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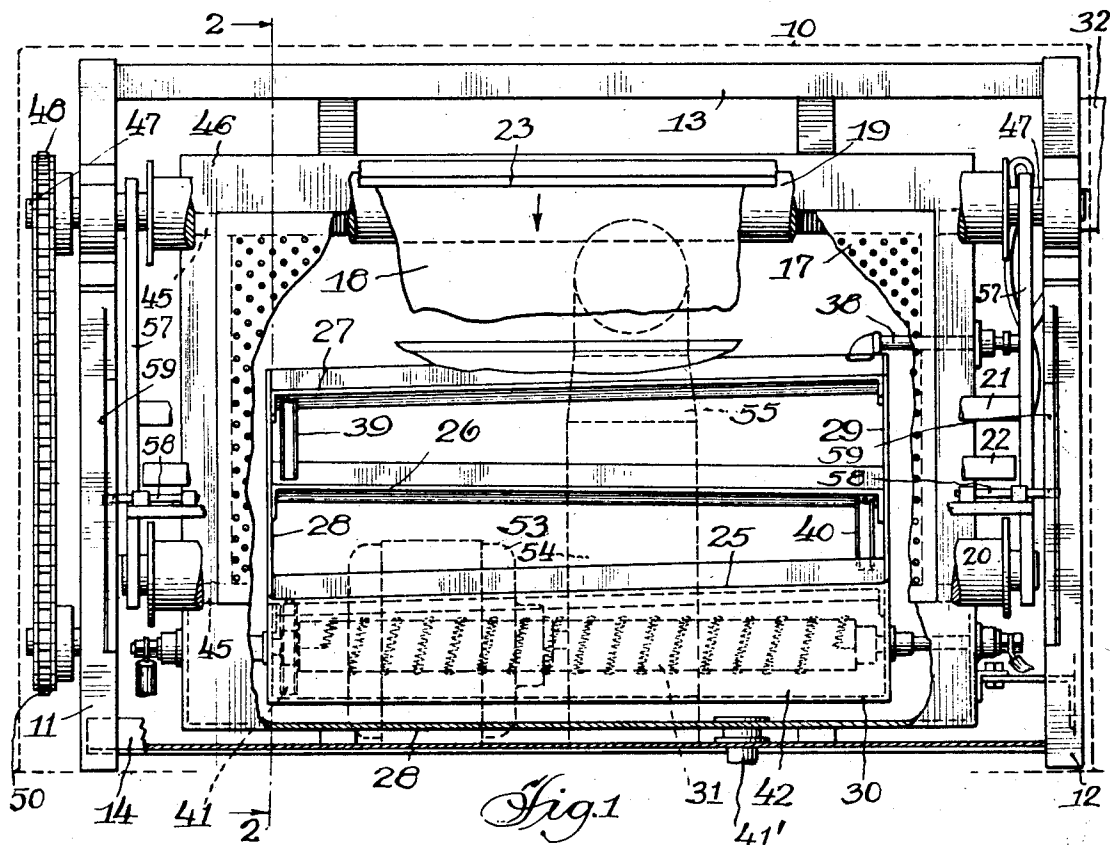
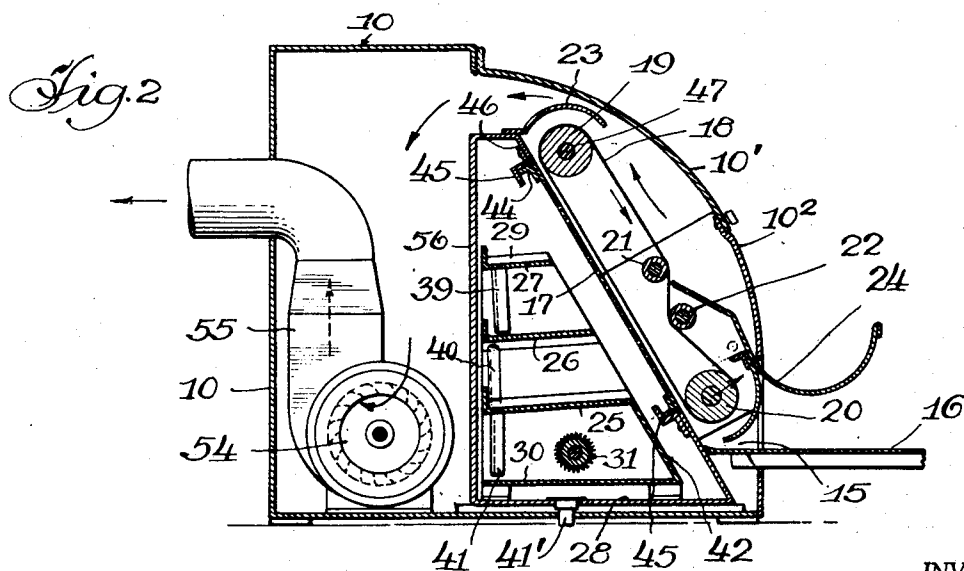
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2,384,155

APPARATUS FOR DEVELOPING PRINTS BY MEANS OF GAS

Filed July 14, 1943

2 Sheets-Sheet 1



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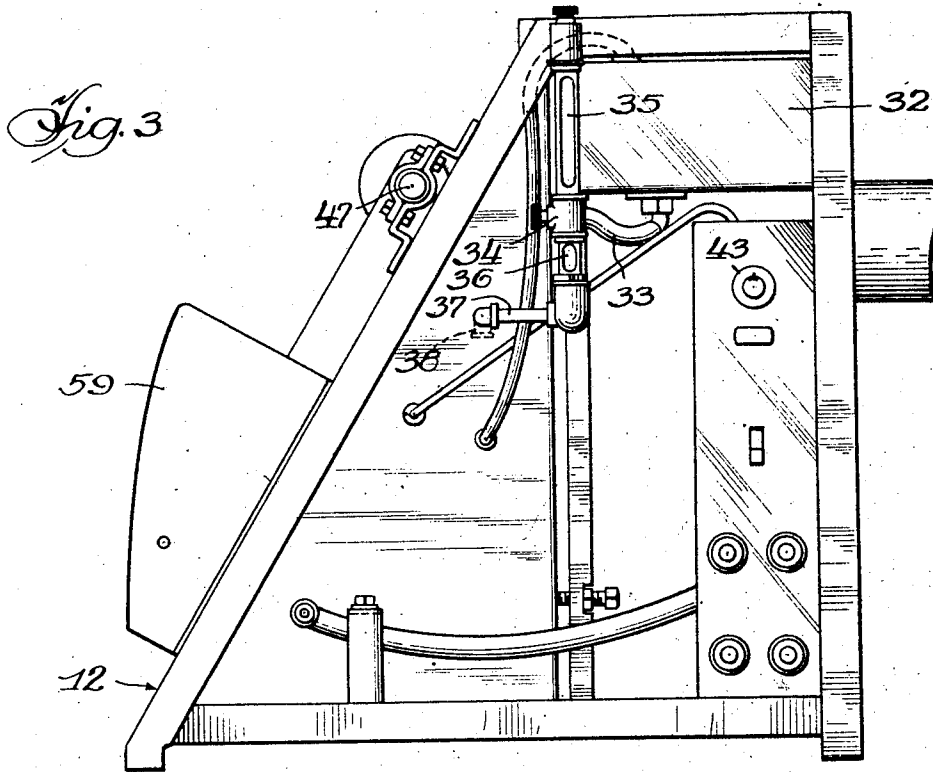
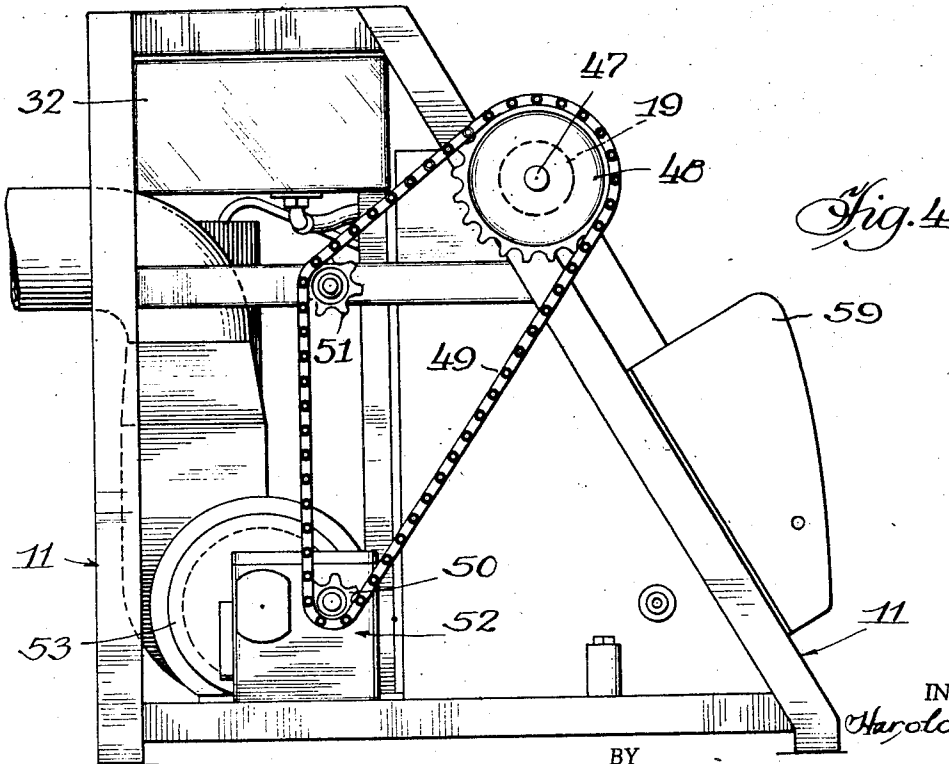
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UNITED STATES PATENT OFFICE

2,384,155

APPARATUS FOR DEVELOPING PRINTS
BY MEANS OF GASHarold J. Brunk, Chicago, Ill., assignor to The
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11 Claims. (Cl. 95—89)

This invention relates to improvements in apparatus in which light-sensitized prints are developed by means of a gas, of which ammonia gas is an example.

The general object of the invention is to provide improved apparatus by means of which the time required to develop the prints is reduced.

Contributory objects are to provide a developing cabinet of increased evaporating capacity for the liquid ammonia used; one in which the escape of objectionable fumes is reduced to a minimum; one in which the conveyor belt may be driven at a more rapid rate than heretofore; one in which the evaporation of the ammonia water takes place simultaneously in several trays; one in which a single heater is employed, but without the difficulty which often arises due to condensation of liquid on the metal surfaces resulting in blemishes on the prints; one in which the heat is applied effectively in accordance with the proportion of water to the ammonia gas therein; and one in which these advantages are attained with a moderate consumption of electric power.

Other objects and advantages will be apparent from the description hereinafter given of a commercial embodiment of the invention.

In the drawings

Fig. 1 is a front view of the equipment with the casing removed;

Fig. 2 is a section on the line 2—2 with certain parts omitted;

Fig. 3 is a right-hand end view with the casing removed; and

Fig. 4 is a left-hand end view without the casing.

The apparatus has a housing 10, 10¹, 10², concealing the frame on which the various parts are mounted. Said frame has end members, indicated as a whole by 11 and 12 (Fig. 1), and connected at the top and bottom by transverse members 13 and 14, respectively, together with other connecting parts.

The prints to be developed enter through a horizontal slot 15 in the front of the housing at the inner end of the shelf or feed table 16 (Fig. 2), and travel upwardly over an inclined perforated plate 17, being moved by an endless belt 18 traveling over rollers 19 and 20 at opposite ends of the loop and passing over adjusting rollers 21—22 at an intermediate portion thereof. Said prints pass diagonally upward and are deflected forwardly and downwardly by the deflector 23, slide over the sheet of metal 24, and pass out through a horizontal slot somewhat above the entrance slot, discharging the prints onto the curved extension of said metal sheet 24, constituting a tray.

Referring now to the containers in which the ammonia is evaporated, the same comprise, in

this instance three superimposed trays 25, 26 and 27, as shown in Fig. 2, each of which slopes somewhat from front to rear and has an upwardly extending flange at the rear, hereinafter referred to. Each tray slopes also from one end to the other, as shown in Fig. 1. These trays are supported by sheet metal end members 28—29 forming a unit having a sheet metal base 30. The heater 31 of the electric resistance element type is mounted beneath the lowermost of said three trays.

As shown in Figs. 3 and 4, the ammonia water is stored in a suitable receptacle 32 at one end of the frame, and is delivered through a pipe 33 to a regulating valve 34 above which is a gauge 35 to indicate the liquid level. From the regulating valve the ammonia drips through the transparent tube 36 and flows through pipes 37—38, being discharged as shown in Fig. 1 onto the upper right-hand end of the top tray 27, this end being higher than the other end. The liquid then flows to the lower end of said tray, then downwardly through the discharge pipe 39 to the upper end of the tray 26 immediately beneath, along said tray and from the lower end thereof through the pipe 40 to the bottom tray 25. From the lower end of said tray it is discharged through the pipe 41 and finds its way to the drain pipe 41' if all of said liquid is not evaporated. Under proper conditions all of said liquid will be evaporated as it is essential to have a substantial amount of water vapor present.

The lowest tray 25 forms the top wall of a compartment in which the electric heater 31 is located. The front of said compartment is closed by the inclined sheet of metal 42, the rear end of said compartment being open. The heater is controlled by a thermostat 43 shown in Fig. 3.

The maximum heat is applied to the lowermost tray 25 as the latter is directly above said heater, whereas the higher trays 26 and 27 receive correspondingly less heat. The inclined plate 42 adjacent the lower end of the perforated plate 17 is also heated by said electric heater. The heated air passes outwardly through the rear of the compartment in which the resistance element is located, and flows upwardly and forwardly between the trays 25 and 26 and upwardly along the inclined under surface of said perforated plate 17. It flows upwardly also through the clearance spaces immediately to the rear of the upper trays and over each tray toward said perforated plate. The ammonia gas driven off by the heat is carried along by these currents of air and passes through the perforations of said plate, thus effecting the development of the prints which slide over the opposite side of said plate.

The ammonia water as used in machines of this character contains about 85% of ammonia gas, some of which is put in under pressure as water

will absorb about 50% of the gas at atmospheric pressure. As a result, mere release of the ammonia water from the storage tank will cause the immediate escape of some of the gas without the application of heat, whereas more heat is required to drive off successive amounts of the remaining gas until practically all of it is dissipated. The design of the apparatus, as indicated in Fig. 2, is such as to provide for an increasing amount of heat as the amount of gas remaining in the liquid in the trays decreases, thus insuring a more uniform application of the ammonia fumes to the prints being developed. The heat also causes the evaporation of the water, the water vapor being essential for completing the chemical reaction in the sensitized layer on the prints.

Another feature of the machine is the provision of a greatly increased evaporation area by the provision of a plurality of trays, as compared with earlier machines which have only one tray. Although three trays are shown in the illustrative embodiment of the invention, the number may of course be varied. This multiple tray arrangement greatly increases the speed of development, making it possible to drive the conveyor belt about twice as fast as in machines used heretofore.

As indicated, the heated vapor passes up and over both sides of the trays, thus heating the metal regardless of the amount of liquid on it. The entire confined space is heated and as the inclosure narrows toward the top there is a tendency to confine the heat, thus offsetting the increase in the distance above the heater. The temperature of the sheet metal parts is sufficiently maintained by the single heater. The liquid does not run off the rear of the individual trays, due to the upstanding flange at the rear of each. Neither does the moisture condense even on the uppermost metal parts in the cabinet or on the perforated plate or the paper as the temperature is higher than that required for condensation. For this reason, blemishes such as would otherwise occur do not appear on the paper.

The heater 31 comprises a porcelain tube with a resistance wire wound around it helically from one end to the other in a conventional manner. Only this one heater is used, and it is protected from the ammonia fumes by virtue of its location near the bottom of the cabinet. However, more than one heater may be used under special conditions if desired.

As shown in Fig. 2, the perforated plate 17 is provided with suitable projections in the form of angle irons 44—44 near the top and bottom thereof, which rest against stops 45—45 at the upper and lower margins of the cut away plate or frame 46, shown also in Fig. 1. With this arrangement said perforated plate may be readily lifted out of its supporting frame, when it is desired to inspect it or to clean it.

The roller 19 is the driving roller for the belt 18 and is mounted on a shaft 47 having a sprocket 48 also mounted thereon (Fig. 4), driven by the chain 49 from a driving sprocket 50, the chain passing over an idler 51. Said driving sprocket is driven from reduction gearing 52 by a motor 53. Said motor also drives an exhaust fan 54 (Fig. 2), thus discharging the air which is laden with ammonia fumes through ducts 55. The vertical partition 56 divides the housing into front and rear compartments, fresh air being drawn in through the inlet and outlet slots at the front of the ma-

chine, passing diagonally upward along in the vicinity of the belt 18, as indicated by the arrows, and discharging into the rear chamber and thus into the exhaust fan housing and outlet pipe. With this arrangement the leakage of ammonia fumes from the cabinet is substantially eliminated.

The rollers 19 and 20, as stated, are supported in a frame, the side members 57 of which are pivotally supported at their upper ends, so that the lower ends may be swung outwardly as indicated by the arrow in Fig. 2, when the two front sections 10¹ and 10² are removed. Said frame is locked in normal position by bolts 58 received within openings in the triangular shaped side members 59, which are shown in Figs. 2 and 4. By opening the front of the cabinet and swinging said frame upwardly, the perforated plate is rendered accessible and may be lifted out, as previously stated, and thus may conveniently be cleaned. Also its removal gives convenient access to the trays. In other words the construction is such as to make the entire front compartment readily accessible.

Ammonia fumes have been referred to herein as illustrating a gas which is used to a great extent commercially in developing sensitized prints. It will be recognized that other gases are employed for similar purposes, and the structural features of the cabinet are adapted to the development of any one of a number of different types of prints by means of any gas suitable for the purpose.

I claim:

1. A cabinet for the development of sensitized prints by means of gas, comprising a plurality of superimposed trays for the liquid which contains said gas, said trays being inclined alternately to the right and the left and each provided with an outlet at the lower end to discharge said liquid onto the trays beneath it, a source of liquid supply communicating with the uppermost of said trays, a heater beneath the lowermost tray to drive off the gas in said liquid as it flows in thin layers over all of said trays simultaneously, a perforated plate past which and through which the gas flows and means to direct a sensitized print over said perforated plate.

2. A cabinet for the development of sensitized prints by means of gas, comprising a plurality of superimposed trays for the liquid which contains said gas, said trays being inclined alternately to the right and the left and each provided with an outlet at the lower end to discharge said liquid onto the trays beneath it, means to supply liquid to the uppermost of said trays, a heater beneath the lowermost tray to expedite the simultaneous evaporation of the liquid in each of said trays, a perforated plate mounted in an inclined position adjacent one edge of said trays, and means for moving the sensitized prints over said perforated plate whereby said prints are exposed to the gas liberated.

3. In a developer cabinet comprising a series of superimposed trays which are inclined to the horizontal so as to cause a liquid to flow from one end to the other thereof, means to supply liquid to the uppermost of said trays, a base and end walls assembled as a unit, a closure for the front of the space between said base and the tray immediately above it, forming a compartment open at the rear, a heater in said compartment, and means for delivering liquid to the

uppermost tray, each tray having an opening therein to conduct said liquid to the next lower tray whereby it may flow over successively lower trays as it is being evaporated and means to direct a sensitized print along a path spaced from the edges of said trays whereby said print is exposed to the vapors emanating from said trays.

4. In a developer cabinet comprising a series of superimposed trays, a base and end walls assembled as a unit, a closure for the front of the space between said base and the tray immediately above it, forming a compartment open at the rear, a heater in said compartment, a source of liquid supply, means for delivering liquid from said source to the uppermost tray, each tray having an opening therein to permit said liquid to flow onto and over successively lower trays as it is being evaporated, a front and a rear wall adjacent but out of contact with said unit and connected at the top to confine the gas driven off from said liquid by said heater, said front wall having perforations therein and means for drawing a sheet of material over said perforated plate and hence subjecting it to said gas.

5. A developer cabinet having a dividing wall therein forming a front and a rear compartment, an evaporating unit in said front compartment comprising trays mounted one over the other and decreasing in width from the bottom to the top to provide a large evaporating surface, means to supply liquid to the uppermost tray, means to conduct said liquid from each tray to the next lower tray, a heater below the lowermost tray, and a perforated plate on the front side of said unit and spaced from the front wall of said cabinet, on which plate a sensitized print may be disposed.

6. A developer cabinet having a dividing wall therein forming a front and a rear compartment, an evaporating unit in said front compartment comprising trays mounted one over the other and decreasing in width from the bottom to the top to provide a large evaporating surface, each tray being inclined slightly so as to permit liquid to flow from the same from one end to the other, means to supply liquid to the upper end of the uppermost tray, means to conduct liquid from the lower end of a tray to the upper end of the tray beneath it, a heater below the lowermost tray, a perforated plate on the front side of said unit and spaced from the front wall of said cabinet on which plate a sensitized print may be disposed, and a blower in the rear compartment, the latter being in open communication with the space between said perforated plate and said front wall.

7. A developer cabinet having a dividing wall therein forming a front and a rear compartment, an evaporating unit in said front compartment comprising trays mounted one over the other and decreasing in width from the bottom to the top to provide a large evaporating surface, each tray being inclined slightly so as to permit liquid to flow from the same from one end to the other, means to supply liquid to the upper end of the uppermost tray, means to conduct liquid from the lower end of a tray to the upper end of the tray beneath it, a heater below the lowermost tray, a partition in front of said evaporating unit, and a perforated plate on which a sensitized print may be disposed re-

movably mounted in an opening in said partition.

8. Apparatus for developing sensitized sheets of the type referred to comprising a cabinet, an inclined perforated plate therein over which the sheets may slide, an evaporating unit behind said perforated plate, said unit consisting of a series of trays each provided with an upturned flange at its rear end and sloping from front to rear, said trays being arranged one over the other and also sloping from one end to the other, means to supply liquid to the uppermost tray, means to supply liquid to the successively lower trays from the tray immediately above each, and a single heater beneath said trays to heat all of them simultaneously.

9. In combination, an evaporator unit comprising a series of elongated trays each sloping from one side to the other and provided with an upturned flange at the low side, said trays being arranged one over the other and also sloping from one end to the other, means for conducting liquid from one of said trays to the next lower tray, a supply of gas-charged liquid having an outlet above said uppermost tray, and a heater beneath the lowermost tray whereby the liquid is evaporated as it flows over successively lower trays, the aggregate area of said trays being sufficient to evaporate substantially all of said liquid as well as to drive off the gas therein, together with means to dispose a sensitized print in a position spaced from the sides of said trays whereby said print will be exposed to the action of said gas.

10. A developer cabinet comprising a triangular-shaped structure for evaporating ammonia water or the like, having a plurality of superimposed trays in communication with each other, means to supply liquid to the uppermost of said trays whereby it may pass to successively lower trays and a heater beneath the lowest tray to effect simultaneous evaporation of the ammonia water on all of said trays, an inclined perforated plate adjacent said heater, an endless belt mounted adjacent the side of said perforated plate opposite said evaporating unit, the front wall of said cabinet enclosing said endless belt except for an entrance and an exit slot near the lower end of said belt, whereby a sensitized print fed into said entrance will be carried by said endless belt into a position wherein it will be exposed to the action of ammonia.

11. A cabinet, for the development of sensitized prints by means of gas, having a partition therein providing a front and rear compartment, the front wall of said cabinet being removable, a series of trays mounted in superimposed relation in said front compartment, means to supply liquid to the uppermost of said trays, means to conduct liquid from one tray to the next succeeding lower tray, an inclined frame in said compartment adjacent said trays, a perforated plate removably mounted in the opening in said frame, a pivoted frame in front of said inclined plate and having an endless belt thereon for conveying prints past the perforations in said plate, said frame being mounted to swing outwardly through the open front, whereby said removable perforated plate and said trays are rendered accessible.

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