at a rate of speed not substantially less than the web.

5. The method of reducing local overheating of a web while passing it through an oven containing direct heating means for the web, which comprises flowing air onto the side of the web exposed to the direct heat in the direction of travel of the web at a rate of speed approximating the rate of speed of the web so that a film of air travels with the web through the oven, the air being applied immediately before the web is exposed to the heat.

6. The method of drying wet films of ink on a web of sensitive paper stock which scorches when raised to temperatures of the order of 450 to 500° F., which comprises passing the web through an oven containing gas burners directed at the web, at a rate of speed such that the average temperature of the paper never reaches the scorching point, and preventing scorching due to local overheating by flowing air onto the side of the web exposed to the direct heat, in the direction of travel of the web, before the web enters the oven at such a point and at such a rate of speed that a film of air travels with the web through the oven.

7. The method of drying wet films of ink on a web of sensitive paper stock which scorches when raised to temperatures of the order of 450 to 500° F., which comprises passing the web through an oven containing gas burners directed at the web, at a rate of speed such that the average temperature of the paper never reaches the scorching point, and preventing scorching due to

local overheating by flowing air onto the side of the web exposed to the direct heat, in the direction of travel of the web, immediately before it enters the oven, at such a rate that the air travels through the oven with the web at a rate of speed not substantially less than the web.

8. A method of drying an ink film applied to a web of combustible material, which comprises passing the web, with the ink film uppermost, beneath a source of heat of sufficient intensity to scorch the web; and, immediately before the web reaches the source of heat, directing a substantially continuous sheet of air angularly upon the surface of the web containing the ink film to be dried and in the direction of travel thereof, so as to form a layer of air on the web surface which travels with the web beneath the source of heat.

ALBERT E. GESSLER.