

Dec. 12, 1961

R. C. GOODMAN ET AL

3,012,492

APPARATUS FOR DEVELOPING SENSITIZED MATERIAL

Filed March 25, 1959

3 Sheets-Sheet 1

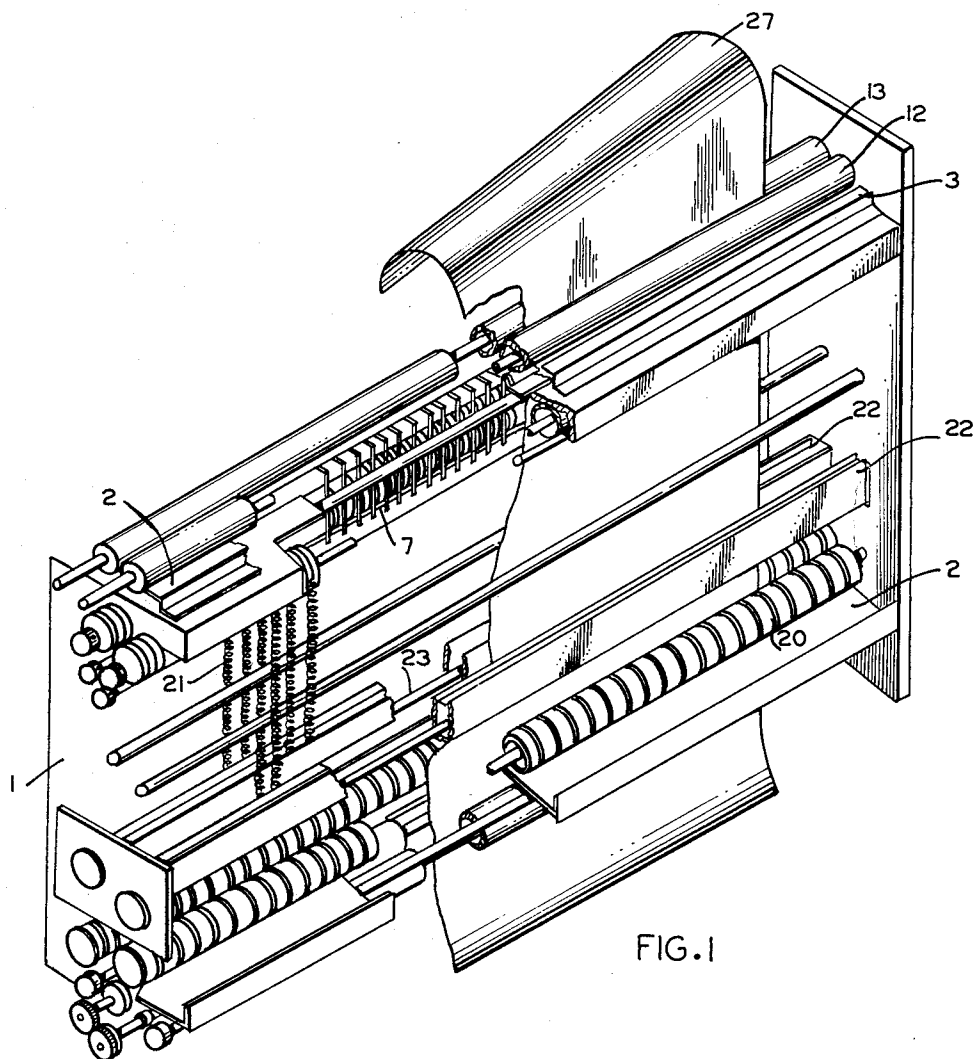


FIG. 1

INVENTORS
ROBERT C. GOODMAN
EMILIO G. MASTROIANNI
BY *Harry W. Coughlin*
Frederick A. Dutton
ATTORNEYS

Dec. 12, 1961

R. C. GOODMAN ET AL

3,012,492

APPARATUS FOR DEVELOPING SENSITIZED MATERIAL

Filed March 25, 1959

3 Sheets-Sheet 2

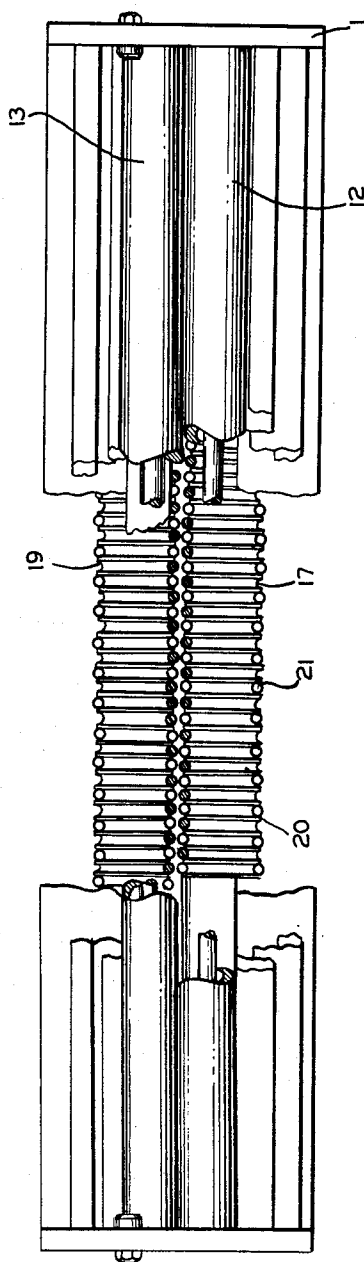


FIG. 2



FIG. 5

INVENTORS

ROBERT C. GOODMAN
EMILIO G. MASTROIANNI

BY

Her. W. Coughlin
Fredrick S. Dunthorn

ATTORNEYS

Dec. 12, 1961

R. C. GOODMAN ET AL

3,012,492

APPARATUS FOR DEVELOPING SENSITIZED MATERIAL

Filed March 25, 1959

3 Sheets-Sheet 3

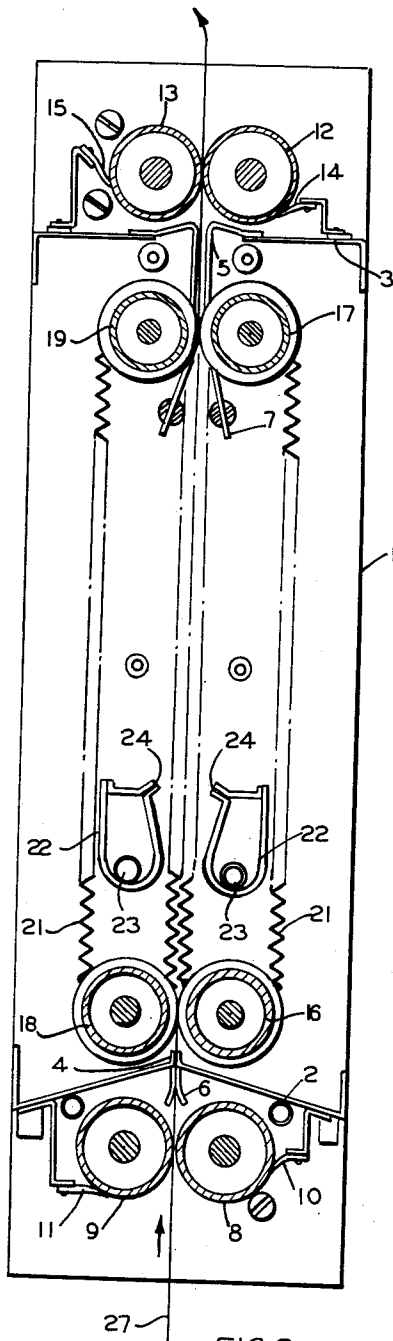


FIG. 3

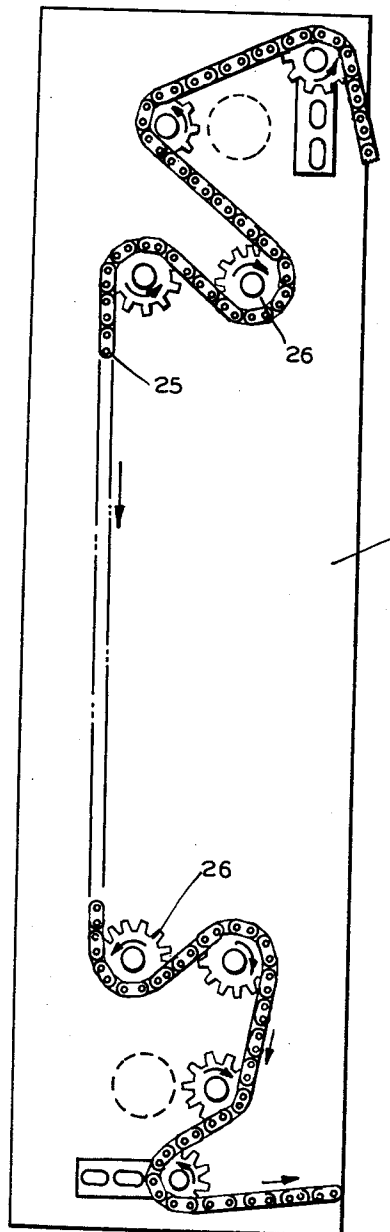


FIG. 4

INVENTORS
ROBERT C. GOODMAN
EMILIO G. MASTROIANNI
BY *Henry W. Long*
Frederick S. Dutton
ATTORNEYS

1

3,012,492

APPARATUS FOR DEVELOPING SENSITIZED MATERIAL

Robert C. Goodman, Binghamton, and Emilio G. Mastroianni, Endicott, N.Y., assignors to General Aniline & Film Corporation, New York, N.Y., a corporation of Delaware

Filed Mar. 25, 1959, Ser. No. 801,878

3 Claims. (Cl. 95—94)

This invention relates to an apparatus for developing diazo sensitized sheet material, either film or paper, which is conveyed through the developing apparatus without marring the surface thereof. More particularly, this invention relates to a developing apparatus wherein the sensitized material is developed by means of vapors of aqueous ammonia.

Apparatus for developing diazo sensitized material by means of vapors, now generally in use, comprises a tank having a perforated curved wall permitting the passage of vapors from the interior of the tank where they are generated to the exterior thereof. A flexible endless impermeate belt, usually of rubber, generally termed the "sealing sleeve," is mounted on rollers and positioned to pass in close contact with the perforated wall of the tank. In operating this type of developing apparatus, the material to be developed is placed between the sealing sleeve and the stationary perforated wall of the tank and in contact with both. The movement of the sleeve slides the material across the perforated stationary wall of the tank where the material is contacted on one side thereof with the developing vapors issuing through the perforations.

There are many disadvantages inherent in the prior art apparatus as described above. First, the sensitized face of the material must slide against the stationary surface of the perforated tank wall and scratching of the sensitized material and damage to the material are liable to occur. The metal between the perforation restricts the free flow of developing vapors over the sensitized material and also obstructs the flow of heat so that the vapors which flow through the perforations condense at times, at least partly, and the sensitized material is thereby damaged. Also, dirt and moisture tend to collect on the curved wall of the tank which increase the friction between the sensitized face of the material and the wall of the tank thereby increasing the tendency of the film to scratch and also precluding proper development of the film or sheet. The dirt and moisture also tend to produce corrosion.

It is an object of this invention to provide a developing apparatus wherein both surfaces of the sensitized sheet material are simultaneously exposed to the developing vapors.

It is a further object of this invention to provide a developing apparatus wherein contact between the sensitized material and stationary wall is eliminated.

It is a still further object of this invention to provide a developing apparatus wherein the sensitized material is passed through a sealed chamber containing developing vapors by means of open work belts positioned to contact both faces of the material.

Other objects and advantages of this invention will occur to those skilled in the art from the detailed description thereof given below when taken in connection with the accompanying drawing, in which

FIG. 1 is a perspective view of the novel apparatus with portions of the casing and portions of the rolls broken away to better illustrate the various elements within the chamber,

FIG. 2 is a plan view of the apparatus with parts broken away,

FIG. 3 is a vertical section through the casing,

2

FIG. 4 is an end view of the casing illustrating the chain drive for the driver rolls, and

FIG. 5 shows the configuration of the paper between the conveyor belts.

The novel apparatus as shown in the drawing comprises a casing 1 having side and end walls which together with the lower wall 2 and upper wall 3 form a substantially closed chamber. The lower wall is provided with a slot 4 through which the sensitized material may enter the chamber and the upper wall is provided with a slot 5 through which the sensitized material may leave the chamber. Guide means in the form of rods 6 and 7 guide the material through the slots.

A pair of driven rolls 8 and 9 are positioned below the bottom wall 2 for advancing the material through slot 4 into the chamber. These rolls may have outer surfaces covered with Teflon or other plastic material and may cooperate with sealing means 10 and 11 to provide a substantially gas tight closure for the chamber to minimize leakage of vapors from slot 4 to the atmosphere. A similar pair of rolls 12 and 13 cooperating with sealing means 14 and 15 are positioned above the upper wall 3 to move the developed material leaving the slot 5 away from the apparatus.

Within the chamber are positioned two pairs of rolls 16, 17, 18 and 19. The rolls 16 and 18 are positioned in spaced parallel relation adjacent the lower wall 2 with the space between the rolls in substantial alignment with the slot 4 and rolls 17 and 19 are positioned in spaced parallel relation adjacent the upper wall 3 with the space between the rolls in substantial alignment with the slot 5. All four rolls are provided with circumferential grooves 20. A plurality of endless coiled springs 21 are positioned in the grooves 20 and are stretched between each pair of rolls 16, 17 and 18, 19, thereby forming an endless belt. As shown in FIG. 3, the adjacent runs of the two belts are in substantial alignment with slots 4 and 5 and are placed so that the belts on one roll do not face the belts on the other roll but are spaced apart. In this manner, the sheet material is constrained, to a slight extent, into a corrugate formation, as shown in FIG. 5, which leaves substantial stiffness to the material, making it easier to pass it through the exit opening 5 and between the sealing rolls 12 and 13. While various types of open work belts or bands can be used, we found that endless coiled springs are especially suitable for this purpose, since they permit almost complete access of the developing vapor to the sensitized material. Moreover, dirt and moisture will not accumulate on the springs as readily as on a flat continuous perforated belt. Also, the developing vapors permeate through the coiled springs much more readily than through a perforated wall of the conventional developing tank belts since the flow of vapors is not stopped by the metal between the perforations.

Positioned in the space between the two runs of each of the belts, but out of contact with the belts, are vaporizing tanks 22, adapted to contain a liquid to be vaporized, such as aqueous ammonia for example. The tanks contain electrical heating elements 23 to vaporize the liquid. The vapor issues through a slot 24 in the upper portion of each tank and is directed toward the sensitized material.

FIG. 4 shows a chain drive comprising a chain 25 and pinions 26 associated with the rolls for driving all the rolls in unison.

In operation, the sensitized material 27 is conveyed by rolls 8 and 9 through slot 4 into the chamber, the material being guided by guide 6. The material entering the chamber is contacted on opposite sides thereof by the spring belts 21 which carry the material through

3

the chamber and through the exit slot 5 to be delivered between rolls 12 and 13 out of the chamber. While passing through the chamber, the sensitized material is subjected to the developing vapor exuding from slots 24 of tanks 22, the vapors being generated by the heating elements 23. Thus, the material is contacted substantially uniformly on all sides by the vapors and is developed thereby.

In the illustration, the chamber and belt assemblies are shown by way of example in a vertically disposed construction. It is just as feasible to place the assemblies in a horizontal position, in which case the developing troughs 22 are rearranged and shaped so as to prevent spillage of liquid and to properly immerse the heating elements into this solution.

Our invention is not limited to the detailed description contained herein as many modifications thereof will occur to a person skilled in the art. Our invention includes all modifications which fall within the scope of the appended claims.

We claim:

1. An apparatus for developing sensitized material comprising a chamber having end walls each of said end walls having a slot therein, two pairs of rollers within said chamber, said pairs of rollers being closely spaced together and each roller of each pair formed with a plurality of circumferential grooves, a plurality of endless coiled springs stretched between the two rollers of each pair and positioned in said grooves whereby a belt comprising a plurality of individual springs positioned side by side is formed on each pair of rollers, a tank adapted to contain a vaporizable developing fluid, heating means in said tank for vaporizing the fluid, an outlet from said tank for directing the vapors toward the

4

sensitized material moving through the chamber, two pairs of conveying rollers positioned outside of the chamber, one pair being spaced from but in close proximity to each of said end walls with the bight of each pair of conveying rollers being in substantial alignment with the adjacent slot, means cooperating with said pairs of conveying rollers for sealing the spaces between the rollers and end walls and means for rotating said grooved rollers and said conveying rollers, whereby sensitized material is conveyed by one pair of rollers through one of said slots into said chamber and into contact with said belts, the material is conveyed through the chamber in contact with the developing vapors and through the other slot by the belts and the material is thereafter moved away from the apparatus by the other pair of conveying rollers.

2. An apparatus as recited in claim 1 including means associated with said slots for guiding the material through said slots.

3. An apparatus as recited in claim 1 wherein two tanks containing vaporizable fluid are provided in the chamber one tank being positioned between the two runs of each belt and out of contact with said runs.

References Cited in the file of this patent

UNITED STATES PATENTS

612,931	Parker et al.	Oct. 25, 1898
1,999,965	Hall	Apr. 30, 1935
2,811,909	Bungay	Nov. 5, 1957
2,812,699	Bungay	Nov. 12, 1957

FOREIGN PATENTS

852,807	Germany	Oct. 20, 1952
---------	---------------	---------------