Nov. 25, 1947. P. B. STREICH 2,431,520

PHOTOPRINTING MACHINE

Filed Feb. 20, 1945 2 Sheets-Sheet 1

Fig. 1.

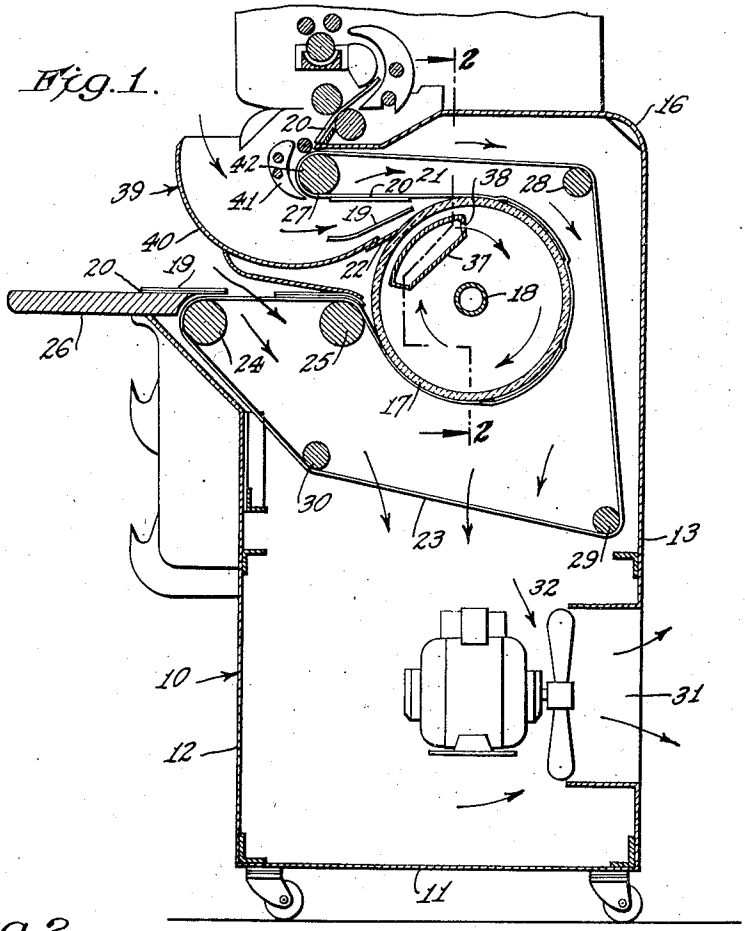
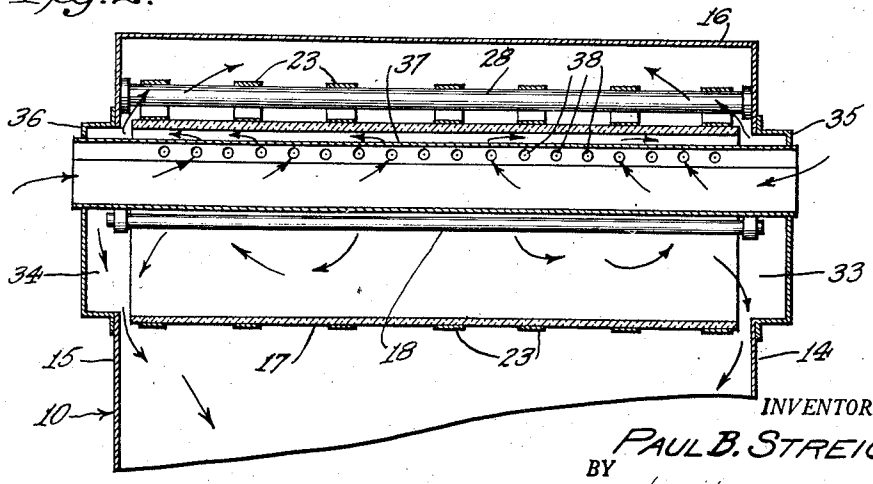


Fig. 2.



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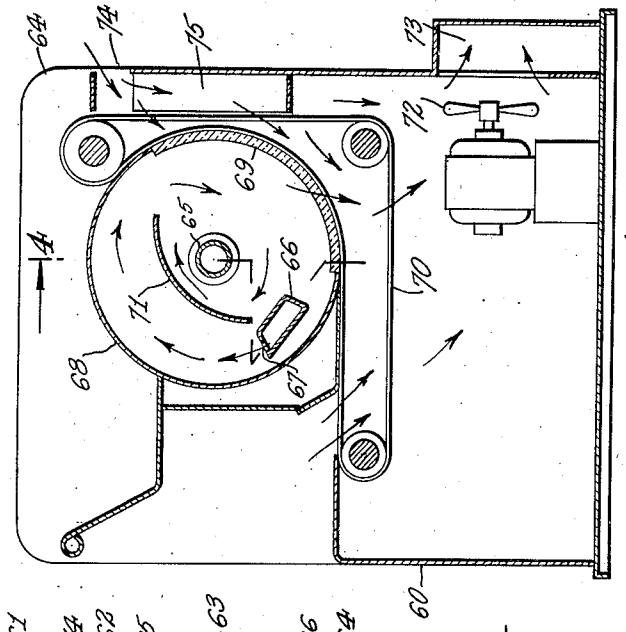

Fig. 5.

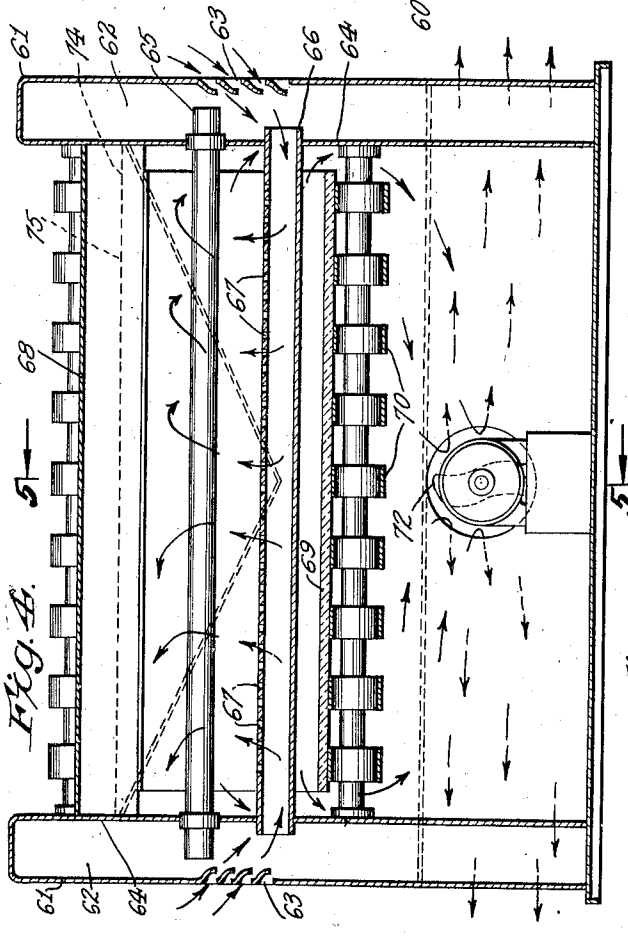

Fig. 4.

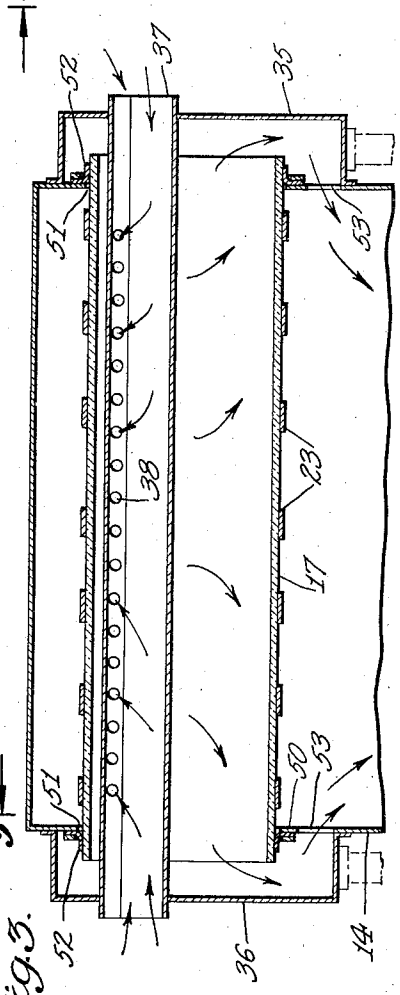

Fig. 3.

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UNITED STATES PATENT OFFICE

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PHOTOPRINTING MACHINE

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Application February 20, 1945, Serial No. 578,840

5 Claims. (Cl. 95—77.5)

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This invention relates to improvements in printing machines for sensitized material, and more particularly, to printing means of the general type in which sensitized material such as paper, is fed around a revolving light-transmitting or transparent cylinder containing lighting or illuminating means adapted for printing purposes, the tracings or the like of which prints are to be made, being fed between the sensitized material and the cylinder.

In machines of this type heat radiating from the lamp tends to heat the transparent cylinder to a high temperature and consequently, the tracings and the sensitized material. Inasmuch as heat has an accelerating action on diazo-sensitized material, uneven heating, and therefore contact temperature, along the length of the cylinder results in uneven effective exposure of the sensitized material. Such heating is, therefore, distinctly undesirable, and it has been proposed to cool the cylinder by placing a suction device at one end thereof and drawing through the cylinder air admitted at the other end thereof. However, the results are unsatisfactory in that the cooling of the cylinder is not uniform. In the foregoing machines, it has also been difficult to remove tracings and the like from the sensitized paper or material.

An important object of the invention is to provide novel and advantageous means for cooling the apparatus.

A further object of the invention is to provide an improved means of effecting even cooling of the apparatus.

Another object is to provide for cooling the apparatus by drawing air from a casing enclosing the apparatus, and thereby drawing cooling air into the casing.

A further object of the invention is to provide means for more uniform cooling of the cylinder.

Another object is to provide means for effecting internal cooling of the cylinder whereby the cooling is substantially uniform from end to end.

Still another object is to provide means for supplying air to the interior of the cylinder intermediate its ends and withdrawing such air from both ends of the cylinder.

Another object of the present invention is to provide means for cooling the cylinder substantially uniformly from end to end, comprising means entering the cylinder longitudinally and supplying air as required at different points along said cylinder, and means for withdrawing air from the cylinder.

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A further object is to provide means for conducting air by one or more ducts, through both sides of the printer into the interior of the rotating cylinder intermediate its ends, discharging the air from said duct or ducts into the interior of the cylinder at one or more intermediate points, and withdrawing the heated air through both ends of the cylinder into the interior of the casing of the machine.

Another object is to provide one or more ducts extending into the rotary cylinder and discharging cooling air in directions to tend to produce currents of air around the inner surface of the cylinder, and means to draw air from the cylinder longitudinally and cause the air to move in helical currents.

Still another object is to utilize the cooling means for the separation of tracings from the exposed printing paper or other material.

Another object of the invention is to provide apparatus in which the rotary transparent cylinder is enclosed in the casing of the machine and outside air, supplied to the interior of the cylinder intermediate its ends through one or more ducts, is drawn from both ends of the cylinder into the casing and, together with air entering the casing at one or more other points, is withdrawn from the casing by the same exhaust means.

Another object of the present invention is to provide apparatus of the character specified in which the partial vacuum maintained in the casing is utilized to separate tracings and the like from the sensitized paper.

A further object is to provide apparatus of the general type referred to in which exhaust means for the chamber draws air from the outside through duct means to the interior of the revolving cylinder at an intermediate part, draws the heated air from both ends of the cylinder into the casing, and draws air into the casing and over the cylinder to cool the cylinder, the bands and the upper part of the casing and to separate the tracings from the exposed paper or the like.

Other objects, features, and advantages will appear upon consideration of the following detailed description and of the drawings, in which

Figure 1 is a view in transverse vertical section of printing apparatus embodying one feature of the invention;

Figure 2 is a section taken along the line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 2, showing a modified form of the invention;

Figure 4 is a view similar to Figure 2, showing yet another modified form of the invention, the view being on the section line 4—4 of Figure 5; and

Figure 5 is a view in transverse section, taken on line 5—5 of Figure 4 and looking in the direction of the arrows.

Referring to the drawings, the printer comprises apparatus within a casing 10, having a bottom 11, a front wall 12, a rear wall 13, a right side wall 14, a left side wall 15 and a top 16. Mounted transversely of the casing 10, and in the upper part thereof, is a rotatable light-transmitting cylinder 17 of heat resisting material such as "Pyrex." A suitable lamp 18, such as a mercury vapor lamp, is mounted coaxially of said cylinder 17, the cylinder receiving tracings 19 and sensitized paper 20 on the outer surface thereof. The cylinder 17 is suitably mounted for rotation about its axis, as for example, by being suspended by a series of endless bands 23 which also serve to hold the tracings 19 and the sensitized paper 20 against the rotating cylinder 17. Instead of a series of endless bands, as above described, it is contemplated that a perforated band would be used.

Said bands 23 pass upwardly and rearwardly over a roll 24 to a roll 25 adjacent to the front of cylinder 17, thus providing a traveling platform to receive the tracings and paper from a feed board 26. From the roll 25 the sensitized paper and the tracings are fed around the cylinder between the same and bands 23 until they pass over the top of the cylinder 17 where the bands leave the cylinder and run forwardly and substantially horizontally to the bottom of a roll 27, upwardly at its front and rearwardly to a roll 28 at the rear part of the casing. At the rear of roll 28, the bands pass downwardly to a roll 29, forwardly from the bottom of the roll to the bottom of the roll 30, and from the same upwardly to roll 24.

The heat generated by lamp 18, unless dissipated, would injure the sensitized paper and otherwise impair the printing operation. In accordance with this invention, the lamp and cylinder 17 are cooled by providing an exhaust outlet 31 in the back or rear wall 13, preferably in the lower part of the casing, and an exhaust fan 32 to force air outwardly through said outlet, thereby drawing in cool air through openings provided in the casing.

According to the present invention, substantially uniform cooling of the cylinder 17 may be obtained, and this cooling is effected by means of air flow induced by said fan 32. To this end, the cylinder ends are spaced inwardly from the side walls 14 and 15 to permit the flow of air around such ends of the cylinder 17, as indicated by the arrows in Figure 2. Beyond said cylinder ends are provided openings 33 and 34 covered by caps 35 and 36. Extending through the cylinder 17 and through suitable close-fitting openings in the caps 35 and 36, is a duct 37 which is open at both ends to receive the outside air.

The duct 37 is of substantial cross-section and preferably is shaped in such a manner that the side adjacent the cylinder 17 is cylindrical, preferaby having a curvature above the axis of the cylinder 17. It will be observed that the duct 37 serves as a light shield to prevent light from reaching the portion of the cylinder 17 where the tracing and print are not in contact. The narrow face of the duct facing rearwardly with reference to the rotation of the cylinder is provided with a series of air passages 38 from which the air passes in a clockwise direction around the interior of the cylinder and due to the drawing out of the air through the ends of the cylinder by means of the fan 32, the air passes in helical currents, as indicated by the arrows in Figure 2, to the ends of the cylinder where it passes between said ends and the sides of the casing into the main part of the casing, the flow into the main casing being influenced by the chambers within the caps 35 and 36. Air is also drawn into the casing above the feed board 26, as indicated by the corresponding arrows on Figure 1, thus producing a cooling effect at the interior of the casing.

According to another feature of the invention, outside air is drawn into the casing above the cylinder 17 through an opening 21 in the front of the casing, as indicated by the corresponding arrows on Figure 1, and at this point, the vacuum chamber is utilized to separate the tracings from the sensitized paper, thus eliminating the need for a special device to effect such separation. To this end, there is provided a receiving tray 39 extending across the front of the casing and connected to the side walls thereof. Said tray 39 includes a curved bottom 40 and a substantially horizontal portion over the bands between the rolls 24 and 25. A stripping edge 22 is formed on the tray 39 either to engage the cylinder 17 yieldingly, or to be spaced slightly away therefrom.

Each tracing 19 with the sensitized paper beneath it is fed from the feed board 26 over a horizontal stretch of bands 23 to the cylinder 17 and carried around the cylinder 17 to the top thereof. There such sensitized paper is held against the lower sides of the bands 23 by the partial vacuum in the casing and fed forwardly beneath the bands, the tracings being separated from the sensitized paper by gravity and air agitation and falling into the tray 39. After the exposed paper reaches roll 27, the bands continue in their movement and pass around the roll 27 from below and then rearwardly as hereinbefore described, the guide fingers 41 assisting the printing paper around roll 42 on its way to a developer unit above said casing 10.

Since direct cooling of a mercury arc lamp reduces its efficiency and life, it will be seen that the present invention provides a highly advantageous structure in that the cooling air is directed away from the lamp and about the inner surface of the cylinder. Direct air currents are thus avoided around the lamp which is thus maintained in an atmosphere of substantially free air.

With reference to the structure shown in Figure 3, the casing 14 is shown as being provided with caps 35 and 36 in which the duct 37 is mounted in a manner similar to that shown in Figures 1 and 2. In the form shown in Figure 3, however, the casing 14 is formed with extensions 50 which lie within the caps 35 and 36 and which are provided with circular openings 51 within which the rotatable cylinder 17 is received. Circular gaskets 52 serve to seal the space between the cylinder 17 and the walls 50. One or more openings 53 are formed in each wall 50 in order that the interior of the caps 35 and 36 may communicate with the interior of the casing 14 and provide the desired vacuum effect within the cylinder 17. In this structure, it will be seen that the cooling air is drawn into the duct 37 from

the outside of the machine, then, from the duct 37 through the apertures 38 and into the interior of the cylinder 17. The vacuum produced by the fan 32 draws the air from the cylinder 17 into the end caps 35 and 36, and then through the openings 53 into the interior of the casing 14.

In the form of the invention shown in Figures 4 and 5, a casing 60 is formed with end walls 61 which provide hollow chambers 62. Louvers 63 permit air to be drawn within the chamber 62. The end walls 61 are formed with inner plates 64 within which a source of illumination 65 is mounted, and also within which a hollow duct 66 is mounted, the ends of the duct being open so they communicate with the interior of the end walls 61. As in the forms shown in Figures 1, 2, and 3, the duct is provided with apertures here designated 67 which communicate with the interior of an enclosing element 68. In the form shown in the drawings, the enclosing element is circular in cross-section and is provided with a transparent portion 69 over which the tracing and sensitized paper are moved by means of endless belts 70 in a manner similar to that described in connection with Figures 1, 2, and 3. A reflector and shield 71 are provided so that the illuminating means 65 directs light only upon the transparent portion 69.

In the form shown in Figures 4 and 5, the transparent portion 69 of the enclosing element 68 terminates short of the inner plates 64, so that air drawn through the apertures 67 and into the enclosing element 68 continues into the lower portion of the casing and is exhausted therefrom by means of a fan 72 which is similar in construction and operation to the fan 32. The fan 72 discharges the air into a transverse chamber 73 and then to the atmosphere, thus maintaining a partial vacuum within the entire casing 60 so that the interior of the enclosing element 68 is subjected to the vacuum. In this fashion, the cooling air drawn through the louvers 63 and into the ends of the tube 66 is directed through the openings 67 into the enclosing element 68. In view of the manner in which the duct 66 and openings 67 are mounted, the cooling air follows a generally helical path through the enclosing element 68, as indicated by the arrows in Figures 4 and 5.

The enclosing element 68 is fixedly mounted within the casing so that the tracings and sensitized paper slide over the surface of the transparent portion 69 and are discharged at the top of the enclosing element 68 as will be apparent in Figure 5.

In order that the bands 70 may be cooled, air is also drawn into the casing through an opening 74 at the rear of the casing. A V-shaped baffle plate 75 is provided so that the bands 70 in the center of the machine receive more cooling air than the bands at the ends, thus to provide uniform cooling of all of the bands and to correct the tendency of the bands in the center portion of the machine from being heated to a greater extent than the bands at the ends thereof.

It should be understood that various changes may be made, and that various features may be used without others, without departing from the true scope and spirit of the invention.

I claim:

1. In a machine of the character specified, the combination with a cylinder having at least a portion thereof light-transmitting and illuminating means therein, of means for producing uniform cooling of the cylinder throughout its length comprising air supply means disposed longitudinally within said cylinder, said air supply means having at least one end open to a source of cool air and having openings intermediate the ends of the cylinder and along the length thereof to supply cool air in proper proportion and in directions tending to produce air currents along the inner surface of said cylinder, and means overlying at least one end of the cylinder for withdrawing heated air from the cylinder, thereby imparting axial components of motion to said air currents and drawing cool air into and through said air supply means.

2. In a printing machine for sensitized paper, the combination with a light-transmitting cylinder and illuminating means therein, of cooling means for said cylinder comprising a duct in said cylinder having openings intermediate the ends of said cylinder and along the length thereof to connect the interiors of said duct and cylinder, the interior of said duct communicating with the outside air and the openings thereof being directed to produce currents of air along the internal surface of the cylinder, and means for drawing air from at least one end of the cylinder thereby drawing cool outside air into said duct and from said duct into said cylinder.

3. In a printing machine for sensitized paper, the combination with a light-transmitting cylinder and illuminating means therein, of cooling means for said cylinder comprising a duct in said cylinder having openings intermediate the ends of said cylinder and along the length thereof to connect the interiors of said duct and said cylinder, the interior of said duct communicating with the outside air and said openings being directed to produce whirling currents at the internal surface of said cylinder, and means for drawing air from both ends of the cylinder and in connection with such whirling currents producing helical currents of air, thereby drawing cool outside air into said duct and from said duct into said cylinder.

4. In a machine of the character specified, the combination with a light-transmitting rotary cylinder, illuminating means in said cylinder adjacent the axis thereof; of a casing about said cylinder with its sides spaced from the ends of the cylinder, means for exhausting air from the cylinder into the casing and from the casing to the atmosphere, and an air supply duct passing through the cylinder at one side of the illuminating means, said duct communicating with the outside air and having an aperture therein adjacent the inner wall of the cylinder and along the length thereof between the ends of the cylinder to supply air to the interior thereof.

5. In a machine of the character specified, the combination with a light-transmitting rotary cylinder, illuminating means in said cylinder adjacent the axis thereof; of a casing about said cylinder with sides spaced from the ends of the cylinder, means for exhausting air from the cylinder into the casing and from the casing to the atmosphere, and an air supply duct passing through the cylinder at one side of the illuminating means, and through the side walls of the casing, said duct having at least one open end and having apertures adjacent the inner wall of the cylinder and along the length thereof for the passage of air into the cylinder.

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