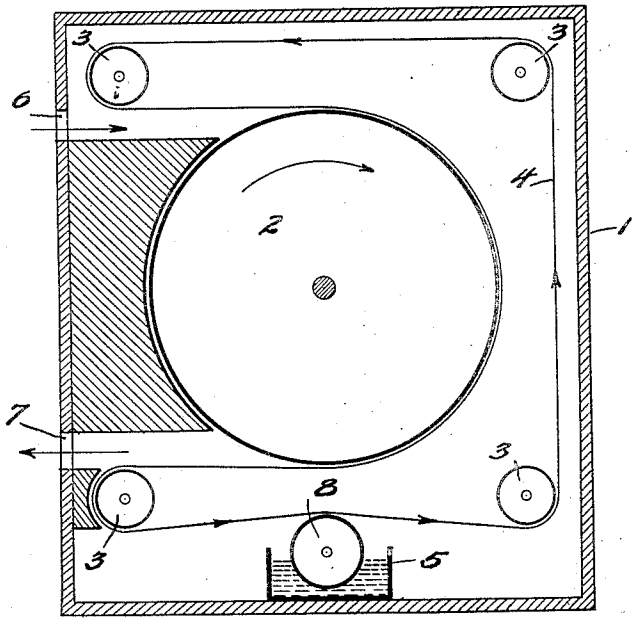
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PROCESS AND APPARATUS FOR DEVELOPING LIGHT SENSITIVE LAYERS

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PROCESS AND APPARATUS FOR DEVELOPING LIGHT-SENSITIVE LAYERS

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My present invention relates to an improved process and apparatus for developing light sensitive material, such as paper, films, fabric and the like, and particularly light copying paper, by the action of a gas. In the present exemplification of my invention, the development is accomplished in a substantially dry manner, by a gas of alkaline reaction, ammonia being in the first place practically suitable for the purpose. The development takes place in closed containers or cabinets wherein the light sensitive material is subjected to the action of the gas.

One of the objects of my present invention is to provide an improved process and apparatus for hastening the development of the light sensitive material by the action of the developing gas which primarily consists in moistening the surface of the light sensitive material with a breath-like film of moisture whereby the developing action of the gaseous medium is expedited so that by means of my new process and apparatus the light sensitive material may be developed in a substantially dry condition in a much shorter space of time.

Still another object of my invention resides in applying the moisture to the surface of the light sensitive material in a very fine breath like film or layer preferably in the presence of the developing gas itself, thereby providing not only a substantially dry process which prevents shrinkage, distortion and bleeding of the light sensitive material but also most pronouncedly expedites the development of the material.

While this thin breath like film of moisture may be applied to the light sensitive material in a variety of different ways, I prefer the method and means disclosed herein since it enables me to confine the application of the moisture to only that side of the material which is covered with a sensitive layer. In the present instance, I find a simple method of applying moisture to the film consists in utilizing the aqueous solution of ammonia itself as a source of moisture so that the water component of this source of ammonia provides the necessary breath like film for the light sensitive material while the ammonia gas constantly evolves from the surface of this aqueous solution of ammonia and rising through the developing chamber, provides the gaseous developing medium. It is of course obvious that other arrangements are within the contemplation of my invention.

In carrying out my new process it is advantageous but of course not essential to apply the developing liquid, for instance an aqueous solution of ammonia, by means of an impermeable non-absorptive band to the paper to be developed, since the use of this type of band results in the application of the fluid in the form of a fine breathlike layer of uniform thickness but it is of course, possible and within the contemplation of my present invention to use other than an impermeable non-absorptive band, if desired. The paper and band run together over a roll and the vessel, which contains the solution of ammonia and from which the developing liquid is transmitted by means of a roller to the non-absorptive endless band, is placed within the closed case. In this manner the atmosphere within the case is simultaneously saturated with the ammonia gas, and as the band itself or the roll around which it passes and with which the band co-operates to carry the light sensitive material through the developing cabinet, is or may be formed of porous material, the ammonia saturated atmosphere will itself attack the paper and promote a developing action therein.

The annexed drawing shows the elements of an apparatus suitable for carrying out the new process.

In a case 1 are mounted four rollers 3 of small diameter and one roller 2 of a larger diameter, covered with an endless, broad non-absorptive band 4, preferably, though not necessarily, made of india-rubber, passing around these rollers in the manner shown on the drawing. In a trough 5 containing the liquid used for the development, for instance a solution of ammonia, rotates a roller 8 which with its lower part dips into the liquid and which with its upper part is in contact with the endless band 4.

When turning the roll 2 the endless band 4 moves in the direction, indicated in the draw-

ing by arrows, over all of the rollers, the roller 8 being rotated simultaneously. The surface of roller 8 transmits the developing liquid contained in the trough 5 to the lower side of the endless non-absorptive band 4.

The case 1 is provided with a slit 6 through which the paper to be developed is introduced into the case so that it gets between the moistened side of the endless band 4 and the roller 2, which carries it along and discharges it again through the slit 7. In this respect, the apparatus of my invention comprises a continuous machine, that is to say, one in which the material, to be developed, passes through the apparatus continuously whereby the developing operation is speeded up and in fact becomes an automatic as distinguished from a manual process.

Owing to the fact that the band 4 is only slightly moistened with the liquid, the paper leaves the apparatus in an almost dry state so that it completely dries in the air in a few minutes.

As the paper when treated by my new process, is developed in a very short time, the way which it has to run in the apparatus may be considerably shortened, so that only a few guide-rollers are required. By light-sensitive material, I mean material that is coated with an emulsion sensitive to light.

I claim:

1. Process for developing light-sensitive layers which consists in developing the light-sensitive layers by the action of gases and simultaneously slightly moistening the paper to be developed with a liquid containing the developing gas.

2. The method of developing light-sensitive material which includes applying a fine breath like film of moisture to the material to be developed and subjecting the light sensitive material to the action of ammonia gas.

3. The method of developing light-sensitive material which includes applying a fine breath like film of moisture to the surface of the material and subjecting the moistened material to a developing gas.

4. The method of developing light-sensitive material which includes applying a fine breath like film of moisture to that side of the material which is covered with the sensitive layer and subjecting said moistened surface to the action of ammonia gas.

5. The method of developing light-sensitive material which includes applying a fine breath like film of developing liquid to the material and subjecting the moistened material to a developing gas.

6. The method of developing light-sensitive material which includes applying a fine breath like film of developing liquid to that side of the material which is covered with the sensitive layer and in the presence of a developing gas.

7. The method of developing light-sensitive material which includes applying a fine breath like film of moisture to the material in the presence of a developing gas.

8. The method of developing light-sensitive material which includes slightly moistening the material to be developed with a fine breath like film of moisture by contact with an impermeable non-absorptive member carrying the moisture and subjecting the material thus slightly moistened to the action of a developing gas.

9. The method of developing light-sensitive material which includes feeding the light sensitive material in a predetermined path while subjecting the surface of the material to a fine breath like film of moisture and to the action of ammonia gas.

10. In a device of the class described, a combination of a cabinet, means for positioning light-sensitive material therein, means for applying a fine breath like film of moisture to the material, and means for subjecting the material to a developing gas.

11. In a device of the class described, the combination of a cabinet, means forming a gaseous developing medium in said cabinet, means for positioning light-sensitive material therein, and means in said cabinet for providing the sensitized side of the material with a very light film of moisture.

12. In a device of the class described, the combination of a cabinet, means for positioning light-sensitive material therein, a source of developing liquid in said cabinet adapted to create developing gases therein, and means for slightly moistening the sensitized side of the material therein.

13. In a device of the class described, sheet positioning means, a carrier composed of impermeable non-absorptive material, means for applying liquid to the surface of said carrier and means for bringing said liquid carrying surface into contact with the sheet to be developed whereby to apply a fine breath like film of moisture to the surface of the paper.

14. In a device of the class described, the combination of means for holding a piece of sensitized paper, a carrier composed of impermeable non-absorptive material, means for applying a developing liquid to the surface of said carrier and means for bringing said surface into contact with the sensitized paper whereby to apply a fine breath like film of moisture to the surface of the paper.

15. In a device of the class described, the combination of means for feeding a sheet of sensitive paper, means for feeding a sheet of impermeable non-absorptive material, means for applying a liquid to the surface of said non-absorptive material and means for bringing said moistened surface into contact with the surface of the sheet to be developed in the presence of a developing gas.

16. In a device of the class described, the

combination of a cabinet, means for feeding a sheet of light sensitive material in said cabinet, a carrier of impermeable non-absorptive material, means for applying liquid to a surface of said material, means for feeding said material into contact with the sensitive side of said sheet and means for subjecting the sheet so moistened to a developing gas.

17. In a device of the class described, the combination of a cabinet, means for feeding a sheet of paper into said cabinet and about a predetermined path therein and thence out of said cabinet, a source of developing liquid in said cabinet and a carrier of impermeable non-absorptive material adapted to pass into contact with said source of developing liquid and thence into contact with the sensitive side of said sheet to slightly moisten the same in the presence of said fumes from said developing liquid.

18. In a device of the class described, the combination of a cabinet, means for providing said cabinet with a source of ammonia gas, means for feeding a sheet of light sensitive material through said cabinet in a predetermined path, an endless carrier of impermeable non-absorptive material, means for applying a liquid to said carrier and means for bringing said moistened carrier into the path of movement of the sensitive side of said sheet.

19. In a device of the class described, the combination of a cabinet, means for providing said cabinet with a source of ammonia gas, a rotatable member therein, an endless band adapted to travel in said cabinet and about a portion of the periphery of said drum, means for applying liquid to that side of the band which contacts with the periphery of the member and means for feeding a sheet of sensitive material into said cabinet whereby to cause it to pass about the periphery of said member and into contact with the moistened side of said traveling band.

20. In a device of the class described, the combination of a cabinet, means for providing said cabinet with a source of ammonia gas, a rotatable drum therein, a series of smaller drums therein, a member passing around said smaller drums and about a portion of the periphery of the larger drum, a reservoir containing developing liquid beneath said larger drum, a smaller drum rotatable in said reservoir and adapted to contact with that face of said band which travels in contact with the periphery of the larger member and means for feeding a sheet of sensitive material into said cabinet and about the periphery of the larger drum with the sensitive side of the paper in contact with the moistened side of the endless band.

21. In a device of the class described, the combination of a casing having an inlet opening and an outlet opening, means in said casing forming a source of ammonia gas, a revolving roller in said casing, an endless band of non-absorptive material engaging a portion of the periphery of said roller, means for moistening said band with a liquid containing the developing gas, said band and roller being located so as to receive and grip between them a print inserted through said inlet opening and convey the same to a point adjacent said outlet opening.

22. In a device of the class described, a cabinet having an inlet and an outlet, means creating an atmosphere of a chemically active developing gas in said cabinet, means within the cabinet to receive light sensitive material at the inlet and to carry same in a circuitous path through the cabinet whereby to expose the light sensitive material to the chemically active gases and to discharge the developed light sensitive material at the outlet, and means to subject the light sensitive material to breath-like quantities of moisture as it is carried along in the cabinet.

23. In a device of the class described, a cabinet having an inlet and an outlet, means creating an atmosphere of a chemically active developing gas in said cabinet, and means within the cabinet to receive light sensitive material at the inlet and to carry same in a circuitous path through the cabinet whereby to expose the light sensitive material to the chemically active gases and to discharge the developed light sensitive material at the outlet, and means to humidify the light sensitive material in excess of the normal absorption of moisture from the atmosphere by applying moisture in fog-like quantities to the material as it is transported through the cabinet.

24. In a device of the class described, the combination of an enclosing cabinet having an inlet and an outlet for the introduction and discharge of light sensitive material into and from the cabinet, means to create a chemically active atmosphere in the cabinet comprising developing gases, means formed and arranged in the cabinet to receive light sensitive material introduced into the cabinet at the inlet and to carry said material through the cabinet whereby to expose it to the chemically active developing gases therein and thereafter to discharge the light sensitive material at the outlet and means for slightly moistening the sensitized portions of the material as it is carried along in the cabinet.

In testimony whereof I hereunto affix my signature.

EMIL GRONAU.