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GASEOUS DEVELOPING APPARATUS FOR LIGHT PRINTING MACHINES

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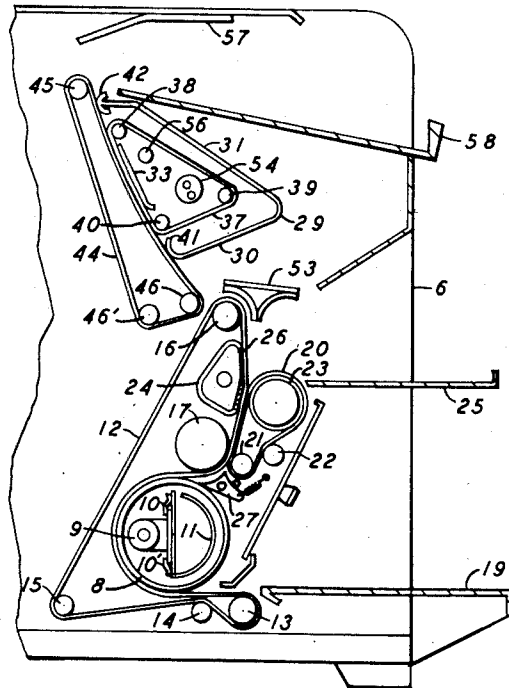


FIG. 1

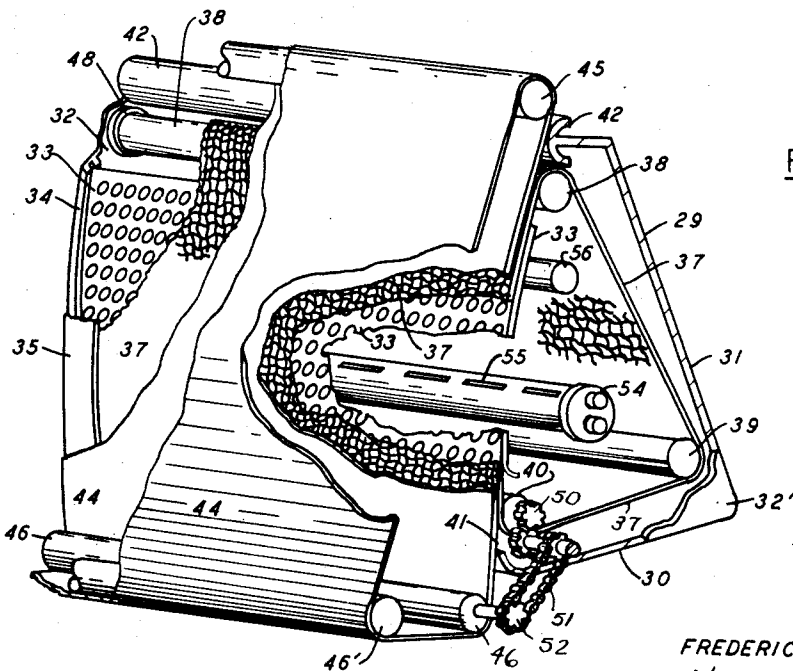


FIG. 2

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GASEOUS DEVELOPING APPARATUS FOR LIGHT PRINTING MACHINES

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2 Claims. (Cl. 95—94)

This invention relates to light printing or duplicating machines of the type employing diazo sensitized materials, and more particularly to mechanisms in such machines for developing the exposed sensitized material.

Machines of the type indicated are widely employed in industry for making exact duplicates of translucent originals, such as drawings or letters, and deliver a positive photocopy which can immediately be used without further processing or drying. For this reason, these machines are generally termed "dry printing and developing machines," known by the trade name "Ozalid" to distinguish them from other types where the exposed material is liquid developed and thereafter must be dried before it can be used.

The Ozalid-type machines have generally three distinct functional assemblies combined into one operating unit. In the first assembly, designated as the printer, the sensitized material, in contact with the original, is exposed to high intensity light. In the second assembly, known as the separator-conveyor unit, the material is separated from the original and conveyed to the developer while the original is delivered at a predetermined location into a suitable receiving tray. The third assembly is the developer where the exposed sensitized material is subjected to the vapors of a volatile developing agent, such as heated aqueous ammonia and thereafter delivered by the conveyor into a print delivery receiving tray.

This invention is particularly directed to the developing portion of the machine wherein the exposed sensitized sheet material is developed, resulting in a positive copy of the original.

Accordingly, the primary object of this invention is to provide a gaseous developing apparatus of novel construction and higher efficiency which forms an integral component element of the light printing machine.

Another object of the invention is to insure more uniform distribution of developing gas to the material processed.

A salient feature of the invention is the provision of a moving, endless, flexible mesh belt which is located within the tank where the gas is generated while a portion thereof extends outside of the tank forming a carrier support for the sheet material to be developed and also conveying developing gas particles thereto.

A particular advantage of the construction herein described is that heat losses at the material treating surface of the developing apparatus are greatly reduced and compensated.

Other objects, features and advantages will be apparent from the following description of the invention, pointed out in particularity in the appended claims and taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevational, sectional view of the various assemblies forming the light printing machine; and

Fig. 2 is a perspective view, partly in section, of the developing apparatus.

Referring to the drawings, in the sectional view of

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Fig. 1, the housing 6 of the machine is shown merely in outline to indicate that the components are supported and arranged in a housing which surrounds all the working parts.

The various controls for the operation of the machine and the power drive, which may be a suitable type of electric motor, are not shown for the sake of simplicity of illustration since the invention is not concerned with these components.

The printer assembly located near the bottom of the machine includes a printing cylinder 8 which is rotatably supported in any convenient manner. A suitable light source 9 within the cylinder 8 is slidably supported between the brackets 10 and 10' affixed to an enclosure 11 which forms an air duct for the circulation and exhaust of cooling air to insure proper temperature for both the light source 9 and the printing cylinder 8.

A plurality of porous endless conveyor belts 12, arranged side by side, partially surround the cylinder and travel over rollers 13, 14, 15, 16 and 17 distributed at strategic points to form a transport from the cylinder 8 toward the separating and developing assemblies of the machine. The roller 13 is located near the material receiving end of the machine, there being a feedboard 19 in the proximity of the roller 13 extending from the housing 6. This board forms the support for the original and the sensitized material as they are inserted into the machine to be passed over the surface of the printing cylinder 8.

A secondary conveyor comprises several endless belts 20, arranged side by side, and traveling over roller 21, tensioning roller 22 and suction roller 23. Over a portion of this travel the two belts 12 and 20 run parallel and in contact with each other, forming a conveying passage. The separating assembly is located within this portion and comprises two suction elements. The one which deflects the sensitized material is a triangularly shaped suction chamber 24, and the other, which deflects the original to be deposited in the tray 25, is the above mentioned suction roller 23.

The entry into the separator assembly is between rollers 17 and 21. Here, the sensitized material, as well as the original, will enter after being stripped from the surface of the printing cylinder 8. For this purpose, a plurality of stripping fingers 27 are arranged alongside the printing cylinder 8 and in contact therewith.

The suction chamber 24 has a perforated side 26 over which pass the porous belts 12 as they travel between the rollers 16 and 17.

As pointed out before, the invention pertains to improvements in the developing portion of the light printing machine.

In the gaseous developing art of diazo sensitized sheet material, it is customary to use a developing tank which may take various forms but comprises essentially an airtight enclosure of which one wall is perforated to allow the gas to contact the material. The latter is passed alongside and in close contact with the wall. In order to prevent the escape of gas, an endless belt, generally made of canvas reinforced rubber, is utilized to cover the perforated wall. This belt is generally termed the "sealing sleeve" and, in addition to its function of sealing the perforations, it also provides the means for moving the sheet material alongside the perforated wall.

The gas generated within the tank is usually evaporated aqueous ammonia which may be introduced in liquid form of measured amounts into the tank and there gaseified by electrical heaters located inside the tank. Heat is an important factor to obtain uniform results and the temperature of the tank must be maintained uniform, particularly over the perforated surface.

The above conventional construction has certain well

recognized disadvantages which the present novel construction, in accordance with this invention, substantially eliminates. These disadvantages are as follows:

(a) The material being passed along the surface of the perforated wall and tightly pressed against it by the sealing sleeve moves under appreciable friction and the sensitized surface often becomes scratched resulting in lines which mar the developed image.

(b) The material as well as the sealing sleeve absorb heat from the tank and cool the perforated wall which often results in uneven temperature distribution.

(c) The supply of gas exuding from the perforations is a function of the gas pressure within the tank which is governed not only by the supply of ammonia to the tank but also by heat distribution therewithin. A cooled portion of the tank surface will result in condensation of the gas and inadequate supply for the material.

An attempt to improve on prior, conventional construction of the developing apparatus is disclosed in U.S.P. 2,515,144 wherein a flexible mesh belt is utilized which travels over the perforated wall of the tank at the same speed as the sealing sleeve and thereby forms a support for the material which is between the sleeve and the mesh belt. The disadvantage of friction is thereby eliminated and better diffusion of the gas is obtained.

The present invention is particularly directed to an improvement in the construction disclosed in the above patent. While the mesh belt moving around the tank ameliorates the condition causing damage to the material due to friction, it seriously interferes with the heat distribution and also reduces the efficacy of the gas. The reason for this is that the mesh belt, being outside of the tank in a comparatively cool atmosphere with respect to conditions inside the tank, cools the paper as well as the tank surface as it moves over the perforated wall. Moreover, gas particles occluding to the belt from the outer surface of the perforated wall have the tendency to condense in the interstices of the mesh, resulting in additional cooling which hinders the developing process and often smears the print material.

As will be seen from the following description of the present construction, in accordance with the invention, the above disadvantages are completely eliminated with the unexpected result that the mesh belt also aids the developing process.

Referring to Fig. 2, the tank 29 is of a triangular shape having a bottom wall 30, back wall 31 forming nearly a 90° angle, side walls 32 and 32' and a curvilinear front wall portion comprising perforated plate 33 held in frame members 34 attached to the side walls 32 and 32' and provided with marginal strips 35. Since the plate 33 does not extend to meet the walls 30 and 31 there is an opening across the front near the top and another near the bottom, both of which communicate with the inside of the tank 29. The purpose of these openings is to accommodate exit and entry of the endless mesh belt 37 which is stretched over rollers 38, 39 and 40 located within the tank and so distributed that the belt 37 overlies the plate 33 and inside the tank, follows in substantially close parallel relationship, the bottom and back wall configuration of the tank 29.

The bottom wall 30 has a rounded front edge 41 and the back wall 31 has a front edge in the form of a curved lip 42. A sealing sleeve 44 is stretched over rollers 45, 46 and 46' so placed as to have the sealing sleeve 44 ride firmly against the plate 32 as well as against the edge 41 and the lip 42, thereby hermetically sealing the tank. Additional sealing on the side is provided by the marginal strips 35 (of which only the one on the left hand side is illustrated) over which the sealing sleeve 44 rides in firm contact.

The rollers 38, 39 and 40 within the tank 29 rotate in bearings attached to the side walls 32 and 32' of which only the bearing 48 of the roller 38 is illustrated.

The roller 40 has a gear 50 which is meshed with an intermediate gear and sprocket assembly attached to the tank wall 32'. A chain drive 51 connects with the sprocket 52 of the roller 46. The latter is the driven roller. As mentioned before the driving mechanism is not shown here since it has no relation to the invention. Suffice it to say that the gears 50 and 52 are so proportioned that chain drive 51 provides the same linear speed in the same direction for the mesh belt 37 as that of the sealing sleeve 44.

Within the tank 29 is seen the evaporator unit 54 which may take the form of a tubular container having longitudinally extending slits 55 and containing a suitable electric heating element not shown here. The ammonia liquid may be injected into the evaporator where it suddenly gasifies and the vapor under pressure leaves through the slits 55 to fill the tank 29. A heater element 56 is generally placed in a suitable position within the tank 29 to superheat the gaseous atmosphere.

The operation of the developing apparatus hereinabove described is similar to standard procedure. The exposed sheet material is separated by the suction chamber 24 and is diverted by the deflector 53 to enter between the sealing sleeve 44 and the mesh belt 37, both moving at the same speed and carrying the sheet material past the front plate 33 which has a great number of perforations through which the gas, also passing through the mesh belt 37, reaches the sensitized surface of the material and performs the chemical action on the diazo coating.

The salient feature of the invention is now manifest. The mesh belt 37 traveling continuously into and out of the tank and having its largest portion within the superheated inner atmosphere maintains the plate 33 at a high temperature and compensates for any heat loss due to heat conduction of both the material as well as the sealing sleeve 44. In addition to this, the mesh belt 37 absorbs gas from within the tank 29, the gas particles occluding in the interstices of the mesh, and transfers these gas particles to the sensitized surface of the material. In other words, instead of absorbing gas which exudes through the perforations of the wall plate 33, it adds to it by bringing gas particles from within the tank. Consequently, the mesh belt becomes a material aid in supplying active, high temperature gas particles for the development.

The developed material, leaving over the lip 42, is deflected by the guide 57 to be deposited as a finished print into the receiving tray 58.

I claim:

1. An apparatus for gaseous development of exposed diazo sensitized sheet material comprising a developing tank having imperforate end, bottom and back walls and a perforated front wall, said tank also being provided with spaced slots opening into the interior of the tank from the front wall thereof, an endless flexible mesh belt, means including rollers within the tank for movably supporting the belt to cause it to move through a first slot out of the tank, then outside said tank along and adjacent the outer surface of said perforated front wall in a direction substantially parallel thereto, then back into the interior of said tank through a second slot, then through the interior of said tank and back to said first slot, said rollers within the tank being so distributed as to constrain the belt to follow in substantially close parallel relationship the wall configuration of said tank, heating means within said tank for generating a gas, said heating means being located within the area circumscribed by said belt, a movable sealing sleeve positioned entirely outside the tank and having a portion thereof in contact with the portion of the belt outside the tank and moving in unison therewith to move the sheet material past said perforated front wall and to minimize the escape of vapors from the tank and belt and means for driving the sleeve, whereby condensation

of the developing gas entrained by the belt, due to cooling of the belt, is prevented and developing gas is supplied to the sheet material by the belt and through the perforated wall.

2. An apparatus in accordance with claim 1 wherein the configuration of said tank is substantially triangular having the bottom wall and the back wall at approximately right angles and the front wall forming the hypotenuse of said triangle, and additional heating means within said tank located near an apex thereof for maintaining the temperature of said belt at a level suitable for conveying gas particles of a predetermined tempera-

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ture to said sheet material while said belt is outside of said tank.

References Cited in the file of this patent

UNITED STATES PATENTS

2,457,753	Trump	Dec. 28, 1948
2,515,144	Trump et al.	July 11, 1950
2,625,865	Taini	Jan. 20, 1953

FOREIGN PATENTS

667,376	Great Britain	Feb. 27, 1952
702,792	Great	Jan. 20, 1954