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2,588,966

DRUM-TYPE GLOSSY PRINT DRIER

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FIG. 1.

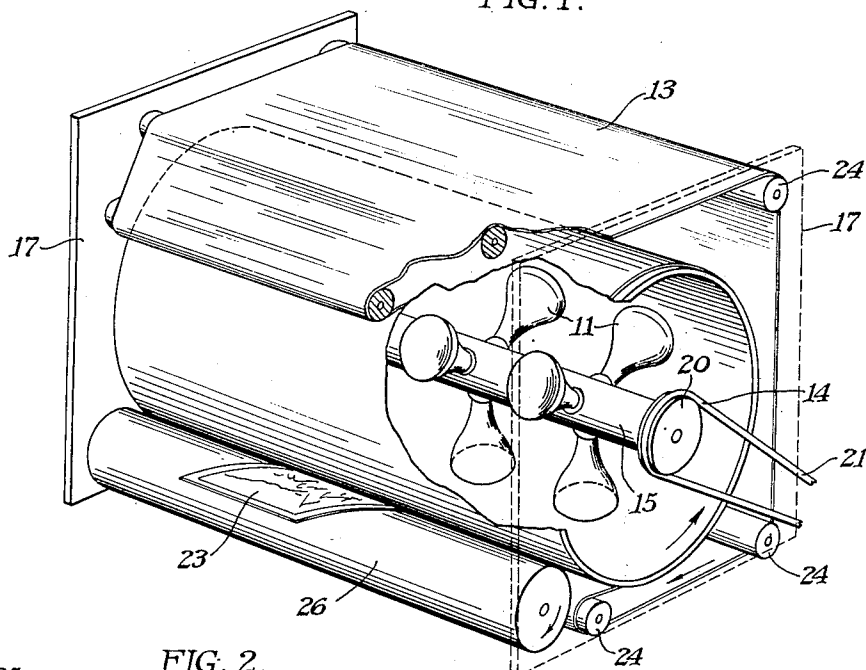


FIG. 2.

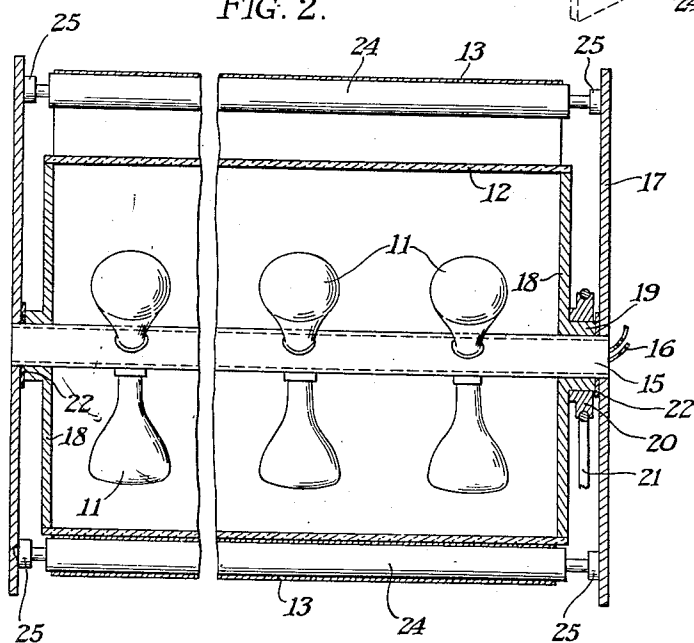
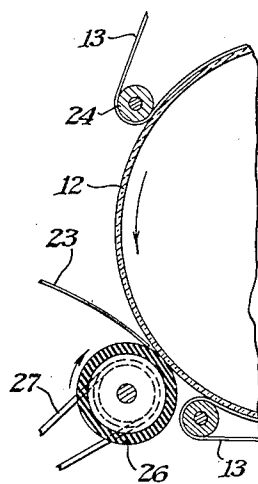


FIG. 3.



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DRUM-TYPE GLOSSY PRINT DRIER

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2 Claims. (Cl. 34—123)

1

The present invention relates to a drier for sheet material and more specifically to a drum-type drier for photographic sheet material, such as glossy prints.

In the prior art, a particularly satisfactory type of drier for drying photographic sheet material, such as photographic prints, has been the rotary-drum variety in which an endless fabric belt engages the peripheral surface of a metal cylinder to hold the print against the cylinder. Rotation of the drum and the corresponding travel of the belt carry the print about the cylinder. The latter is heated by various methods, usually by the inclusion of a heating element within the cylinder. This heating element has been any one of a number of conventional means such as electric heating coils, gas burners, etc. As an alternative, steam or hot air generated outside of the cylinder has been fed into the cylinder. An inherent disadvantage of such prior art driers, however, has resulted from the fact that the operation of these driers depends almost entirely upon contact of the prints with a heated surface. This results in a non-uniform heating and drying of the prints which may cause strains to be set up in the gelatin layer, leading to increased graininess, reticulation and blistering and excessive curling of the prints.

The use of infrared radiation has been found to obviate some or all of the above deficiencies, inasmuch as these heat rays have considerable penetrating power which causes photographic material exposed to such to be more uniformly dried. As a result of this penetrating power and the fact that these rays are strongly absorbed by water, the moisture is evaporated more uniformly from the photographic sheet instead of progressively from top to bottom as when drying is accomplished by contact of the photographic material with a hot surface. The use of infrared radiation for drying is well-known, this type of radiation having been successfully employed in the drying of paints, varnishes, etc. No claim is made to the use of infrared radiation in the drying of photographic materials per se but rather to a novel means by which such radiation may be adapted for use in a drying apparatus for photographic sheet materials.

It is, therefore, an object of this invention to provide an improved drier for sheet material employing infrared radiation as the source of heat.

It is a further object of this invention to provide an improved drier for photographic sheet material in which means are provided to simultaneously convey such material about a source of

2

infrared rays and expose the material to this radiation.

It is a still further object of this invention to provide an improved drier for photographic materials in which sheets of the material are held in contact with a rotatable cylinder, formed of material pervious to infrared rays, which cylinder conveys said sheets of material about a source of such radiation.

It is a still further object of this invention to provide an improved drier for photographic sheet material of the character herein described which is simple in construction, relatively inexpensive, and efficient of operation.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawing, and it will be understood that many changes may be made in the details of construction and arrangement of parts shown and described without departing from the spirit of the invention as expressed in the accompanying claims. I, therefore, do not wish to be limited to the exact details shown and described as the preferred form only has been shown by way of illustration.

In the drawing:

Figure 1 is a perspective view, partly cut away, of an improved drier for photographic sheet material embodying the present invention;

Figure 2 is a longitudinal, elevational section taken through the improved drier; and

Figure 3 is transverse, elevational section taken through a portion of an improved drier illustrating a modification of the invention.

Figures 1 and 2 illustrate one embodiment of the present invention. This drier comprises a series of regularly spaced infrared lamps 11, a rotatable glass drum or cylinder 12, an endless belt 13 which engages a major portion of the peripheral surface of the cylinder, and means 14 for rotating the glass cylinder.

The series of infrared lamps 11 are regularly spaced to provide greater uniformity of heating. They are mounted upon the shaft 15 through which pass the wires 16 which connect the lamps to an external source of electric current. The lamps 11 are of the conventional type having a high emission in the infrared portion of the spectrum. The shaft 15 is fixedly secured at its ends to the end plates 17 which support the several elements of the drier including the various rollers, as will be apparent from the following description. The shaft 15 also serves to mount the cylinder 12 which is rotatable thereon. The ro-

tatable cylinder 12 is preferably formed of glass but may be constructed of any material that is pervious to infrared radiation. Various plastics would obviously serve the purpose. The cylinder 12 is closed at its ends by the circular plates 18. The inner surfaces of the circular plates 18 are preferably polished, reflecting surfaces which serve to lower the heat losses through the ends of the cylinder. By this expedient, substantially all of the infrared radiation is directed upon the pervious cylinder wall. The circular plates 18 include integral bearing elements 19 which are journaled upon the shaft 15 which permit the cylinder to rotate upon said shaft and, therefore, about the array of infrared lamps. A pulley 20 is secured to one of the bearings 19 and together with the belt 21 comprises the means 14 which rotates the glass cylinder. The cylinder may be driven by other arrangements, another of which is described below. Washers 22 may be provided between the ends of the bearings 19 and the end plates 17.

The photographic sheet material 23 to be dried is held against the cylinder 12 by means of an endless belt 13 which contacts the major portion of the peripheral surface of the cylinder. This endless belt is mounted upon a series of idler or free rollers 24 which are journaled in bearings 25 in the end plates 17. The belt 13 is preferably formed of cotton fabric to permit the evaporation of the moisture given off by the print as it traverses its course about the bank of infrared lamps. Obviously the belt may be made of any one of a number of materials although the material should preferably be porous. The endless belt 13, as illustrated in Figure 1, is in close, frictional contact with the major portion of the circumferential surface of the cylinder and is itself driven by the rotation of the cylinder. Photographic sheet material, such as a photographic print, introduced between the belt 13 and the cylinder 12 is carried about the array of lamps by the rotation of the cylinder and corresponding movement of the belt until the sheet is discharged at the point at which the belt leaves the cylinder. The speed of rotation of the cylinder may be varied so that a single traverse through the drier is sufficient to dry the print.

While not illustrated, the tension of the endless belt 13 may be varied by any known conventional means. For example, a roller mounted upon a pivot arm, such as is disclosed in U. S. Letters Patent 1,400,273 granted to B. P. Enright, December 13, 1921, could be employed as a belt tightener in the apparatus embodying the present invention. Similarly, such an adjustable roller, as is disclosed in U. S. Letters Patent 1,240,468, granted to M. B. Martin, September 18, 1917, could be incorporated in my machine to vary the tension of the belt 13.

A transfer roller 26, preferably formed of rubber, is journaled into the end plates 17 and frictionally engages the glass cylinder 12 at a point in close proximity to where the endless belt 13 first makes contact with the cylinder, as shown in Figures 1 and 3. The roller 26 provides a means by which photographic prints may be readily brought into contact with the peripheral surface of the cylinder and fed between that surface and the endless belt 13. It also serves to squeeze superfluous water from the prints before they are exposed to the infrared radiation of the lamps 11. Inasmuch as the transfer roller is in frictional contact with the cylinder 12, the rotation of the latter effects a corresponding rotation of

the roller. In operation, the photographic sheet material is fed into contact with the drum or cylinder 12 at a point near the bottom of the cylinder, as illustrated. Rotation of the drum in the direction indicated by the arrow in Figure 1 carries the sheet up and around the cylinder to the point at which the endless belt 13 leaves the cylinder near the top thereof and just above where the sheet is introduced into the apparatus. This particular arrangement permits a convenient method for introducing and removing the sheet and yet allows it to remain in contact with the cylinder, and, therefore, be exposed to the drying action of the infrared radiation, during the major portion of the revolution of the cylinder. Obviously, however, the transfer roller 26 could be positioned near the top of the drum or cylinder, that is, where the sheet now leaves the cylinder, and the direction of rotation of the latter reversed.

A modification of the present invention is shown in Figure 3 where, instead of driving the cylinder by the means 14 as illustrated in Figures 1 and 2, rotation of the cylinder 12 is effected by driving the transfer roller 26 by the belt 27. Rotation of the roller 26 produces a corresponding rotation of the cylinder 12 which, in turn, as in the first embodiment of this invention, causes the endless belt to be driven.

While the present invention has been described in connection with the drying of photographic sheet material, it is apparent that with few, if any, minor changes the apparatus shown and described could be adapted to serve as a drier for sheets of various non-photographic materials, as, for example, paper.

From the foregoing description, it will be apparent that I have provided means for obtaining all the objects and advantages of this invention.

What I claim and desire to secure by Letters Patent of the United States is:

1. A drier for photographic sheet material comprising a pair of end plates, a shaft extending between and having its ends secured to the end plates, a series of infrared lamps mounted radially about the shaft and being spaced longitudinally thereon, a hollow drum having a cylindrical wall formed of a material substantially pervious to infrared radiation and end walls provided with inner reflecting surfaces, said end walls being journaled upon the shaft to enclose the lamps in the drum whereby the latter is rotatable about the shaft and the lamps, a series of freely rotatable rollers positioned about the drum, the ends of said rollers being journaled in said end plates, an endless belt supported on the rollers and engaging a major portion of the cylindrical wall of the drum and being adapted thereby to hold a sheet of photographic material in contact with the cylindrical wall, a transfer roller in peripheral contact with the cylindrical wall of the drum in close proximity to the point at which the endless belt makes contact with the drum, and drive means for rotating said drum whereby the transfer roller and belt are driven by contact with the rotating drum.

2. A drier for photographic sheet material comprising a pair of end plates, a shaft non-rotatably secured at each end to an end plate, a series of infrared lamps mounted radially about the shaft and being regularly spaced thereon, a hollow drum having a cylindrical wall formed of a material substantially pervious to infrared radiation and having non-pervious end walls which are journaled upon the shaft to enclose the lamps

5

in the drum whereby the latter is rotatable about the shaft and the lamps, a series of freely rotatable rollers positioned about the drum, the ends of the rollers being journalled in said end plates, an endless belt supported on the rollers and engaging a major portion of the cylindrical wall of the drum and being adapted thereby to hold a sheet of photographic material in contact with the cylindrical wall, and drive means for rotating the drum and driving the belt whereby the sheet is conveyed therebetween about said infrared lamps.

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REFERENCES CITED

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

6

UNITED STATES PATENTS

Number	Name	Date
1,075,809	Benson -----	Oct. 14, 1913
2,184,663	Dye -----	Dec. 26, 1939
5 2,311,849	MacDonald -----	Feb. 23, 1943
2,335,798	Schuch -----	Nov. 30, 1943
2,376,207	Tetzlaff et al. -----	May 15, 1945

FOREIGN PATENTS

Number	Country	Date
10 581,040	Great Britain -----	Sept. 30, 1946

OTHER REFERENCES

- "Infra-Red Radiation," pgs. 229 and 230 of
 15 The Chemical Age, March 4, 1944; vol. L, No. 1288.