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APPARATUS FOR DEVELOPING SENSITIZED LAYERS

Filed Sept. 28, 1932

2 Sheets-Sheet 1

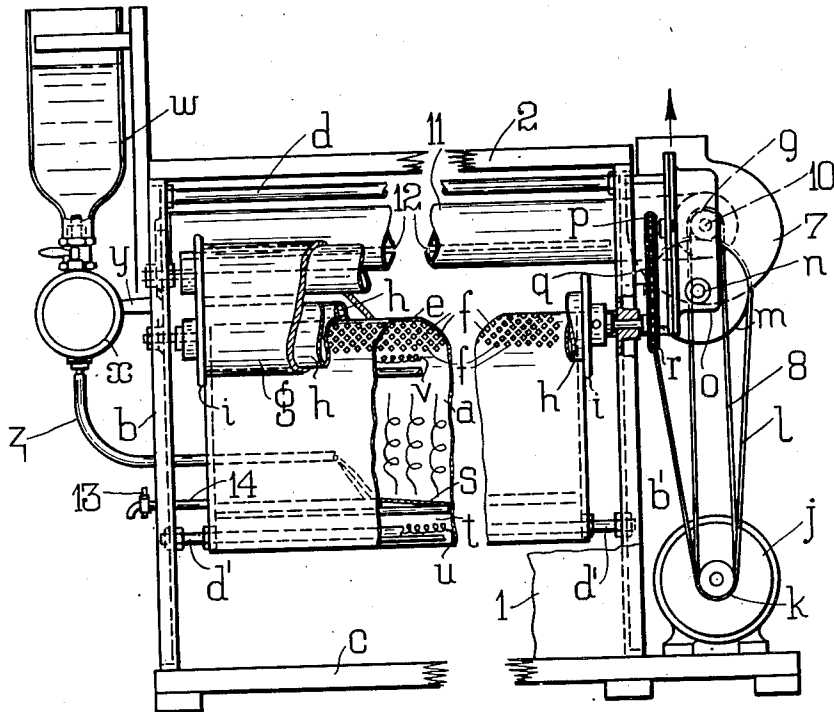


Fig. 1.

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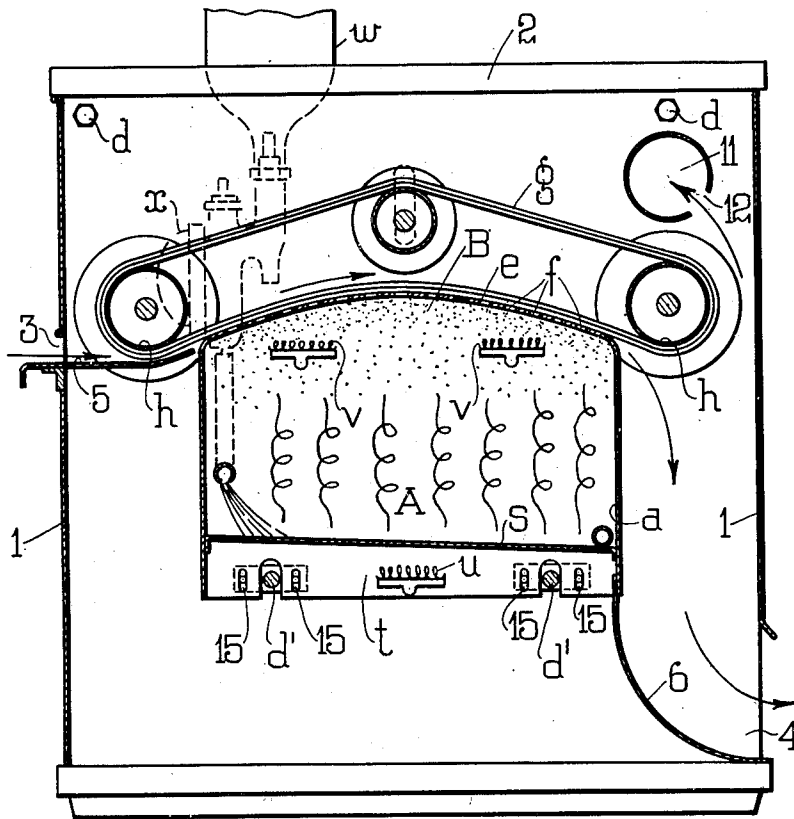


FIG. 2.

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UNITED STATES PATENT OFFICE

2,047,104

APPARATUS FOR DEVELOPING
SENSITIZED LAYERS

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In Great Britain January 20, 1932

9 Claims. (Cl. 95—94)

This invention relates to apparatus for develop-
ing sensitized layers, in which the said layers are
subjected to the action of ammonia or other de-
veloping gas.

5 Apparatus has been suggested for this purpose,
comprising an endless gas-tight band which car-
ries the layer to be developed over a perforated
plate through which the ammonia or other de-
veloping gas obtains access to such layer, but hith-
10 erto such apparatus has been found to be unsuc-
cessful in cases where the developing gas is humid
or easily condensable, since under these condi-
tions condensation takes place on the plate and
eventually gets on to the band or the layer or on
15 to both with the result that the layer is spoiled.

The object of the present invention is to pro-
vide a simple and relatively inexpensive appa-
ratus for developing sensitized layers by the ac-
tion of ammonia or other gas which can be oper-
20 ated with great rapidity. Further objects are to
prevent the above-described condensation, and to
prevent the escape of the gas when charging the
apparatus and during operation.

To this end the invention consists in a process
25 for developing sensitized layers, by a superheated
vapour, so as to prevent condensation upon the
band or layer or to prevent condensed liquid
formed owing to the drop in temperature of the
gas during its flow, from coming in contact
30 with the said band or layer.

The invention also consists in an apparatus
comprising means for evaporating the charge of
developing liquid to form a gas for example by
contact with the heated bottom plate of a tank,
35 and means for superheating the said gas prefer-
ably immediately before it comes into contact
with the sensitized layer for example by means of
one or more heaters provided inside the upper
part of the tank in close proximity to the top
40 plate of the tank, which plate is perforated and
over or upon which the sensitized layer is passed
or applied.

The invention further consists in processes and
apparatus as defined in the appended claims.

45 Referring to the accompanying drawings which
illustrate by way of example, one form of appa-
ratus for carrying out the said invention.

Figure 1 is a front elevation of the machine
with the centre portion broken away, and

50 Figure 2 a cross-section.

In carrying the invention into effect, there is
provided a tank *a* of oblong form which is mount-
ed between a pair of side frames *b* and *b'* secured
to a base plate *c* and held together by stretcher
55 bars *d* and *d'*, the lower pair *d'* of which serve

as a support for the tank *a*. The top plate *e* of
the tank *a* is of convex form in cross-section and
is provided with a series of holes, slots, or louvers
f which may be arranged in any formation
and permit the egress of gas from the tank.

An endless band *g* of rubber or other suitable
material is so disposed that it lies firmly and even-
ly over the curved top plate *e* of the tank and
overlaps the said top plate at the front and back
10 of the tank and by reason of the overlap prevents
the escape of gas from the holes *f*. The endless
band *g* is rotated by suitable rollers *h* which are
provided at each end with flanges *i*, the front
and rear rollers having their flanges almost
touching the side edges of the tank, as shown in
15 Figure 2, thereby retaining the band *g* in the cor-
rect travelling position.

The rollers *h* are driven from an electric motor
or other power unit *j* through pulley *k* mounted
on the motor shaft, pulley belt *l* and pulley *m* se-
cured to the worm shaft *n* of a worm gear reduc-
20 tion mounted in a casing *o* and which drives a
sprocket wheel *p* connected by a chain *q* with a
second sprocket wheel *r* provided on one of the
rollers *h*. This driven roller *h* may, if desired,
25 be connected by chain and sprocket with one of
the other rollers so as to give an additional drive
to the endless band.

The tank *a* is preferably of substantially H-
shaped cross-section, the bottom plate *s* being
30 preferably positioned some distance up the side
and end walls of the tank so as to leave a screened
space *t* within which is placed an electric or other
heater *u* for heating the plate *s*. There is also
provided inside the body of the tank close to
35 the curved top plate *e*, one or more electric or
other heaters *v* which extend along the whole
length of the tank body.

Fixed at one side of the machine, is a filler or
charger *w* for supplying the developing liquid to
40 the tank *a*. The filler *x* which is of the flexi-
ble diaphragm type used for measuring small
quantities of liquid is fixed into the neck of an
ordinary bottle or similar vessel *w* containing the
developer and is secured to the side frame *b* in
45 an inverted position by means of the clip or hold-
er *y* and connected by a flexible tube *z* to the in-
terior of the tank above the bottom plate *s*. By
this arrangement any escape of gas from the ves-
sel *x* into the atmosphere, is prevented and the
50 tank can be charged from the filler as often as
required.

Side cover plates *l* are provided at the front
and back of the machine as well as a top cover
2 so that the whole of the apparatus is enclosed 55

with the exception of a narrow slot 3 at the front of the machine which receives the layer to be developed, and a delivery opening 4 at the rear of the machine, through which the developed layer is discharged. Guide plates 5 and 6 for the layers may be provided at the feed and delivery openings respectively.

At one side of the machine against the frame b', there is secured a suction fan 7 which may be driven from the same motor as the rollers h through the driving belt 8 and pulley 9 mounted on the fan shaft 10 and is in communication with the interior of the machine through the exhaust pipe 11 extending along the whole length of the machine and provided with a slot 12 through which the fumes inside the machine are drawn into the said pipe.

A cock 13 is provided upon the frame b, for the purpose of drawing off through the pipe 14 any surplus developer which may have accumulated on the bottom plate of the tank.

The bottom plate s of the tank is preferably sloped downwards away from the developing charge inlet, as viewed in Figure 2, so that the developing liquid introduced into the tank by the filler w will run over the heated surface in a film, and produce quick action by giving a higher gas concentration than is possible without the use of heat. The tank may also be adjustably mounted as at 15 upon the stretcher bars d' so as to vary the tension of the endless band upon the top plate e and also to prevent creeping from side to side of said band.

The machine operates in the following manner.

The motor j is started thereby setting the endless band g in motion and putting the suction fan 7 in operation, the heat being also switched on. The valve of the filler w is then operated and a charge of developing liquid delivered through the pipe z into the tank where it flows over the sloping bottom plate s which is heated by the heater u. This small charge of developing liquid is immediately evaporated, by contact with the hot plate s within the body of the tank itself and forms a zone A as shown in Figure 2. The gas then rises to the top of the tank where it is further heated by the heaters v so as to produce a second and hotter zone as shown at B immediately below the perforated top plate e and in close proximity thereto. The sensitized layer to be developed is fed into the machine through the slot 3 where it is drawn by the endless band g between the latter and the perforated top of the tank. As the layer passes over the curved top plate e the gas will develop the layer, the surface of which it reaches through the holes f, and gives sufficient treatment to complete the development during the period in which the layer is passing over the perforated plate. After treatment the developed layer is delivered through the opening 4.

By reheating and keeping the top portion of the tank hotter than the lower portion all condensation is eliminated, and by reason of the different temperatures within the tank itself no condensed liquid can get through the perforated plate on to the endless band and attack the sensitized layer. In this way any risk of spoiling the layers by causing "bleeding" of the lines is entirely eliminated as any condensation which takes place is strictly confined to the lower portion of the tank.

It is advisable to connect the heating elements in series so that if the voltage fluctuates the correct balance will be maintained between the heaters.

Suitable temperatures are 110° F. at the bottom and 140° F. at the lid but the invention is not limited to these temperatures. It is not advisable to run at a higher temperature than about 180° F. as additional heat tends to discolour the background of the prints.

The apparatus is extremely simple in construction and is wholly enclosed with the exception of the feed and delivery openings so that the fumes which escape from the delivery end of the top plate e, into the interior of the machine, are drawn by the suction fan in the direction shown by the arrow in Figure 2 and enter the exhaust pipe 11 through the slot 12 from whence they pass to the outside of the building.

Whilst any suitable developer may be used in the apparatus, it has been found that a solution of half water and half .880 ammonia gives very satisfactory results which are better than those obtained by the use of .880 ammonia without added water.

By providing additional heat in the upper part of the tank it is found that development of the sensitized layer is very rapid.

Although electric heaters have been described the invention is not limited to any particular source of heat. The initial vaporization may be performed outside the apparatus if desired. The superheat may also be applied direct to or in proximity to band carrier if desired.

I declare that what I claim is:—

1. In an apparatus for developing sensitized layers by evaporating a charge of developing liquid to form a vapour, the combination of means for evaporating said liquid, and supplementary heating means for maintaining a temperature over any part of the sensitized layer, such as will prevent any condensation due to drop in temperature from impinging on the said layer.

2. In apparatus for developing sensitized layers, means for evaporating the charge of developing liquid to form a gas consisting of a tank and means to heat the bottom plate of said tank in combination with means to superheat said gas immediately before it comes into contact with the sensitized layer situated inside the upper part of the tank in close proximity to the top plate of the tank, and a perforated plate over or upon which the sensitized layer is passed or applied.

3. Apparatus for developing sensitized layers as claimed in claim 2, in which the sensitized layer is fed between the perforated top plate of the tank and a continuously moving endless band which keeps the said layer in close contact with the outer side of the said top plate and at the same time moves it across the full width of the tank.

4. Apparatus for developing sensitized layers as claimed in claim 2, in which the layer is fed by an endless band rotated by rollers having flanges at their extreme ends which overlap the sides of the tank and are arranged immediately adjacent thereto so as to prevent any creeping of the said band from side to side.

5. Apparatus for developing sensitized layers as in claim 2 in which the perforated top plate of the tank is of convex form in cross-section.

6. An apparatus for developing sensitized layers comprising a tank having a bottom plate with a slight slope, means to heat said bottom plate, means to discharge developing liquid thereon to cause instant evaporation of same, means for exposing a sensitized layer to the action of the vapor of said liquid, and means for superheating

the vapor before it comes into contact with said layer.

7. An apparatus for developing sensitized layers comprising a relatively deep tank, a perforated cover to said tank, supporting said sensitized layer, means to heat the bottom of said tank, and means to superheat the gas evolved from the developing liquid in said tank, before it comes into contact with said layer, in close proximity to said perforated cover.

8. In apparatus for developing sensitized layers by means of the vapour of aqueous ammonia, a tank for containing said aqueous ammonia, means for supporting said sensitized layers to be developed over said tank, means for evaporating said aqueous ammonia, and producing an atmosphere containing ammonia and water vapour,

and means for superheating said atmosphere adjacent to the surface of said material whereby to prevent any condensate produced by a fall in temperature from impinging on said layer.

9. In apparatus for developing sensitized layers by means of the vapour of aqueous ammonia, a tank for containing said aqueous ammonia, means for supporting over said tank the sensitized materials to be developed, means for evaporating said aqueous ammonia and producing in said tank from said aqueous ammonia a humid atmosphere and means for maintaining said atmosphere while adjacent to the surface of said material, above the dew point, whereby to prevent any condensate formed by a fall in temperature from impinging on the said material.

SIDNEY HAROLD MORSE.