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DEVICE TO DEVELOP PHOTOGRAPHIC LAYER-CARRIERS BY THE DIFFUSION PROCESS

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FIG. 1

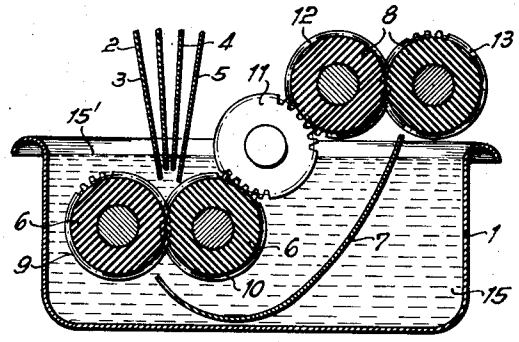


FIG. 2

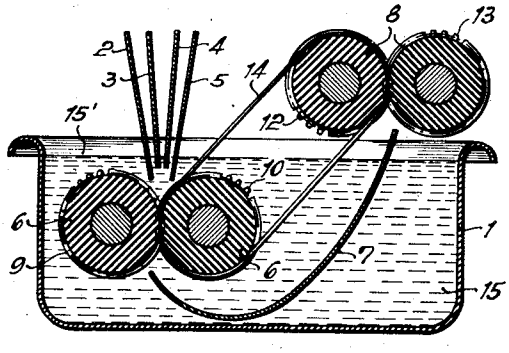
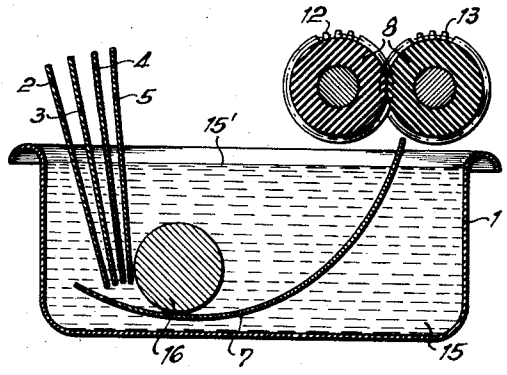


FIG. 3



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DEVICE TO DEVELOP PHOTOGRAPHIC LAYER-CARRIERS BY THE DIFFUSION PROCESS

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5 Claims. (Cl. 95—89)

The invention relates to a device to make photographic copies and other photographic transfer by the so-called diffusion process. Devices based on this process are known. The layer-carriers are separately conducted into the developing bath and separately moistened with developing fluid, passed between rollers by which the moistened carriers are compressed and thereupon transferred from the device into the open.

With one of these known devices the layers of the carriers are separately moistened, compressed and conducted by means of rubber sheeting over a main roller to a squeezing roller, and from there into the open. To develop photographic layer-carriers by the diffusion process with this device, the layer-carriers are passing through the fluid in a compressed state, after having been moistened in it for a short time, being then sealed against further absorption of the developing fluid. The carriers are then squeezed between the squeezing roller.

In another of the known devices, the layer-carriers are compressed by a pair of rollers and then are conducted into the open, after having separately been led into the developing fluid and separately kept in it on a rather long passage through it.

The first mentioned apparatus has the following disadvantage: the layer-carriers are compressed so strongly after short moistening in the fluid that only the smallest possible quantity of fluid is able to adhere to the layer-carriers when in a compressed state, and only a very insignificant transferral from one of the layers of the carriers to the other can take place. As a natural consequence, the layers of the carriers do not swell sufficiently for a reliable transferral process, and the insufficient swelling of the gelatine layers is then the reason for their showing a tendency to considerable adhesion to each other.

The drawback of the second of the known devices is that the separately moistened layer-carriers are kept separated from one another on a very long passage through the fluid before being compressed. The developing fluid therefore reacts too long upon the layers and the chemicals of the layers are washed out by the fluid to a certain degree. Another severe drawback is that the layer-carriers will turn yellow, later on exposed to daylight. The reason for this is evidently that the developing fluid, which contains lyes, penetrates the layer-carriers to such a degree that the oxidizing effect is prolonged. In spite of the strong action of the developer the layer-carriers are losing part of the intensity of their mutual reaction on account of the chemicals being washed out.

This strong oxidizing effect, especially on layer-carriers for positive transfer, may be ascribed to the metal particles they contain which are especially exposed to oxidation on account of the prolonged moistening.

To these disadvantages, it was suggested to let the layer-carriers adhere to one another by natural adhesion after a short moistening, and to pass them through the fluid, in this state finally to be squeezed dry.

In a known device of this latter type the described drawback of the first mentioned devices was partly corrected but there still remained the danger that the layer-carriers too tightly compressed, would shift with relation to each other during the passage through the fluid, resulting in double picture as a possible consequence.

The object of the present invention is to obviate the defects referred to and provide a process by which the diffusion reaction is already completed in the developing fluid, in such a manner that the layer-carriers cannot shift in relation to one another, resulting in a double image.

To attain this object satisfactorily, an apparatus for the developing of photographic layer-carriers by diffusion reaction is proposed, by which the separate layer-carriers are being moistened sufficiently and separately in the developing fluid, then are compressed while still in the developing bath in such a manner that a film of moisture remains between them, and are then conducted in their compressed state through the developing bath in such a manner that they continue to be washed by the developing fluid.

The proposed process provides the following advantages: the layer-carriers, after having been briefly and separately moistened by the developing fluid, are compressed while still in the developing fluid. The layer-carriers are then led through the fluid without being pressed by other means, i.e. the layer-carriers once compressed are not disturbed at this stage and are then led out of the fluid. There remains a film of fluid between the layer-carriers sufficient to continue and to complete the development; the layer-carriers remain immersed in the developing fluid during their passage through the fluid so that a washing out of the chemicals from the layer carriers and a strong oxidation of the developing fluid may be avoided.

The invention furthermore provides a device for carrying out the above-mentioned process, in which a receptacle containing developing-fluid is provided, having several inlet tracks adapted for guiding layer-carriers separately from one another into the fluid, the outlet slots of said inlet tracks being directed towards the contact-line of a pair of rollers which are rotatably mounted in said receptacle also, means are required for conducting the layer-carriers from this pair of rollers, through the developing fluid, to a second pair of rollers which are in contact with each other, the second pair of rollers being rotatably mounted on the receptacle above the level of the developing fluid.

Fig. 1 is a sectional view of the invention, showing two pairs of gear-driven rollers;

Fig. 2 is a sectional view showing the two pairs of rollers to be belt driven;

Fig. 3 is a sectional view showing another embodiment of the invention, having a single immersed roller.

In a receptacle 1, filled with developing fluid 15, four plate-like guiding tracks 2 to 5 are shown. They are inclined towards each other at their lower ends in such a manner that their section is funnelshaped. These plates 2 to 5 serve as guiding tracks for the layer-carriers introduced separately. In the interior of the receptacle and below the level of the fluid 15 a pair of rotatable rollers 6 are fitted. The outlet slots of the inlet tracks 2 to 5 are directed towards the line of contact between the two rollers 6. Below the pair of rollers 6 a guiding track 7 is arranged. It consists of a baffle plate projecting above the receptacle 1 at its upper end and directed towards the line of contact of a further pair of rollers 8. This pair of rollers is also rotatable. In Fig. 1 the pairs of rollers 6 and 8 are shown coupled synchronously by means of a toothed wheel transmission 9,

10, 11, 12, 13. If the toothed wheel 11 is rotated by means of a starting handle, the pairs of rollers 6 and 8 are rotating at a uniform speed.

The process according to the invention takes place in the following manner:

The layer-carriers to be developed are separately introduced from above into the slots of the inlet tracks 2 to 5, and the layer-carriers are pushed to the rotating rollers below. The rotating pair of rollers seizes the layer-carriers, pulls them through and carries them over the guide track 7 through the developing bath to the rotating pair of rollers 12, 13. In this device, the layer-carriers travel only a relatively short distance before they enter between the pair of rollers 6. They are, however, sufficiently and separately moistened during this short passage through the developing fluid. The further passage of the layer-carriers now is automatic. They are compressed by the pair of rollers 6 in such a way that a fluid film remains between them. The compressed layer-carriers remain immersed in developing fluid on their way through the developing bath. The developing fluid is then squeezed out between the upper pair of rollers 8. This roller pair therefore has a double function, i.e. to conduct the layer-carriers automatically from the developing bath into the open and to free them of the developing fluid, which returns to the receptacle 1.

In accordance with the invention, the diffusion from one of the layer-carriers to the other is completed while the layer-carriers are still in the developing fluid.

The modification according to Fig. 2 differs from the device described before only in the synchronous drive of the roller pair 6 and of roller pair 8 which is here accomplished by an endless belt 14, preferably elastic. For the rest, the developing of the photographic layer-carriers is taking place by exactly the same diffusion process, as described already under Fig. 1.

The modification according to Fig. 3 differs from the embodiments shown in Figs. 1 and 2 by having a single roller 16 in place of the pair of rollers 6 arranged within the developing fluid 15. This roller 16 is freely rotating about an axis and is mounted in the receptacle in such a manner that it touches the curved guiding plate 7. Also in this embodiment, the inlet tracks 2 to 5 are arranged so that their outlet slots are directed toward the contact line between roller 16 and guiding track 7.

In the embodiment shown in Fig. 3, the roller 16 is not externally driven but put into rotating movement by the layer-carriers which are introduced and shoved forward through the slots of the inlet tracks 2 to 5. After passing between them the layer-carriers slide over the curved guiding plate 7 through the developing fluid towards the line of contact between the two rollers 8. These being in rotation, seize the layer-carriers and transport them into the open after having squeezed out the developing fluid still adhering to them, the fluid returning to the receptacle 1.

The diffusion process itself is identical with that described for the embodiments of Figs. 1 and 2.

In the embodiments shown in Figs. 1, 2 and 3, the guiding tracks 2 to 5 are rigidly mounted on the receptacle 1. They may, however, also be made adjustable in vertical or lateral directions, so that the gap between the outlet slots of the guiding tracks and the roller pair 6 or roller 16, as well as the degree of inclination of the guiding tracks in relation to one another can be regulated.

I claim:

1. A device for the development of photographic layer carriers comprising a receptacle for a photographic developing fluid, a plurality of inlet track means adapted to guide a plurality of said layer carriers during introduction thereof separated from one another directly into the developing fluid in said receptacle, said inlet tracks having outlet slots; first transporting roll means mounted in said receptacle under the level of said developing fluid in the region of said outlet slots of said inlet track means for receiving said introduced layer carriers after both faces of each layer carrier have been wetted by said developing fluid; second transporting roll means mounted spaced from said first transporting roll means; guide means mounted in said receptacle for guiding superimposed wetted layer carriers from said first transporting roll means; and driving means for rotating said transporting roll means so as to properly transport said superimposed wetted layer carriers received by said first transporting roll means to and past said second transporting roll means while guided by said guide means.

2. A device for the development of photographic layer carriers comprising a receptacle for a photographic developing fluid, a plurality of inlet track means adapted to guide a plurality of said layer carriers during introduction thereof separated from one another directly into the developing fluid in said receptacle, said inlet tracks having outlet slots; first transporting roll means mounted in said receptacle under the level of said developing fluid in the region of said outlet slots of said inlet track means for receiving said introduced layer carriers after both faces of each layer carrier have been wetted by said developing fluid; second transporting roll means mounted spaced from said first transporting roll means above the level of said developing fluid; guide means mounted in said receptacle for guiding superimposed wetted layer carriers from said first transporting roll means; and driving means for rotating said transporting roll means so as to properly transport said superimposed wetted layer carriers received by said first transporting roll means to and past said second transporting roll means while guided by said guide means.

3. A device for the development of photographic layer carriers comprising a receptacle for photographic developing fluid, a plurality of inlet track means adapted to guide a plurality of said layer carriers during introduction thereof separated from one another directly into the developing fluid in said receptacle, said inlet tracks having outlet slots; a first pair of transporting rollers mounted in said receptacle under the level of said developing fluid in the region of said outlet slots of said inlet track means for receiving said introduced layer carriers after both faces of each layer carrier have been wetted by said developing fluid; a second pair of transporting rollers mounted spaced from said first pair of transporting rollers and being above the level of said developing fluid; drive means cooperating with said first and second pairs of transporting rollers for synchronous rotation thereof; and guide means mounted in said receptacle for guiding superimposed wetter layer carriers from said first pair of transporting rollers to said second pair of transporting rollers.

4. A device for the development of photographic layer carriers according to claim 3, wherein said first and second pairs of rollers are connected to each other by a coupling means for synchronous rotation.

5. A device for the development of photographic layer carriers according to claim 3, wherein said first and second pairs of rollers are connected to each other by an endless belt for synchronous rotation.

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