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APPARATUS FOR AUTOMATIC DISPOSAL OF WASTE DEVELOPER
IN DRY PRINTING AND DEVELOPING MACHINES

Filed April 24, 1952

2 Sheets-Sheet 1

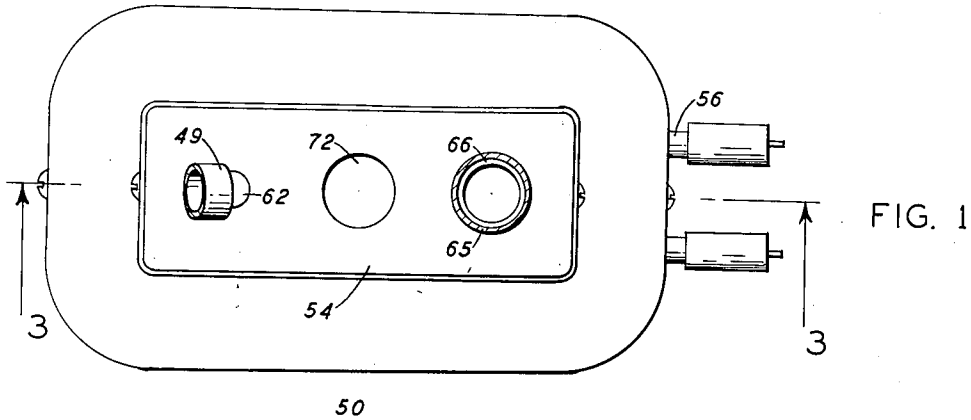
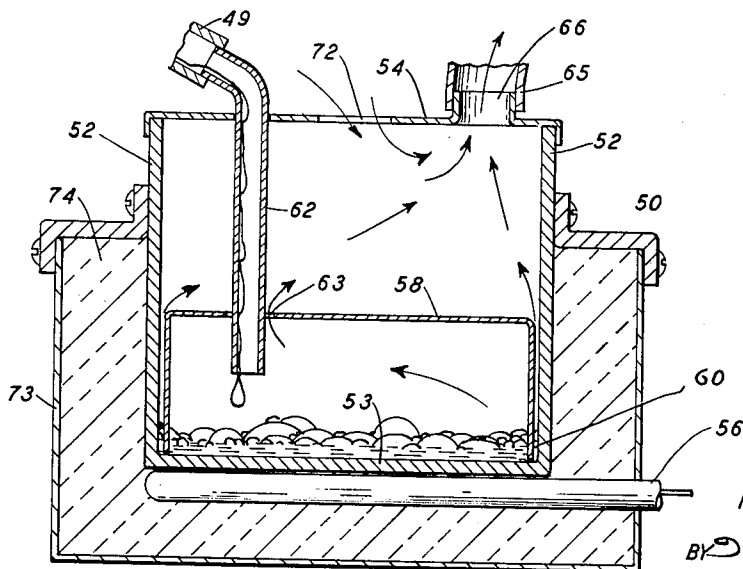
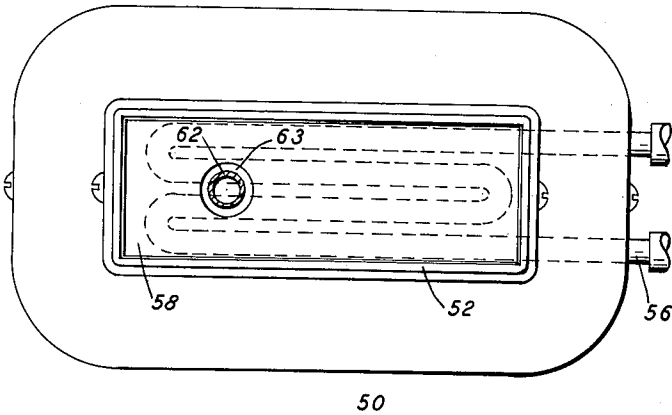


FIG. 2



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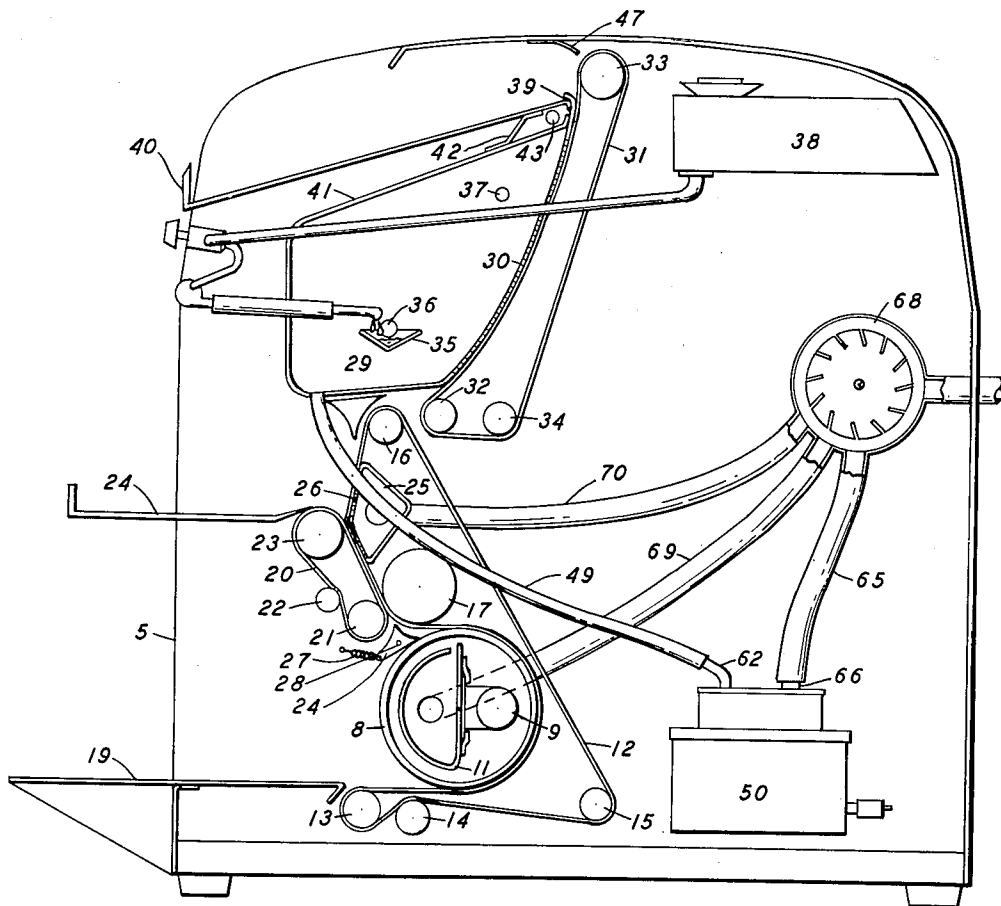


FIG. 4

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APPARATUS FOR AUTOMATIC DISPOSAL OF WASTE DEVELOPER IN DRY PRINTING AND DEVELOPING MACHINES

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Application April 24, 1952, Serial No. 284,100

3 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 disposing of the developer condensate generally known as the waste developer.

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 functional component assemblies combined into one operating unit. In the first assembly, designated as the printer, the sensitized material, in contact with an 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 to 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 aqueous ammonia, and thereafter delivered by the conveyor into a print or delivery receptacle.

In the developing portion to which this invention is particularly directed, a volatile liquid, such as aqueous ammonia, is vaporized in a tank by means of electrical heating elements. A large portion of the gas so formed is absorbed in the sensitized material, but a part of the moist vapor condenses again into a liquid and must be removed from the tank.

It is the general practice, at the present time, to drain such condensate, or waste developer, from the tank into a storage vessel, such as a glass disposal-bottle and when the latter is filled it is emptied and replaced in the machine. Obviously, this requires periodical attention and involves additional labor and maintenance, not to mention the human element factor on which the removal of the disposal-bottle rests.

The present invention contemplates automatic and continuous disposal of the waste developer during operation of the machine, and, to this end, means are provided for vaporizing the collected condensate and passing the vapors through the air exhaust portion of the cooling system utilized in such machines.

Accordingly, the primary object of this invention is to provide, in the type of machines hereinbefore stated, a simple yet expedient instrumentality in the form of a disposal unit effecting removal of the waste developer.

Another object of the invention is to provide another functional assembly for such machines which will collect the developer condensate from the developing chamber, volatilize such condensate, and subject the vapors so formed to an air current directed into an exhaust outlet,

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thereby removing the waste developer liquid in vapor form from the machine.

A particular feature of this invention is that the removal of the waste developer is entirely automatic in operation, and requires no attention from a maintenance point of view.

Another feature of this invention is that the entire disposal unit is simple in construction, has no moving parts, and may be constructed relatively small in size so that it can be accommodated in existing installations without difficulties.

Other objects and features 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 drawings, in which:

Figure 1 is a top view of the waste developer disposal unit;

Figure 2 is a similar view with the cover removed;

Figure 3 is a side elevational view in cross-section along the lines 3—3 of Figure 1; and

Figure 4 is a side elevational phantom view of the component assemblies of a light printing and developing machine showing the location and application of the disposal unit.

For a better understanding of the construction and operation of the disposal unit, in accordance with this invention, the general features of a light printing and developing machine will first be considered, and reference should be had to Figure 4, wherein the housing 5 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 affixed to an enclosure 11 which forms an air duct for the circulation of cooling air to insure proper temperature for both the light source 9 and the printing cylinder 8.

A plurality of 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 5. 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, which travel 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. The separating assembly is located within this portion and comprises two suction chambers. The one which deflects the sensitized material is the triangularly shaped suction chamber 25, and the other which deflects the original is a 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. A plurality of stripping fingers 24, of special configuration, are arranged alongside the printing cylinder 8 and in contact therewith. Each

finger is biased by the spring 27 and pivots over a shaft 28 extending between the side walls of the machine.

The particular construction and mode of operation of the stripping fingers form the subject matter of my co-pending application, Serial No. 244,924, filed September 4, 1951, entitled "Paper Pick-Off and Guide Means for Light Printing Machines."

The suction chamber 25 has a perforated side 26 over which passes the porous belts 12 as they travel between the rollers 16 and 17. Above the roller 16, in the upper portion of the machine, is placed the developing tank 29 which has a curved perforated wall 30 facing rearwardly. An endless nonporous belt, generally termed the sealing sleeve 31, completely covers the perforated wall 30 as it passes over the rollers 32, 33 and 34.

Within the tank 29 is placed the evaporator tray 35, having an electrical heater rod 36 placed thereabove. An auxiliary heater rod 37 may also be located near the perforated wall 30 to superheat the developer vapors. The tray 35 is supplied with aqueous ammonia by gravity feed from a tank 38, and the ammonia within the tray is vaporized by the heater rod 36. The gaseous medium so produced passes through the perforations of the wall 30 so as to induce the required chemical reaction on the exposed sensitized material which is passed along and in contact with the wall by means of the traveling sealing sleeve 31.

Part of the wall 30 is not perforated and extends over and above the tank 29. This portion of the wall has an returned end or lip 39 engaging the bottom of the print receiving tray 40, which at the point of junction is rounded and preferably welded to the tank 29. The upper wall 41 of the tank 29, together with the print receiving tray 40, and a laterally extending wall 42, form an enclosure for a heater rod 43 located near the non-perforated extension of the wall 30. The particular construction of this portion of the tank 29, and the placement of a heater rod, constitute an improvement which is described in my co-pending application, Serial No. 252,606, filed October 23, 1951, entitled "Apparatus for Light Printing and Developing Diazotype Paper," now abandoned.

All the moist vapor generated in the tank 29 will not be absorbed by the sensitized paper which is held against the perforated side 30 as it is carried by the sealing sleeve 31. A portion of this gaseous developer will condense on the cooler portions of the walls of the tank during operation, and, of course, at each shutdown of the machine, as it cools, the vaporized aqueous ammonia remaining in the tank condenses again into liquid. This is generally termed the "waste developer."

In accordance with the present invention, this condensate is drained from the bottom of the tank where it collects by means of a flexible conduit 49 and into a disposal unit 50. The constructional features of the latter are shown in detail in Figures 1, 2 and 3, to which reference should now be had.

Essentially, this unit comprises a container which may have any desired shape and is shown by way of example as an oblong box having side walls 52, a bottom 53 and a cover 54. This container is preferably made of stainless steel which is not affected by the corrosive action of the aqueous ammonia collected therein. An electrical heating element 56 is arranged in contact with the bottom 53 to furnish the required heat for the evaporation of the collected condensate. This heating element is generally connected to the same energizing source such as the A. C. power line which supplies the other components of the light printing apparatus. In commercial equipment, the heating element 56 may be embedded in the bottom portion of the unit, as is common practice in electrically heated vessels, thereby obtaining a much higher efficiency.

The inside of the container is divided into an upper and a lower section by means of a heat confining shield 58 forming an inverted oblong cup which is smaller in overall dimensions than the container, so as to allow pas-

sage of the vapors into the upper section as will be explained more fully.

Vents 60 are also placed in the wall near the bottom of the shield 58, and provide communication from the lower section, i.e., the space within the shield 58, into the upper section of the container. A drain inlet pipe 62 extends through the cover 54, to which it is tightly fitted and preferably welded, into the lower section through an opening 63 of the shield 58. This opening is larger in diameter than the pipe 62, thereby permitting additional passage of vapors from the lower section into the upper section.

An exhaust outlet pipe 65, which generally comprises a flexible conduit fitting over an outlet bushing 66 of the cover 54, connects to an inlet of the exhaust fan 68, as seen in Figure 1. Such an exhaust fan is standard and necessary equipment in machines of this type, and produces suction wherever needed, as for example, through the printing cylinder 8 by means of conduit 69 in order to cool the cylinder, and also through the conduit 70 for the print separating function. The outlet of the exhaust fan is generally conducted through a suitable exhaust pipe either into an ammonia absorbing tank or into the open air outside of the room where the machine is situated.

The cover 54 also has an air inlet opening 72, which, as will be seen further, has an important function in the operation of the waste disposal unit. The entire assembly is surrounded by a heat insulating jacket 73 filled with any suitable insulating material 74, such as asbestos fiber or other materials having poor heat conductivity and high heat resistance.

The operation of the disposal unit 50 is simple and effective. As the condensate, flowing in the conduit 49 and drain inlet pipe 62, reaches the container it is vaporized due to the heat generated in the confined space of the lower section by the heating element 56. The vapors rise through the vents 60 and through the aperture 63 into the upper section where a partial vacuum is created by the air current flowing through the intake aperture 72 and the exhaust conduit 65 created by the suction of the fan 68. The vaporized condensate is carried by this air current and is thereby removed from the disposal unit 50 through the normal exhaust outlet of the machine.

The air intake opening 72 in the cover 54 has an important function in the efficient operation of the waste disposal, not only in establishing an air current flowing in one direction, but also in eliminating negative pressure in the developing tank 29. Without the opening 72 in the cover 54 of the disposal unit 50, the suction of the fan would maintain a negative pressure in the developing tank through conduit 49 and inlet pipe 62. The vacuum so produced would remove not only the condensate in the tank 29 but also the developing vapors generated therein. The result would be either complete inoperativeness as to development, or a greatly lowered efficiency in performance depending upon the extent of the vacuum produced in the tank 29.

The structural arrangement shown in Figure 4 as to the placement of the disposal unit 50 is by way of example, and it will be readily apparent to any one skilled in the art that this unit may be placed wherever convenient as to mechanical assembly. In some instances, particularly in machines which have been built without such waste ammonia disposal, the unit may be attached outside of the housing 5, and connected through suitable hose couplings to the functional elements in the machine with which the unit cooperates in obtaining the desired result.

I claim:

1. In a developing apparatus for light sensitive material of the type utilizing a volatile liquid which forms a gas for development, a developing chamber, means in said chamber for generating said gas by evaporation of said liquid, a drain in said chamber for removing the condensate of the vaporized liquid, a closed container into

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which said condensate is drained, comprising a metal box, a heat confining shield dividing said box into an upper and a lower section, a conduit connected to said drain and extending into said lower section, said shield having vents communicating with said upper section, means for heating said container and vaporizing the condensate collected therein, an air inlet to said container and forced air exhaust means attached to said container for removing the vapor therefrom.

2. In a developing apparatus for light sensitive material of the type utilizing a volatile liquid which forms a gas for development, a developing chamber, means in said chamber for generating said gas by evaporation of said liquid, a drain in said chamber for removing the condensate of the vaporized liquid, a closed container into which said condensate is drained, comprising a metal box, a heat confining shield dividing said box into an upper and a lower section, a conduit connected to said drain and extending into said lower section, said shield having vents communicating with said upper section, a cover for said container having an air inlet opening and an air outlet opening, suction producing means attached to said outlet opening and heating means in contact with said lower section for vaporizing the condensate collected therein.

3. In a developing apparatus for light sensitive material of the type utilizing a volatile liquid which forms a

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gas for development, a developing chamber, means in said chamber for generating said gas by evaporation of said liquid, a drain in said chamber for removing the condensate of the vaporized liquid, a closed container into which said condensate is drained, comprising a metal box, a heat confining shield dividing said box into an upper and a lower section, a conduit connected to said drain and extending into said lower section, said shield having vents communicating with said upper section, a cover for said container having an air inlet opening and an air outlet opening, suction producing means attached to said outlet opening and heating means in contact with said lower section for vaporizing the condensate collected therein, and a heat insulating jacket surrounding said box.

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