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METHOD AND APPARATUS FOR DEVELOPING AND
TREATING SHEETS OF SENSITIZED PAPER
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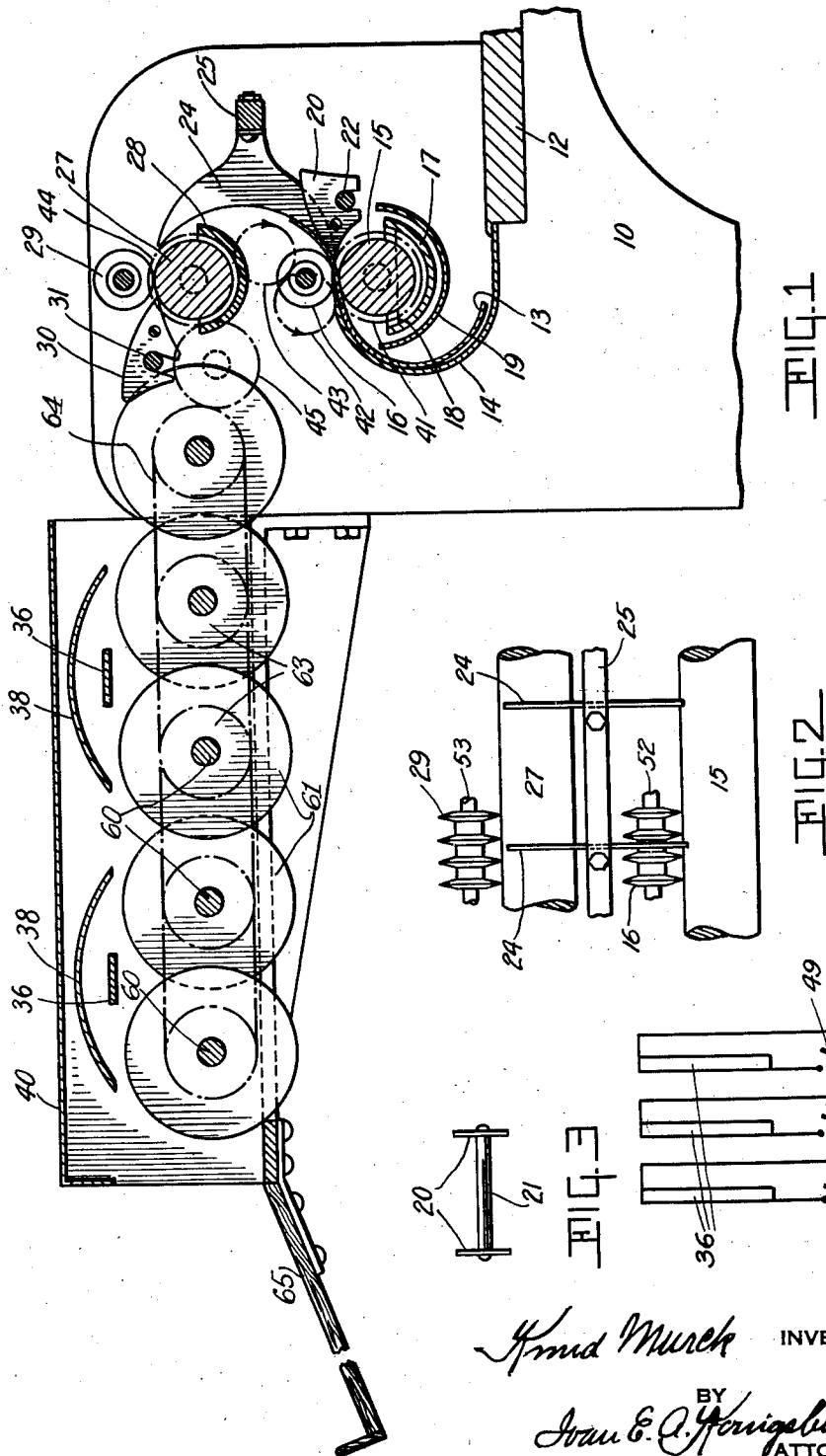


FIG. 1

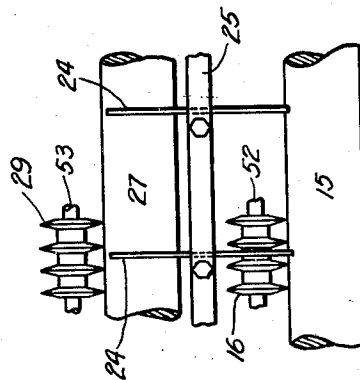


FIG. 2

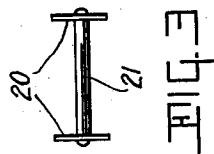


FIG. 3

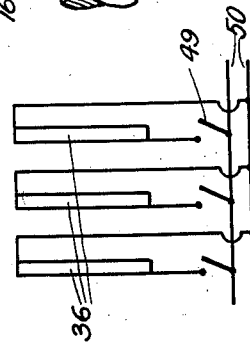


FIG. 4

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METHOD AND APPARATUS FOR DEVELOPING AND TREATING SHEETS OF SENSITIZED PAPER

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15 Claims. (Cl. 95—94)

In the art of developing printed sensitized sheets of paper by the application of a liquid developer to only the exposed surface of the print and thereafter drying the developed sheet it is a common experience that the sheet crinkles or curls up while it is being dried either by allowing it to remain quiescent in the air or by applying artificial heat because of the difference in moisture content between the two surfaces of the print. According to this invention this defect is avoided by moistening the back of the print as soon as it emerges from the developer with water in quantity sufficient to substantially equalize the moisture content of the developed surface. By so doing the developed print remains flat and does not crinkle or curl up while it is being dried by allowing it to remain quiescent in the air or by applying artificial heat. As the amount of water applied to the back of the developed print is very little, the print will dry in a comparatively short time, say a minute or so, when allowed to dry by merely exposing it to room temperature. However, where it is desired to expedite the drying of the prints so that they are dried in a few seconds, this may be done by exposing the prints to artificial heat immediately after they have been moistened on the back.

Accordingly the object of my invention is to provide a method and apparatus for handling sensitized prints in a manner to insure that the prints will remain flat after having been developed and whereby crinkling or curling up of the sheets is prevented.

My invention is disclosed in a method and apparatus for practicing the same embodying the novel features hereinafter described and illustrated in the accompanying drawing.

In some respects the apparatus herein disclosed as an improvement on the apparatus disclosed in my U. S. Patent No. 1,891,722; December 20, 1932. This application is also a continuation-in-part application of my pending application Serial Number 671,939; filed May 20, 1933. In the accompanying drawing—

Fig. 1 is a transverse sectional view of an apparatus embodying the invention with parts shown in diagrammatic outline only, and with other parts removed or broken away.

Fig. 2 is a partial detail view of the developing and moistening rollers, looking from the right in Figure 1.

Fig. 3 is a detail view of the paper stripping means.

Fig. 4 is a wiring diagram.

The several parts and mechanisms of the ma-

chine are supported generally on and between two side frames 10, only one of which is shown. In the front of the machine there is a feed board 12, upon which the operator places the printed sheet 13, with the printed sensitized side upwards and then inserts it in the machine by pushing it against the circular sheet guide 14, which causes the sheet to be curved upwardly and directs the sheet towards and into contact with the rotating developing roller 15. A series or number of 10 freely rotatable contacting disks 16, rest on the developing roller in frictional driving contact, and as the sheet 13 is thus fed towards the roller, the sheet is seized as it were between the roller and the disks and carried into the machine in an obvious manner.

The developing roller 15 dips into a trough 17, which contains a developing solution 18. An inner paper guide or shield, 19, is preferably provided to cooperate with the outer paper guide 14, and to properly guide the paper towards the developing roller and prevent premature contact with said roller.

The development of the sheet takes place almost instantly, for instance, if the apparatus is 25 used for developing diazo type positive prints, and very little of the developing solution is required for this purpose. As soon as the paper has contacted with the developing roller and passed underneath the disks 16, it is stripped from the 30 roller by strippers 20. These latter are preferably in the form of thin blades of suitable material mounted in pairs on the ends of connecting rods 21, see Figure 3. Each stripper blade is cut out to rest on the supporting rod 22, and inas- 35 much as each blade is free to move on the connecting rod 21, individual contact by gravity is provided for, thus insuring good contact between the point of the strippers and the developing roller. The strippers are mounted in detachable, 40 easily movable pairs on the rod 22, so that they may be placed along said rod to best advantage with respect to the sheet.

After leaving the developing roller, the sheet passes upwards against paper guides 24. These 45 guides are also preferably in the form of thin blades suitably shaped and supported on a bar 25. The object of these guides is to guide the paper during its passage from the developing roller 15 to another moistening roller 27.

The moistening roller 27 is, like the developing roller, preferably a highly polished metal roller with a chromium surface for the sake of hardness, smoothness and cleanness. The roller 27 dips into a trough 28, which contains water. 50

Contacting driving disks 29, similar to the aforesaid disks 18, cooperate with the moistening roller to move the paper through the machine. The paper is stripped from the water moistening roller 27 by pairs of strippers 30, which are arranged on a rod 31 in pairs like the strippers 20.

The sheet is now finished and is delivered flat from the machine and remains flat. It may be left to drop on a table or board or simply be taken away from the machine and left to dry in room temperature. The sheet will dry in a very short time, perhaps a minute or so. However, as stated above, very often practically immediate drying is desired and for this reason the apparatus may include means for applying artificial heat. Such heat applying means may be in the form of a drying box or the like. In the present instance there is shown a drying mechanism well adapted for the purpose and which may be so attached, built into and operated from the developing and moistening mechanism to permit of continuous automatic operation if desired.

As shown in the drawing there is secured to the apparatus a suitable support 40 which may be in the form of an inverted casing. In the sides of the latter and also in the frames 10 there are mounted a plurality of shafts 60 which carry conveying disks or wheels 61 in alternately staggered relation as shown. The shafts extend the width of the machine and the wheels 61 are spaced sufficiently close to support the sheets being conveyed thereupon. Heat may be supplied from suitable electric heating elements 36 supported above the wheels 61. Shields such as 38 may be provided to confine and direct the heat and provide for updrafts underneath the casing 40 as will be understood.

The mechanical means for supporting and operating the aforesaid mechanisms are either omitted or shown merely diagrammatically because they form no particular part of this invention. However, means are indicated for driving the movable parts. Thus the developing roller 15 is provided with a gear 41 and from this gear movement is transmitted to the moistening roller 27 and to the shafts 60 by means of gears 42 to 45 inclusive. The shafts 60 carry gears 63 which are driven by a chain 64 and the fixed gear 60 to the right in the drawing, is arranged to receive movement from the gear 45 and also to drive the chain 64 as is obvious. 65 denotes a table or board for receiving the sheets from the machine. The heating elements, two or more as shown in Figure 4 are preferably controlled by switches 49 from the main wires 50. The entire machine is of course driven by a motor or other means not shown. The contacting disks 16 and 29 are mounted on non-rotatable shafts 52 and 53, Figure 2, arranged to permit driving contact by gravity between the disks and their respective contacting rollers.

The use of the contacting driving disks 16 and 29 is a feature of the invention. The beneficial results obtainable by means of the disks 16 are referred to in the patent above mentioned. Similarly, it has been found that in order to control the amount of moisture to be applied to the back of the sheet for the purposes of this invention, the use of such disks is very important in that also in applying the water, great care must be exercised that the sheets are moistened to only a predetermined extent and that no excess moisture is caused to be applied to the edges of the sheet, such as would be the case were merely ordinary driving wheels or other means employed.

The use of the contacting disks or similar elements are also of importance in moving the sheet through the machine. The developing of diazo type and like prints in sheets practically prohibits the use of gripping means applied to the edge of the sheet for pulling it through the apparatus because such means are apt to leave marks on the print. Hence it is important that the sheet be handled with as few mechanical contacting means as possible and that such means be arranged to move the sheet automatically through the apparatus.

The machine as herein disclosed may be used for developing and moistening the sheets as described and drying them with or without the application of artificial heat. In either case the sheets will be delivered flat and remain so. The heat may be applied in one continuous automatic operation, or artificial heat may be applied separately or the sheets may be left to dry in room temperature. The sheets may be narrow or wide, short or long. As is usual in such cases the machine will be dimensioned to take care of a certain maximum width of paper, the length being immaterial for all practical purposes. Again it is not without the scope of the invention that the sheets be moistened first and developed thereafter should such a procedure become practical or desirable.

The machine is widely used for the developing and drying of diazo type and similar prints which require only momentary application of the developing liquid and likewise, therefore, only momentary application of the moistening medium to affect or balance, as it were, the moistening effect of the developer. When the entire operation is carried out automatically and includes developing, moistening and drying, a sheet passes through the machine in a few seconds. The sheets are delivered flat and do not curl up or crinkle.

I claim:—

1. The method of developing and drying a printed sensitized sheet which consists in first subjecting said sheet to the separate action of a developing agent; then moistening the developed sheet on the back thereof and thereafter subjecting the developed and moistened sheet to the influence of heat for a predetermined period, the said method being carried out in one continuous automatic operation.

2. The method of developing and drying printed sensitized sheets so as to obtain a finished print which will remain inherently flat, which consists in first developing said printed sheet, then moistening the same on the back thereof and thereafter drying the developed and moistened sheet, the said method being carried out in one continuous automatic operation.

3. The method of drying printed developed sensitized sheets so as to obtain a finished inherently flat print which consists in bringing the developed print into contact with a momentarily operating moistening agent immediately after it has been developed and thereafter subjecting the moistened sheet to the influence of heat immediately after the application of said moistening agent, the said moistening and drying steps forming parts of a continuous automatic operation for developing and drying the sensitized sheets.

4. The method of developing and drying diazo type positive prints in sheet form which consists in applying a momentarily operating developing agent to the printed sides of the print, then moistening the back side of said print with water and

thereafter subjecting said print to the influence of controlled heat, said method being carried out in one continuous automatic operation whereby to obtain a finished print capable of remaining inherently flat.

5. The method of developing and drying a sensitized sheet which consists in applying a developing liquid to the printed side of the sheet, thereafter applying a substantially equal amount of water to the other side of the sheet and thereafter drying said sheet for a period of sufficient duration to cause the evaporation of practically all of the moisture applied to the sheet by the said developing liquid and said water whereby to obtain an inherently flat print.

6. The combination of a roller for applying developing liquid to the printed side of a sensitized sheet to develop the same, a second roller for applying moisture to the other side of the sheet after it has been developed, means cooperating with the first roller for automatically removing the sheet therefrom into operative relation with the second roller, means for drying said sheet and means cooperating with the second roller for automatically removing the sheet therefrom into operative relation with the said drying means.

7. The combination of a roller for applying developing liquid to the printed side of a sensitized sheet to develop the same, a second roller for applying moisture to the other side of the sheet after it has been developed, means actuated by frictional contact with the first roller for moving the sheet past said roller and into operative relation with the second roller, drying means and means actuated by frictional contact with the second roller for moving the sheet past said second roller into operative relation with the said drying means.

8. Apparatus for developing and drying a sensitized sheet comprising means for applying developing liquid to the printed side of the sheet, means for applying a moistening liquid to the other side of the sheet, means for drying said sheet, and means for manipulating the sheet into operative relation with all of the aforesaid means sequentially in one continuous automatic operation.

9. Apparatus for developing and drying a sensitized sheet comprising means for applying a developing agent to the surface of the sheet to be developed, means for thereafter applying moisture to the other side of the sheet, means for removing the sheet from the developing means and convey the sheet to the moistening means, heating means and means for removing the sheet

from the moistening means and conveying it into operative relation with the heating means and mechanism for controlling the latter.

10. Apparatus for developing and drying a sensitized sheet comprising a roller for applying developing liquid to the face of the sheet, a second roller for applying water to the back of the sheet, a plurality of freely rotatable elements in frictional driving contact with said rollers for moving the sheet through the apparatus, strippers for removing the sheet from the said rollers and means for thereafter applying heat to at least one side of the sheet.

11. The herein described method of treating a printed sensitized paper so as to obtain an inherently flat print which consists in applying a developing liquid to the printed side of the paper, applying a substantially equal amount of water to the other side of the paper and causing the evaporation of practically all of the moisture applied to the paper by the said liquid and water.

12. The herein described method of treating a printed sensitized sheet to obtain a finished flat print which consists in applying to the sensitized side of the sheet a liquid developer in quantity sufficient to develop the print thereafter applying to the other side of the sheet a moistening agent in quantity substantially equal to that of the developing liquid and thereafter causing the sheet to be dried.

13. The herein described method of finishing a printed sensitized wet developed sheet so as to obtain an inherently flat finished print which consists in applying to the unsensitized surface of the sheet while it is still wet an amount of water substantially equal to the moisture content of the sheet and thereafter causing the said sheet to be dried.

14. Apparatus for developing and treating dry sensitized paper comprising means for applying developing liquid to the printed side of the paper, means for applying a moistening agent to the other side of the paper and means for manipulating the sheet into operative relation with all of the aforesaid means sequentially in one continuous operation.

15. Apparatus for developing and treating a sensitized printed sheet comprising means for applying developing liquid to the printed side of the sheet, means for applying a substantially equal amount of moisture to the other side of the sheet and mechanism for moving the sheet automatically in operative relation with all the aforesaid means and away from the said apparatus.

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