May 14, 1940. J. R. REED 2,200,996

APPARATUS FOR CONTINUOUSLY DEVELOPING SENSITIZED LAYERS

Filed April 26, 1938 2 Sheets-Sheet 1

Fig. 1.

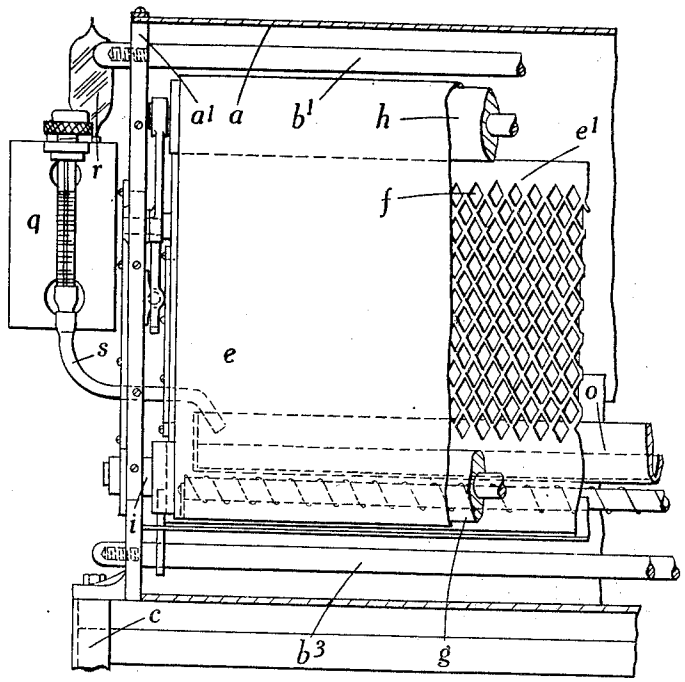
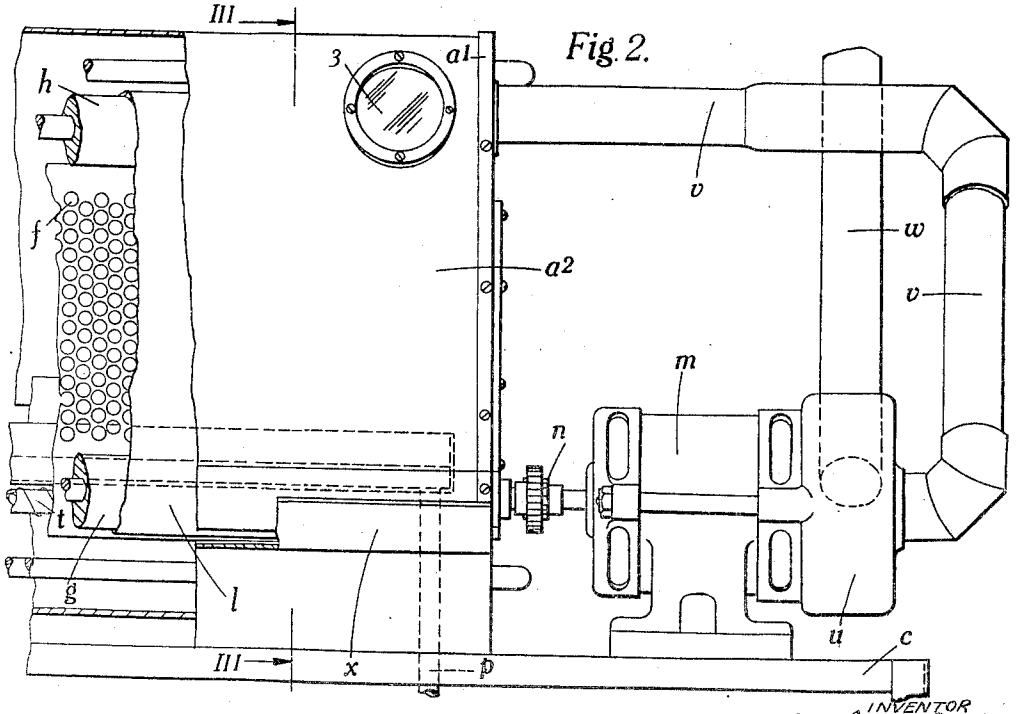


Fig. 2.



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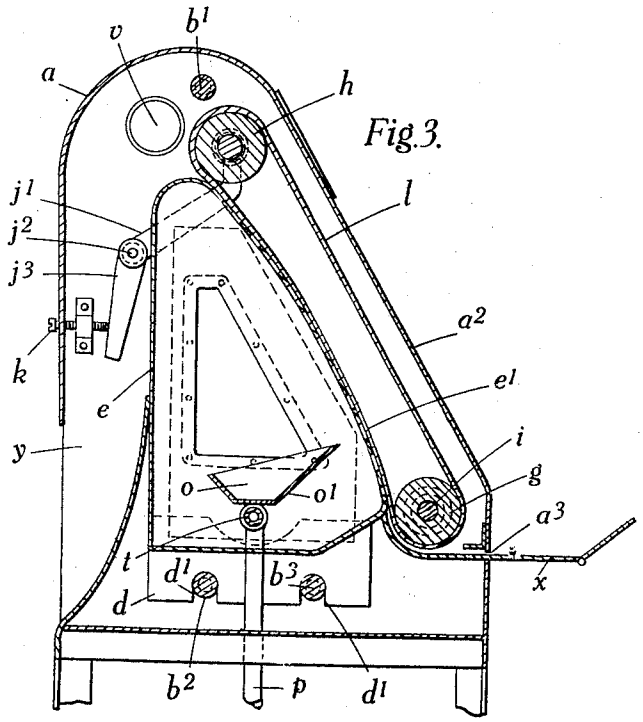
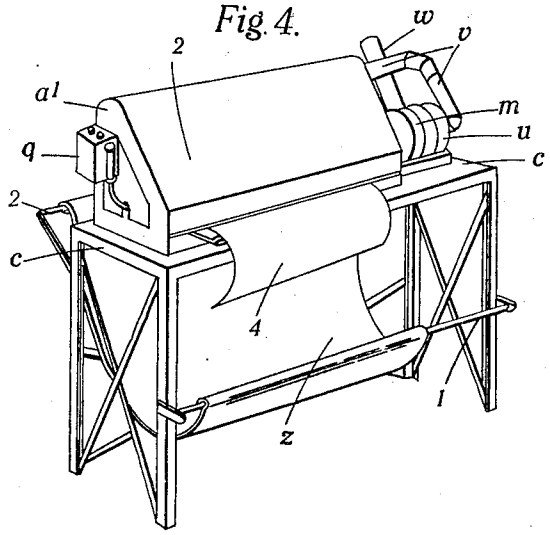


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR CONTINUOUSLY DEVELOPING SENSITIZED LAYERS

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Application April 26, 1938, Serial No. 204,295
In Great Britain May 11, 1937

6 Claims. (Cl. 95—90.5)

Application has been filed in Great Britain May 11, 1937.

This invention relates to improvements in apparatus for continuously developing sensitized layers of the type wherein ammonia or other developing gas is produced in a developing chamber having a perforated guide surface or wall over which the sensitized layer travels, the gas passing through the perforated surface to the layer.

In apparatus of this type as heretofore proposed, humid gas is usually produced by heating and evaporating a liquid in the lower part of the developing chamber, for example in a tray therein, at a substantial distance from the perforated surface, the liquid being generally evaporated by means of an electric heating element. Such an arrangement in the apparatus as hitherto proposed has the disadvantage that the humid gases condense on the perforated surface or the sensitized surface and cause streaking of the print.

It has already been proposed to avoid the occurrence of such condensation by providing additional heating means within the upper part of the developing chamber. In my experience the gases when heated in this way are comparatively slow as compared with a gas which is in a more humid state.

I have found that the disadvantages arising from condensation can be avoided without the employment of such additional means of heating. This result I achieve by adopting a particular arrangement and heating of the perforated surface through which the developing gas acts on the sensitized layer whereby all injurious condensation is avoided and the sensitized layers can be developed more economically and at a higher speed than heretofore.

According to the main feature of my invention I provide in apparatus for developing sensitized layers of the type referred to, a perforated guide surface for the layer inclined upwardly and inwardly substantially at an angle of 45°–75° to the horizontal and heating means disposed beneath the said surface adjacent the lower end thereof.

The perforated surface is preferably arranged at an angle of 60° to the horizontal. The perforations in the surface may be of diamond shape, the longer diagonals lying parallel to the inclined edges of the perforated surface.

The tray for developing liquid is provided with a drain pipe through which any surplus liquid is discharged so that there can be no accumulation of liquid in the tray or developing chamber should either the feed apparatus or the heater fail to act properly.

The tray is preferably provided with a baffle plate or like device which directs the heat produced by an electric heating element disposed under the tray, towards the lower portion of the perforated surface, this arrangement enabling one heater to be used both for evaporating the liquid and for heating the perforated surface.

In order that the invention may be fully understood, I will now describe one embodiment thereof by way of example by reference to the accompanying drawings, in which:

Fig. 1 is a sectional elevation of the left hand portion of an apparatus for developing sensitized layers constructed in accordance with the invention,

Fig. 2 is a sectional elevation of the right hand portion of an apparatus for developing sensitized layers constructed in accordance with the invention.

Fig. 3 is a section on line III—III of Fig. 2, seen in the direction of the arrows, and

Fig. 4 is a perspective view to a smaller scale of the improved apparatus mounted on a supporting table.

Referring to the drawings:

The apparatus comprises an outer metallic casing a consisting of end members a^1 connected together by tie rods b^1, b^2, b^3 and enclosing a curved body portion a^2. This casing a is mounted on a base c which, as shown in Fig. 4, consists of a table to be referred to again hereinafter.

Within the casing a is carried on a support d, which is itself removably supported by means of slots d^1 on the tie rods b^1, b^2, b^3, a gas or developing chamber e, preferably of metal, which is formed with a sloping perforated side e^1 serving as the perforated surface over which the sensitized layer is to be drawn. This perforated side of the chamber extends from approximately the lower part of the chamber upwardly at an angle of approximately 60° to the horizontal, but is made, as shown in the drawings, slightly convex. The perforations on the surface e^1 are in the form of diamond-shaped holes f, as shown in the Fig. 1, preferably having dimensions of, for example $\frac{5}{8}''$ x $\frac{3}{8}''$, the longer diagonals being located parallel to the inclined edges of the perforated surface e^1. The perforations f may, however, if desired, be round instead of diamond-shaped, as shown in Fig. 2.

Within the casing a are mounted a pair of rollers g and h, which extend parallel to the chamber e at the lower and upper ends of the sloping side e^1 respectively. The roller g is rotatably mounted on bearings i supported in the

aforesaid end members or plates a^1 of the casing a. The other roller h is pivoted to one arm j^1 of a two-armed lever, which is pivoted at j^2, and the other arm j^3 of which bears against an adjusting screw k carried by the aforesaid casing a. By this arrangement the position of the roller h may be varied. Around the two rollers g and h passes an endless belt or band l, which lies firmly and evenly over the curved perforated surface e^1 of the gas chamber e.

The roller g is driven by an electric motor m, which is mounted on the base c externally of the casing a through the medium of suitable gearing n. Within the chamber e is mounted a tray o for the liquid to be evaporated, which is preferably ammonia. This tray o is preferably made sloping downwardly from the left to the right, to enable any unevaporated liquid to escape through an outlet pipe p provided at the lower end thereof and is formed with an inclined side o^1 which acts as a baffle directing heat towards the lower portion of the perforated surface.

The liquid is supplied to the tray by means of a drip feed apparatus q, which is connected at the upper end to the neck of a vessel r containing the liquid and at the lower end to a pipe s, which passes through the casing a and dips into the tray o. Beneath the tray o extending longitudinally of the chamber e is disposed an electric heating element t for evaporating the liquid in the said tray o and heating the lower portion of the perforated guide surface. This element is connected in the usual manner to a source of electrical supply not shown in the drawings.

I have found that with an apparatus of average size having a developing chamber of about 2500 cubic inches capacity and a speed of traverse of the sensitized layer of 4 ft. 6 ins. per minute, a heater of 500 watts capacity is sufficient to evaporate the liquid and heat the guide surface.

Connected to the aforesaid driving motor m is a suction fan u, which is in communication through pipes v with the interior of the casing, and is also connected to a discharge pipe w. The purpose of this fan is to draw the gases, after they have served their purpose, from the container and discharge them. The casing a is formed at the front thereof with a slit a^3 through which extends a guide plate x for guiding the inlet of the sensitized layer to the endless belt l. The rear side of the casing a is formed with the lower part inset so as to form an outlet passage y for the developed layer.

Referring to Fig. 4 the base or support c is in the form of a table carrying a sheet or strip of cloth z on cross bars 1, 2, which serves to guide the sensitized layer when it emerges after the development from the rear of the apparatus. The casing a is provided with one or more inspection holes 3, as shown in Fig. 1.

The apparatus is employed in the following manner: The motor m is started thereby rotating the roller g and setting the endless belt or band l in motion, and at the same time actuating the suction fan u. The circuit of the heating coil t is at the same time switched on. The drip feed filling apparatus q is now operated so as to deliver ammonia from the vessel r to the tank o, where it flows over the bottom thereof and is heated and evaporated by the heater t. This liquid ammonia is, as a rule, immediately evaporated and so forms a gas which rises in the developing chamber e. Should, owing to inaccurate operation of the feeding apparatus or the heater, or other circumstances, any liquid remain in the tray o, it will be discharged by pipe p so that there can be no accumulation either in the tray or in the chamber. The sensitized layer 4 to be developed is now fed along the guide plate x to the endless band l which draws it over the outer face of the perforated plate e^1 of the chamber e. As the said layer 4 passes over the perforations f the humid gas formed in the chamber e causes the layer to become developed. After passing the perforated plate e^1 the sensitized layer, which has now become fully developed, passes out of the casing a through the opening y.

It will be found that by constructing the perforated wall e^1 at an inclination to the horizontal of between 45° and 75° and heating same in accordance with the invention, the developing operation may be carried out in a very simple and efficient manner, whilst the speed of development compared with known prior apparatus is increased.

It will be found that, by means of this invention, humid gases can be employed without any injurious results arising from condensation and without it being necessary to provide any further heating elements in the top half of the developing or gas chamber. It will also be found in practice that the finished prints obtained by the use of apparatus in accordance with my invention are free from blemishes, such as have previously been attributable to condensation.

I claim:

1. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; a tray for developing liquid disposed beneath the perforated guide surface towards the lower end thereof; heating means disposed beneath the said tray for evaporating the liquid in the said tray; means for directing part of the heat produced by said heating means towards the lower portion of the perforated surface; and means for moving the sensitized layer over the perforated guide surface.

2. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; a tray for developing liquid disposed beneath the perforated guide surface towards the lower end thereof; electric heating means for evaporating the liquid in said tray and for heating the lower portion of the perforated surface; and means for moving the sensitized layer over the perforated guide surface.

3. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; a tray for developing liquid disposed beneath the perforated guide surface towards the lower end thereof; electric heating means disposed beneath the said tray for evaporating the liquid; a baffle directing heat towards the lower portion of the perforated

surface; and means for moving the sensitized layer over said perforated guide surface.

4. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; a tray for developing liquid disposed beneath the perforated guide surface towards the lower end thereof; and a common heating means for evaporating the liquid and for heating the lower end of the perforated guide surface.

5. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; a tray for developing liquid disposed beneath the perforated guide surface towards the lower end thereof; and a common heating means for evaporating the liquid and for heating the lower end of the perforated guide surface, said evaporating tray having an outlet pipe for discharging surplus liquid.

6. In apparatus for developing sensitized layers of the type referred to, the combination of: a developing chamber having a perforated guide surface over which the sensitized layer travels, said perforated guide surface being inclined upwardly and inwardly substantially at an angle of 45° to 75° to the horizontal; heating means disposed within the said chamber adjacent the lower end of said guide surface for heating said surface; means for moving the sensitized layer over the said perforated guide surface; a tray, located inside said developing chamber at a point near the lower end thereof for developing liquid and means for evaporating the liquid in the said tray.

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