

May 26, 1942.

H. SMITH

2,284,236

DEVELOPING PROCESS

Filed Nov. 9, 1940

Fig. 1.

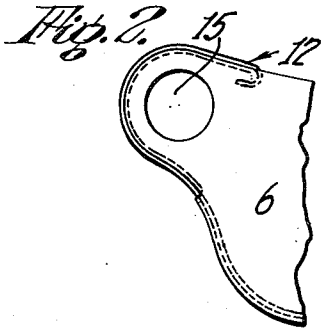
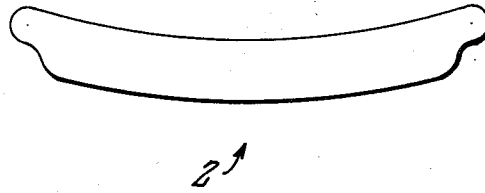


Fig. 3.

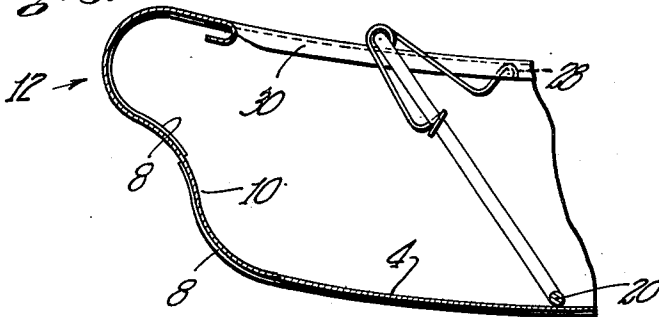
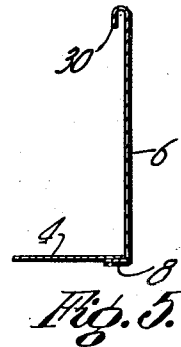
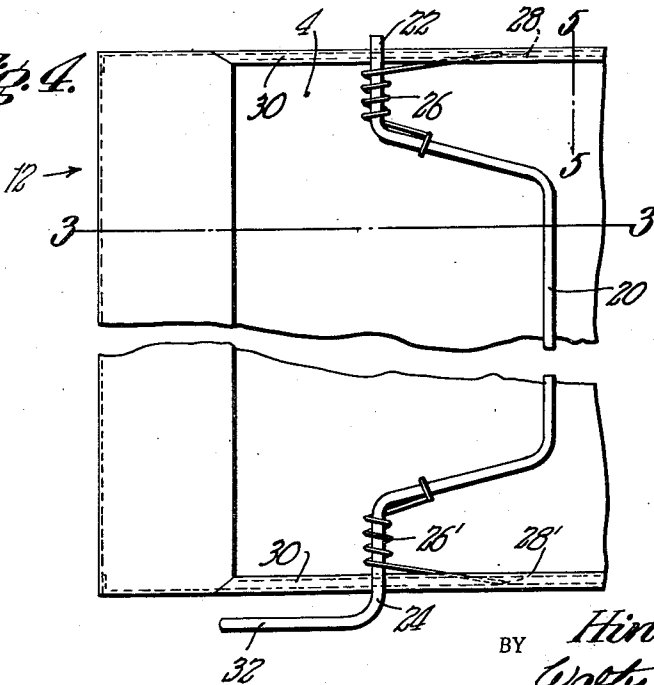


Fig. 4.



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UNITED STATES PATENT OFFICE

2,284,236

DEVELOPING PROCESS

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Application November 9, 1940, Serial No. 365,066

3 Claims. (Cl. 95—88)

My invention relates to improvements in a developing process for developing photographic paper which, as is shown, is coated on one side with a sensitized emulsion or coating.

By means of my invention, this processing or developing of photographic paper may be accomplished in less time than has heretofore been required, notwithstanding the fact that better results are obtained in spite of this efficiency.

Prior practice usually involves as the first step: the placing of an exposed sheet in a tray of a developer fluid for a period of, let us say, three minutes. After the development, the sheet is removed and is placed into a second tray containing a stop bath, in which it remains for approximately 20 seconds. The sheet is then removed to a third tray in which it is bathed in a solution called a fixer or "hypo." After the fixing, the print is washed for the purpose of removing the hypo therefrom.

It will be seen that such a process not only involves the use of three trays but also requires the objectionable handling of the sheets in transferring them from one tray to the other. This not only requires time but also involves undesirable expense.

A further objection is that the print or paper base becomes strongly acid thereby making it difficult, if not impossible, to remove the hypo by the washing operation.

According to this invention as will appear, I maintain the paper in an alkaline condition thereby making it possible to eliminate more completely the hypo in the washing operation.

A particular advantage of my invention is that I do not permit the paper side of the sheet to become acid. It is essential, for best results, that the fixing solution be washed from the print after it has been bathed in the solution for the necessary length of time and, when present practice is followed, it is extremely difficult, if not impossible, for the operator to entirely eliminate the hypo from the print by washing, principally because the common practice results in the paper being acid.

When developing paper in trays of the ordinary type, the developing liquid deteriorates noticeably through use on successive sheets. Even after developing only one sheet, the developing liquid is not in the same condition for the second print and the deterioration advances progressively and more rapidly with continued use so that a generally unsatisfactory condition exists in respect to the results obtained. As one of the fea-

tures of this invention I overcome this objectionable condition.

It is a further object of this invention to provide an arrangement whereby the developing solution will flow uniformly over the entire area of the sheet being treated regardless of its size, there being, as is well known, several different sizes of photographic paper. According to this invention, it is possible to develop prints of various sizes in one tray as an adjustable retaining member is provided which serves to permit prints or sheets of any size to be effectually developed therein.

With the foregoing and various other novel features and advantages and other objects of my invention as will become more apparent as the description proceeds, the invention consists in certain novel features of construction and in the combination and arrangement of parts as will be hereinafter more particularly described and referred to in connection with the accompanying drawing wherein:

Fig. 1 is a side elevational view of a tray embodying the features of the invention;

Fig. 2 is a side elevational view of one end of the tray of Fig. 1 with dot-dash lines to explain certain features of the invention;

Fig. 3 is a sectional view on the line 3—3 of Fig. 4;

Fig. 4 is a partial top plan view of the tray; and

Fig. 5 is a sectional view on the line 5—5 of Fig. 4.

Referring now to the drawing more in detail, the invention will be fully described.

The tray of the invention is indicated generally by 2 and includes a bottom wall member 4 and side walls 6 which preferably have marginal flanges 8 extending under and secured to the bottom wall, as shown, in some suitable manner, as by soldering. As a special feature of construction, the flanges 8 may be slit to permit the opposite end portions to lie adjacent the inside of the opposite end portions of the bottom wall 4. These inside parts, of course, may likewise be secured to the bottom wall and it all makes for a neat appearance.

The bottom wall is curved generally from end to end and the ends are turned upwardly to provide what may be termed stops such as 10 which may perform a function to be described.

While the material of which the tray may be made may vary, I prefer that some sheet metal be employed. This is not only because such material may be readily obtained of a type which

will not be injuriously affected by chemical reaction of the developing materials, but because sheet metal readily lends itself to the novel formation of the tray now being described.

Its bottom surface being curved, the tray is obviously especially adapted to be rolled or rocked on the surface of a table or the like. The motion thus obtained is to be distinguished from a pivotal or swinging action and it will be appreciated that the operator, by rolling the tray from end to end with a smooth and even action, can obtain more satisfactory and efficient flow of fluid over the print in the tray.

The end portions of the tray are preferably formed as shown in the drawing with the bottom wall 4 curving upwardly, outwardly, then upwardly, and then inwardly to provide relatively narrow semi-circular handle portions. These are adapted to be manually engaged by the operator to facilitate his handling of the tray and his rolling it back and forth on its bottom, said handle portions being indicated generally by 12.

There are stop portions 10, one being preferably formed adjacent each end of the tray, for engagement by the opposite marginal edges of the sheet or print being processed, it being the intention to prevent longitudinal shifting of the same relative to the tray when it is being rolled for the developing operation. That is to say, one of the features of the invention is that the sheet or print, after being wetted, tends to adhere to the concavely-curved bottom wall of the tray, by more or less of a suction action and the stops co-operate with such action to prevent the sheets being shifted or raised up from the surface.

By reason of the novel construction here being disclosed, there is close contact between the paper and the tray bottom and, since the paper has its emulsion side uppermost, it is possible, according to this invention, to use but a very small quantity of developer and to obtain uniform results.

Since the bottom of the tray is curving, the paper is held to the tray by more or less capillary attraction. The liquid cannot get under the sheet in quantity sufficient to raise it. Therefore, the sheet need not be entirely immersed at any one time but may be readily traversed by but a small quantity of developer which is flowable thereover as the tray is rocked. In this way the paper is not saturated by developer or fixer so as to facilitate efficient fixing after development and proper washing after fixing.

There may be a hole 15 in one end wall of the tray to permit quick and easy discharge of liquid from the tray without spilling and this may act much in the manner of a funnel. Such hole may be normally closed by a removable stopper or plug which is not shown.

As previously stated, I desire that the tray be adapted to permit the efficient processing of any print or sheet of a size smaller than the tray and that the same be held in fixed position while being so processed. To this end, I provide a movable adjustable member for engaging one end portion of the sheet, it being the intention that the opposite end portion thereof be held in desired position by one of the stops above referred to.

It will be understood that in some cases the stops will be just so spaced apart as to of themselves hold a certain-sized sheet in place. However, as will be obvious, a sheet of less length cannot be held in such a tray and it is for this

reason that a movable or adjustable stop or clamp is desired.

According to the invention, there is a generally transversely-extending rod member having a central part 20 for engaging the print and opposite end portions 22 and 24 respectively for more or less pivotally associating with the opposite sides of the tray. In the form shown, these end portions are offset with respect to part 20, and one of them such as end portion 22 extends outwardly above and rests on the upper edge of one side wall.

A coil spring 26 extends around the part 22 and has a free end portion 28 guided in a channel or slot which may be provided in any suitable manner but, as disclosed, is preferably formed by the turning over and downwardly of the upper marginal edge portion 30 of said side wall. The other end of spring 26 may merely extend around so as to be in engagement with the offset or connecting part of the adjustable member as shown in Fig. 3.

The other end portion 24 of the adjustable engaging rod may rest in a similar manner on the upper edge of the opposite side wall and have a similar spring 26' with free end portion 28' guided in a similar channel formed by bent-over part 30'. The arrangement is such that rotation of the rod in one direction will be against the springs so as to urge the rod part 20 to a lower position so as to yieldingly bear against the bottom surface of the tray, or the sheet thereon.

A handle or manually engageable part 32 may extend from or be provided on one end of the rod, such as the part 24, to facilitate its rotation. As will be obvious, rotation in one direction will raise the central part 20 away from the sheet or tray bottom since said part is offset with relation to the end portion while release of the same will permit the springs to return it into contacting position.

The arrangement is such that the adjustable member may be readily moved relative to the opposite ends of the tray. That is the rod may be manually pushed towards or away from either end, the parts 22 and 24 riding on the tops of the side walls and the parts 28 and 28' sliding in the channels or slots formed on or in the side walls, as described.

Thus a print may be placed in the tray with one end thereof "stopped" by a part 10 and its other end portion stopped by the rod part 20 so that it is caused to adhere to the bottom surface in the manner and for the reasons above set forth.

It will be understood that if desired, a pair or more of such adjustable holding members could be provided and both ends of the print held thereby. It is merely to be remembered that prints of various sizes may be effectively processed, according to this invention, in the same tray.

The part 20 of the stop or clamp may be used for bearing on a sheet resting on the tray bottom or it may be used as a stop engageable by the marginal edge of the sheet so as to act as a stop.

The novel process of the invention will now be described.

An exposed sheet of sensitized paper is placed in the tray emulsion side uppermost after it has been wetted and resting on the curving bottom of the tray it is held in close contact to the bottom by suction. A small quantity only

of developer is required, say about 3 ozs. for an 11" x 14" print, and fresh developer is used for each print. The tray resting on a suitable support is rolled or rocked so that it traverses the print. The normal developing solution is strongly alkaline and during the time of development, which is from approximately three to four minutes, some of the developing fluid has time to seep under the print alkalizing the paper backing. When the print has been sufficiently treated the developing solution is removed from the tray and then a corresponding amount of a fixing solution is poured into the tray, the function of which is to dissolve out the unexposed portions of the silver salts. The tray is rolled or rocked as before.

The principal ingredient of the fixing solution is sodium thiosulphate commonly called "hypo" and in order that it may function properly it is necessary that it have an acid characteristic. For this purpose, a small amount of a substance having this characteristic such as sodium metabisulphide is added to the fixing solution. If the paper backing is in an acid condition when removed to the washing tray after the fixing is complete, it is very difficult to remove all traces of the "hypo" even with prolonged washing. In former methods of development it has been recommended that an alkalizing bath be used after fixing to shorten the washing time and make the print more permanent.

In my new process the acid fixing solution is made of a strength that completes its action on the paper in a comparatively short period, say, about thirty to sixty seconds. As fresh solution is used for each print there are none of the drawbacks that are ordinarily met with in fixing prints and the bath is not exhausted, it is in the proper acid condition, and not loaded with dissolved silver.

It will be seen that whereas the print has remained in the alkaline developer for from three to four minutes it has only been in the acid "hypo" for about one-third or less of that time and that the paper back being protected has not had time to lose its alkalinity and become acid and therefore is in a condition where the washing operation will remove the "hypo" in much less time and much more thoroughly than is possible with prints that are exposed to the "hypo" solution on both sides as in general practice.

Dr. E. Weide of the Agfa research laboratory recommends treatment in an alkaline bath between fixing and washing in cases where importance is attached to permanence. He states that the tenacity with which "hypo" is retained by the paper base is increased by the time of fixation in an acid fixing bath.

This new process eliminates the necessity for this extra treatment thus producing prints of greater permanence and requiring less washing.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all

respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. The method of processing an exposed sensitized sheet or the like having a paper side and a silver halide emulsion side including, placing the sheet on the curved bottom surface of a tray with its paper side lowermost, causing the same to adhere to said surface by capillary attraction, treating the emulsion with an alkaline developing solution for a sufficient time to develop the exposed silver halide of the emulsion and then treating said emulsion with an acid thiosulfate fixing solution for a sufficient time to remove unexposed silver halide whereby the upper surface will be in an acid condition and the under surface in an alkaline condition when treatment is complete.

2. The method of processing a sheet of paper having an exposed silver halide sensitized emulsion side and a non-sensitized side which consists in, wetting and placing the sheet on a flat surface with the non-sensitized side thereof throughout its area against said surface to hold the sheet on said surface with the sensitized side uppermost, placing a relatively small amount of alkaline developing liquid on said sensitized side of the sheet and causing the same to traverse said side back and forth for a length of time sufficient to develop the exposed silver halide, removing said developing liquid, and then in placing a relatively small amount of acid sodium thiosulfate fixer on said sensitized side and causing the same to traverse said side back and forth to remove unexposed silver halide of the emulsion and fix the same leaving the paper alkaline.

3. The method of processing a sheet of paper having an exposed silver halide sensitized emulsion side and a non-sensitized side which consists in, placing the sheet on the flat curved surface of the bottom of a tray with the non-sensitized side thereof throughout its area against said surface and the sensitized side uppermost pouring a relatively small amount of alkaline developing liquid on said sensitized side of the sheet and rocking said tray so that the liquid traverses said sensitized side back and forth a sufficient length of time to develop the exposed silver halide of the same, removing the developing liquid, and then in placing a relatively small amount of fixer including said sodium thiosulfate on said sensitized side and rocking said member so that the liquid traverses the said sensitized side for a sufficient length of time to fix the same by removing the unexposed silver halide leaving the paper alkaline.

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