

Aug. 25, 1959

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2,900,738

APPARATUS FOR DRYING PRINTED WEBS

Filed Aug. 22, 1956

2 Sheets-Sheet 1

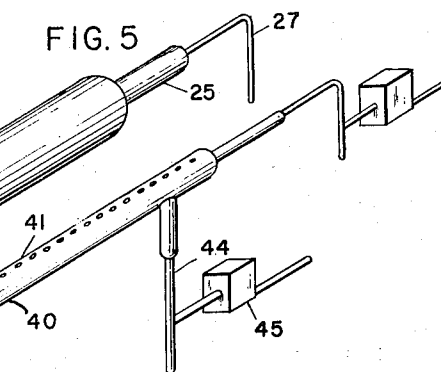
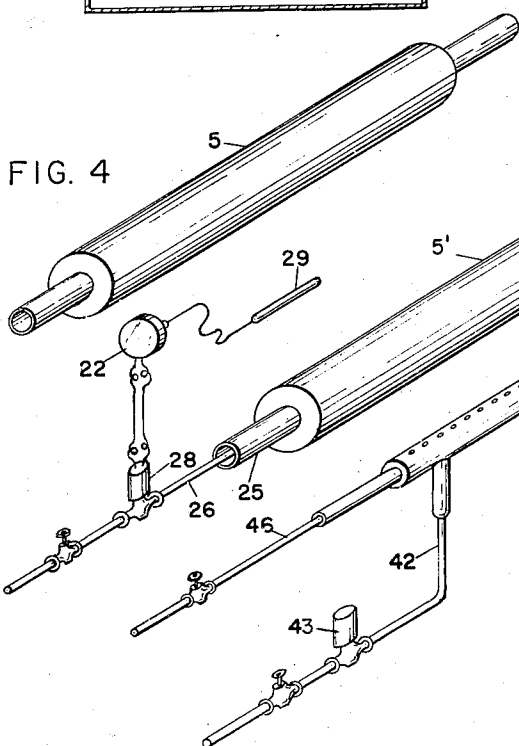
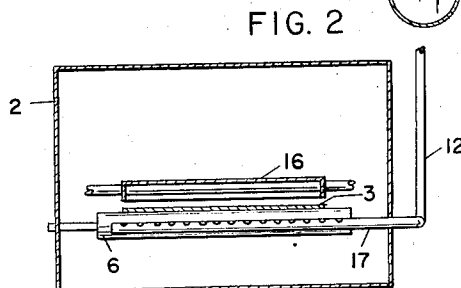
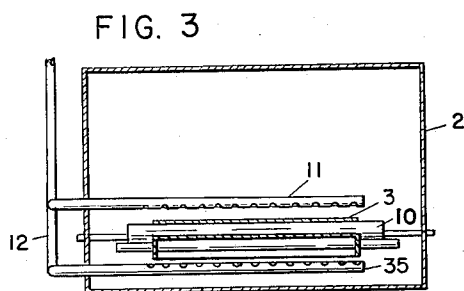
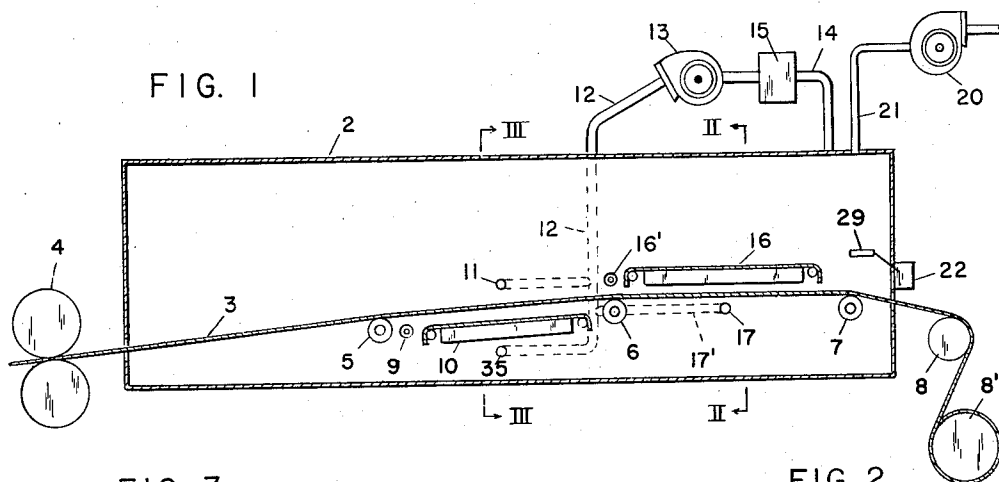


FIG. 8

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2 Sheets-Sheet 2

FIG. 9

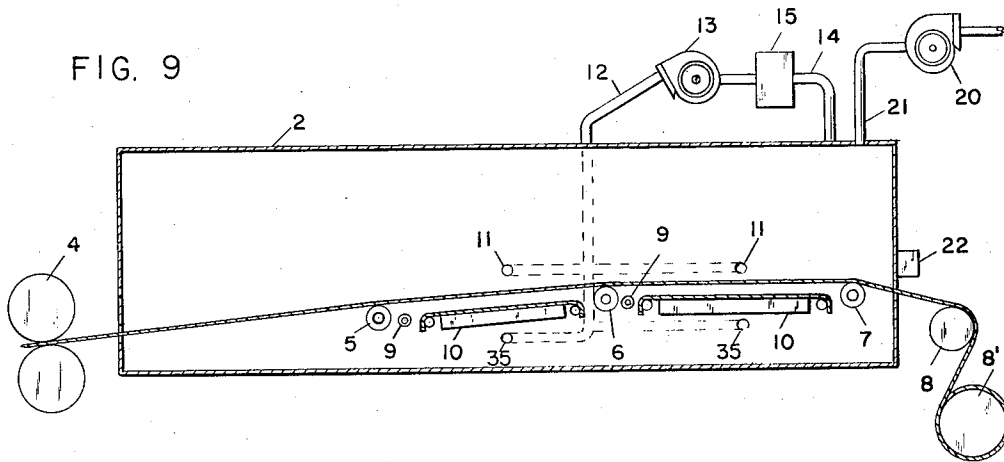


FIG. 6

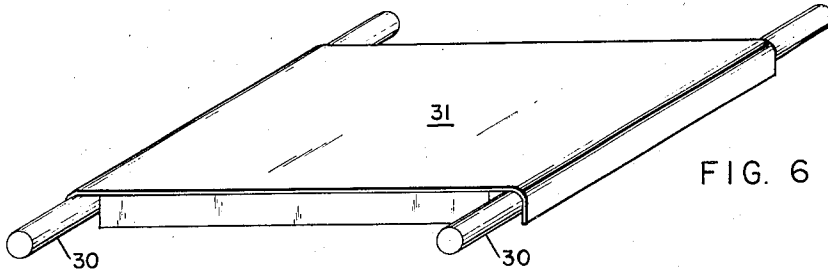
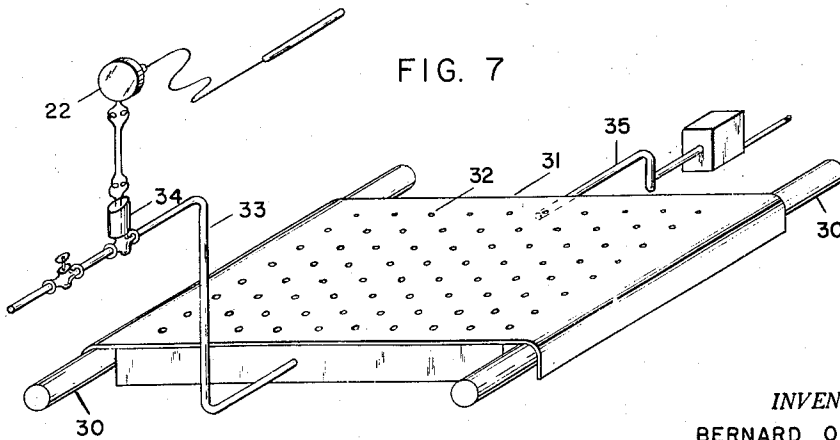


FIG. 7



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APPARATUS FOR DRYING PRINTED WEBS

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8 Claims. (Cl. 34—60)

This invention relates to an apparatus for drying printed webs and, more particularly, to an apparatus for drying printed webs while retarding evaporation of moisture from the web. Further, the intent of the apparatus is to add moisture to the web. In many cases it is desired to increase the percentage of moisture in the printed web or paper.

In drying equipment for printed webs, such as ink on paper, a problem exists in the reduction of moisture in the paper due to the application of heat. Various means have been devised to overcome this condition with little or no success. For example, it has been proposed to employ individual steam applicators which discharged steam on the web. This was not successful since it interfered with the drying of the ink on the paper and failed to retain adequate moisture within the paper.

Ordinarily, two types of inks are used. One is usually called "heat-set" because it requires the application of heat to evaporate the solvents from the ink. In the application of this type, the present invention provides moisture control to retain moisture in the paper. The other type of ink is usually called "vapor-set" or "moisture-set." This ink has a formulation of glycol and, with the application of moisture, the glycol precipitates, setting the ink. Therefore, moisture must be available to the ink so that the ink will pick up the moisture and precipitate. Higher temperatures are employed so that it is necessary to have moisture available to maintain moisture within the paper.

The chief object of the present invention is to provide an apparatus for drying printed webs which assures adequate moisture content of the paper as it leaves the drying equipment.

An object of the present invention is to provide apparatus for drying printed webs which assures adequate moisture content of the paper as it leaves the dryer.

A further object of the invention is to provide drying apparatus for printed webs in which steam is discharged adjacent the web and is trapped under the web thus retarding evaporation of moisture from the web and retaining moisture within the web.

A still further objection of the invention is to provide drying apparatus for printed webs in which heated air is supplied to the printed surface of the web to dry the material printed thereon and steam is discharged and entrapped adjacent the opposite side of the printed web to retard evaporation of moisture from the web. Other objects of the invention will be readily perceived from the following description.

This invention relates to an apparatus for drying printed webs which includes means for discharging heated air adjacent the printed surface of the web, means for discharging vapor adjacent the opposite surface of the web, and means for trapping the discharged vapor adjacent the opposite surface of the web to retard evaporation of moisture from the web.

This invention further relates to apparatus for drying printed webs comprising, in combination, a housing,

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means in the housing for discharging heated air adjacent the printed surface of the web, means in the housing for discharging vapor adjacent the opposite surface of the web, and means for trapping discharged vapor adjacent the opposite surface of the web to retard evaporation of moisture from the web.

The attached drawings illustrate a preferred embodiment of the invention, in which

Figure 1 is a diagrammatic view of the apparatus for drying printed webs;

Figure 2 is a sectional view taken on line II—II of Figure 1;

Figure 3 is a sectional view taken on line III—III of Figure 1;

Figure 4 is a perspective view of the idler roll embodied in the apparatus shown in Figure 1;

Figure 5 is a perspective view of a modified idler roll;

Figure 6 is a perspective view of the vapor trapping member;

Figure 7 is a perspective view of a modified vapor trapping member;

Figure 8 is a perspective view of the steam applicator; and

Figure 9 is a diagrammatic view, similar to Figure 1, of a modified apparatus for drying printed webs.

Referring to the attached drawings, there is shown in Figure 1 the apparatus for drying printed webs of the present invention. In Figure 1, there is shown a housing 2 into which the printed web 3 from the printing rolls or presses 4 is passed with the printed side of the web uppermost. In the housing, the printed web passes over idler rolls 5, 6, 7. The web 3 leaves the housing and passes over a chilling roll 8 to a suitable roll stand 8'.

A first stage of drying within the housing includes a steam applicator 9 placed below the web, a trapping device 10 and a member 11 for discharging heated air against the printed side of the web. Steam is discharged by applicator 9 against the web, the steam being trapped between the web and the device 10 under the web.

Member 11 is connected by duct 12 to fan 13 which is connected by a duct 14 to the housing. A heating member 15 of any suitable type is placed in duct 14. Thus, fan 13 draws air from housing 2 through duct 14, the air passing through the heating member 15, and discharges the heated air through duct 12 and member 11 adjacent the printed surface of the web. In effect, heat is applied to the printed surface of the web to drive off the solvent and, simultaneously, steam is provided adjacent the opposite side of the web, maintaining a high vapor pressure to bring about a high point of equilibrium of moisture to paper web thereby retarding the evaporation of moisture from the lower or unprinted side of the web.

A second stage of drying is provided within the housing which comprises a steam applicator 16' and a trapping device 16 placed adjacent the printed side of the web and a heated air supply member 17 placed below and adjacent the opposite surface of the web. Member 17 may be connected to the fan 13 by suitable ductwork 17'. If desired, as shown in Figure 9, the second stage of drying may include a heated air supply member 11 placed adjacent the printed surface of the web to discharge heated air adjacent the printed surface, a steam discharge member 9 and a trapping device 10. In other words, as shown in Figure 9, the second stage of drying may include elements similar to the first stage as shown in Figure 1.

Preferably, an exhaust fan 20 is provided connected to housing 2 by duct 21 to withdraw some of the air and/or vapor from the housing. A suitable moisture control instrument 22 may be placed adjacent the web 3 as it leaves housing 2 to measure the quantity of moisture contained within the web. Instrument 22 may be used

to regulate the steam supply to the housing and/or the volume of cooling medium passing through the idler roll 5 as hereinafter described.

In Figure 4, I have shown the idler roll 5. Idler roll 5 is extended beyond the housing and has hollow shafts. Cooling of roll 5 causes condensation of steam thereon, wetting the opposite side of the printed web and imparting moisture to the bottom of the web. Preferably, idler roll 5' constructed as shown in Figure 5, is employed. Idler roll 5' and its shafts 25 are hollow. Cooling medium passes through pipe 26 to the hollow shafts 25 and the hollow roll 5' leaving the roll 5' through the hollow shaft 25' and pipe 27. Preferably, a valve 28 such as a solenoid valve is placed in pipe 26 to regulate the quantity of cooling medium passing to idler roll 5'. Valve 28 is controlled by moisture control instrument 22 responsive to the quantity of moisture contained in the web leaving the housing. If desired, instrument 22 may respond to temperature in the housing as reflected by bulb 29.

Trapping device 16 as shown in Figure 6 may include two spaced support members 30 and a pan-like element 31 placed over such members with its open side extending downward away from the web. Preferably, as shown in Figure 7, the trapping device includes a plurality of openings 32 formed in pan-like element adjacent the opposite side of the web. A line 33 supplies steam within the pan-like element 31, the steam passing through openings 32 and being discharged against the lower side of the web. A valve 34 is placed in line 33 and may be regulated by instrument 22 as described above. If desired, a heating line 35 to the panlike element (a steam chest in effect) may be provided to assure that steam discharged therein will remain in vapor form and not condense. Such line may serve as a superheater if desired to raise the temperature of the steam.

Steam applicator 9, as shown in Figure 8, comprises a hollow member 40 having openings 41 therein through which steam is discharged; a steam supply line 42 having a valve 43 therein supplies steam to member 40, condensate leaving member 40 through line 44 and trap 45. If desired, a heating line 46 passing through member 40 may be provided to assure that steam in member 40 is maintained in vapor form.

Considering the method of operation of the drying apparatus, printed web 3 enters housing 2 over the idler roll 5 and passes through the housing over idler rolls 6, 7 leaving the housing over chilling roll 8. Applicator 9 discharges steam adjacent the lower surface (unprinted surface) of the web, the discharged steam being contained between the web and trapping device 10. Simultaneously, heated air is discharged against the printed surface of the web through member 11, heated air being recirculated through the housing by fan 13 and being heated as required by heating member 15. Preferably, some portion of the air as well as waste steam is exhausted from the housing by fan 20. As the web passes over idler roll 5, some vapor condenses on the surface of the roll. The condensate of the roll wets the surface of the web and imparts moisture to the bottom of the web.

Preferably, a second stage of drying is provided in the housing as shown in Figure 1. As shown in Figure 1, in the second drying stage, heated air is discharged against the lower surface of the web while the trapping device traps steam against the printed surface of the web. As shown in Figure 9, the second stage of drying may be similar to the first stage of drying as shown in Figure 1.

Preferably, in the drying apparatus shown in both Figures 1 and 9, a heated air nozzle 35 is provided in the housing to discharge heated air beneath device 10. Thus, if trapping device 10 cools too quickly and condenses steam too rapidly, heated air is discharged against the device to warm it thus maintaining steam between the device and the web.

The present invention provides economical drying equip-

ment which assures a desired moisture content within the printed web after it leaves the equipment. For example, the present equipment permits the printed web to leave the housing at a temperature of approximately 300° F. and yet maintains moisture content within the paper of 5, 6 and 7 percent. The method of drying provided by the present invention assures retention of desired moisture within the printed web since a high vapor pressure is maintained within the housing to bring about a high point of equilibrium of moisture to paper thereby retarding evaporation of moisture from the bottom of the web.

While I have described a preferred embodiment of the invention, it will be understood the invention is not limited thereto since it may be otherwise described within the scope of the following claims.

I claim:

1. In apparatus for drying printed webs, the combination of a housing, means in the housing for discharging heated air adjacent the printed surface of the web, means in the housing for discharging water vapor adjacent the opposite surface of the web, and means for trapping discharged vapor adjacent the opposite surface of the web to retard evaporation of moisture from the web, said trapping means comprising support members and a pan-like element placed over said members with its open side extending downward away from the web.

2. Apparatus according to claim 1 in which a plurality of openings are provided in the pan-like element adjacent the opposite surface of the web, and means are provided for discharging steam in the pan-like element.

3. Apparatus according to claim 2 in which means are provided for controlling the quantity of steam discharged within the pan-like element responsive to the quantity of moisture in the web leaving the apparatus.

4. Apparatus according to claim 2 in which heating means are provided within the pan-like element.

5. In apparatus for drying printed webs, the combination of a housing, an idler roll in the housing over which the wet printed web passes, means in the housing for discharging heated air adjacent the printed surface of the web, means in the housing for discharging water vapor adjacent the opposite surface of the web, means for passing a cooling medium through the idler roll thereby collecting condensate on the surface of the idler to wet the web passing thereover, and means for trapping some portion of the discharged vapor adjacent the opposite surface of the web to retard evaporation of moisture from the web, said trapping means comprising support members and a pan-like element placed over said members with its open side extending downward away from the web.

6. Apparatus according to claim 5 in which a plurality of openings are provided in the pan-like element adjacent the opposite surface of the web, and means are provided for discharging steam in the pan-like element.

7. Apparatus according to claim 6 in which control means are provided for regulating the passage of cooling medium through the idler and control means are provided for regulating the discharge of vapor within the pan-like element, said means being responsive to the quantity of moisture in the web leaving the apparatus.

8. In apparatus for drying printed webs, the combination of a housing, a first drying stage within the housing including means for discharging heated air adjacent the printed surface of the web, means for discharging water vapor adjacent the opposite surface of the web, and means for trapping discharged water vapor adjacent the opposite surface of the web to retard evaporation of moisture from the web, and a second drying stage within the housing including means for discharging water vapor adjacent the printed surface of the web, means for trapping the discharged water vapor adjacent the printed surface of the web, and means for discharging heated air adjacent the opposite surface of the web.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,900,738

August 25, 1959

Bernard Offen

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 56, for "objection" read -- object --; column 3, line 61, for "its provided" read -- is provided --.

Signed and sealed this 1st day of March 1960.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON

Commissioner of Patents