

Nov. 24, 1964

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3,158,447

METHOD FOR DRYING PHOTOGRAPHIC SHEET MATERIALS

Filed April 27, 1961

2 Sheets-Sheet 1

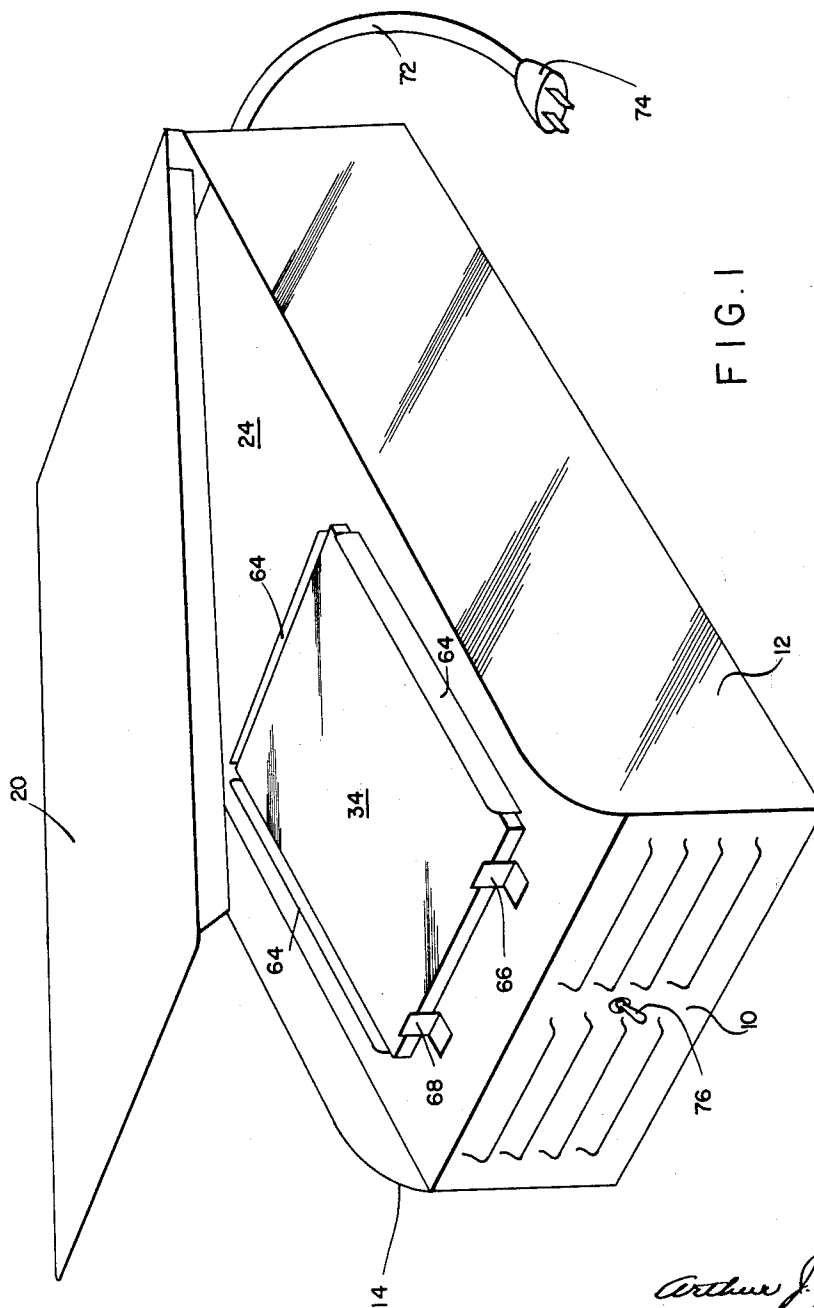


FIG. 1

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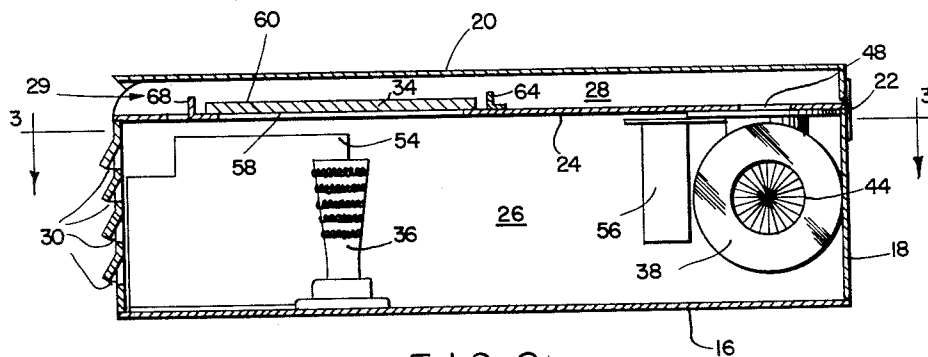
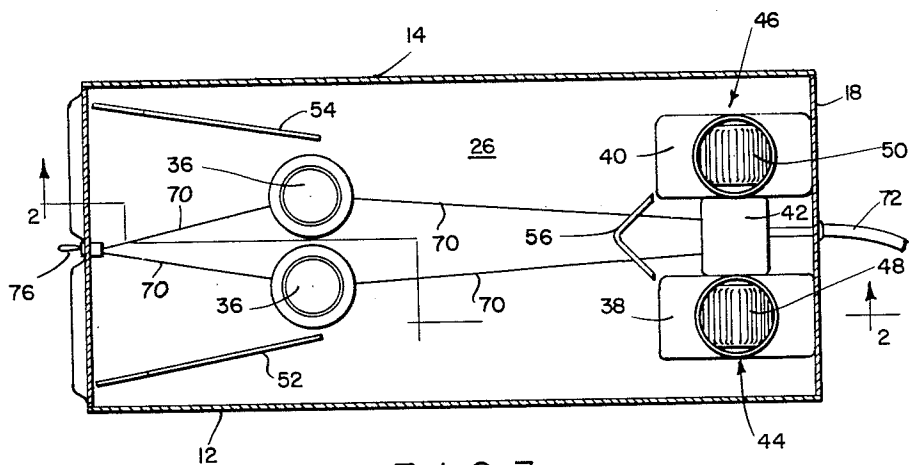
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2 Sheets-Sheet 2



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3,158,447 METHOD FOR DRYING PHOTOGRAPHIC SHEET MATERIALS

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Filed Apr. 27, 1961, Ser. No. 105,993
3 Claims. (Cl. 34—18)

This invention relates to photography and more specifically to novel methods and apparatus useful in the rapid drying of photographic sheet materials.

A variety of forms of apparatus has been proposed for removing moisture from photographic sheet materials which have been treated with one or more fluid processing compositions. Such apparatus includes ordinary drying racks, fans, heaters, and the like. Ordinarily, the sheet material to be dried has been processed in the conventional manner of immersion in a tank or other suitable container of developer, fixer, water, or other known fluid. Consequently, the sheet material is wet on both surfaces.

In a specific application of photographic processing, a photosensitive sheet material is exposed and thereafter processed by a fluid processing composition which is distributed between the photosensitive sheet and a second sheet superposed therewith. The second sheet is preferably adapted to serve as a support for a positive image formed by the well-known diffusion transfer process. Examples of photographic materials suitable for use in such photographic processes are set forth in detail in U.S. Patents Nos. 2,543,181, 2,559,643, 2,614,926, 2,647,049, and 2,647,056, all issued to Edwin H. Land. Preferably, a protective coating comprising a thin layer of a liquid composition containing a protective material in solution or suspension is applied to positive prints formed in the above-mentioned manner. The coating composition is designed to wash away any residue of reagents remaining on the print surface after processing is complete and to protect silver comprising the photographic image from marring or scratching or from reaction with sulfides present in the atmosphere. Examples of suitable materials for protectively coating such photographic prints are disclosed in U.S. Patents Nos. 2,719,791, issued to Edwin H. Land, and 2,830,900 and 2,866,705, both issued to Edwin H. Land et al. The positive print, after such coating has been applied, is therefore wet on one surface only.

Generally, the present invention is directed to a novel method and apparatus for drying photographic sheet materials and is equally adapted to dry sheets wet on both surfaces and those wet on one surface only, as set forth above. The invention is characterized in that the sheet to be dried is placed on a stationary, heat-conducting medium, and heat is supplied from a source on the opposite side of the medium from that on which the sheet has been placed. The heat is conducted through the medium to the sheet, thus driving off moisture from the opposite surface thereof. Air-circulating means are provided to cause air to pass in proximity to the heating source and receive heat therefrom, and then to pass over the said opposite surface of the sheet, carrying away the moisture driven off and further heating the opposite surface.

A principal object of the present invention is to provide novel method and apparatus for rapidly drying wet photographic sheets.

It is a further object of the invention to provide means for driving off moisture from a wet photographic sheet material by the direct application of heat from a solid material in intimate contact with one surface of the sheet, and simultaneously causing a supply of dry air to pass over the opposite surface.

Another object is to provide a method for rapidly removing moisture from wet photographic sheet materials by conducting heat to one surface of the sheet materials, causing the opposite surface to become heated by a supply of air-receiving heat from the same source as the said solid medium, and causing the heated air to continuously move laterally across the said opposite surface.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts, and the process involving the several steps and the relation and order of one or more of such steps with respect to each of the others which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIGURE 1 is a perspective view of a preferred form of the invention shown with the cover in the partly open position;

FIG. 2 is a sectional side elevational view of the apparatus of FIG. 1, taken on the line 2—2 of FIG. 3; and

FIG. 3 is a sectional top plan view of the lower portion of the apparatus of FIG. 1, taken on the line 3—3 of FIG. 2.

Referring now to the drawings, in FIG. 1 is seen a preferred embodiment of the invention enclosed by housing means comprising a front wall 10, two side walls 12 and 14, a bottom wall 16, a back wall 18, and a top wall 20. Top wall 20 is hingedly connected to back wall 18 by any conventional, previously known means such as hinge 22. The housing is divided by interior partition 24 into a first compartment 26 and a second compartment 28. It will be noted that while first compartment 26 is enclosed on all six sides, second compartment 28 is enclosed on five sides only since front wall 10 extends vertically from bottom wall 16 to interior partition 24. Hence second compartment 28 has an open end 29 extending from interior partition 24 to top wall 20 between side walls 12 and 14. The outer walls of the housing may be formed of any suitable, rigid sheet material such as metal, plastics, and the like.

Front wall 10 is provided with one or more openings 30 to allow the free passage of air therethrough. Interior partition 24 is provided in a preferably centrally disposed area with a material of high heat conductivity such as a plate 34 of aluminum, copper, or the like. Suitable heating means such as electric heaters 36 are provided in first compartment 26. In the illustrated embodiment, heaters 36 comprise conventional high resistance coils wound on a conical ceramic core. However, it is to be understood that any suitable heatproducing means may be used. Centrifugal blowers 38 and 40 are driven by conventional means such as electric motor 42. Blowers 38 and 40 draw air in through inlets 44 and 46 respectively, and discharge it through openings 48 and 50 in interior partition 24. The air is thus drawn by blowers 38 and 40 from first compartment 26, into which it enters through openings 30, and discharged into second compartment 28. Upon entering through openings 30, the air is directed by baffles 52 and 54 into proximity with heaters 36. As it passes over heaters 36, the air is heated and enters blower inlets 44 and 46, being directed away from electric motor 42 by V-shaped baffle 56. Providing means for directing the heated air away from electric motor 42 lessens the danger of the motor becoming overheated. As seen in FIG. 3, baffles 52 and 54 are positioned to cause

air entering through openings 30 to pass on all sides of heaters 36, thus utilizing the maximum heating power.

Heaters 36 are positioned in first compartment 26, directly beneath plate 34 in partition 24. The lower surface 58 of plate 34 is thus heated by heaters 36 and the heat conducted to upper surface 60 of plate 34. Thus a wet sheet material placed on plate 34 receives heat directly from upper surface 60 and moisture will be driven off the surface of the sheet material opposite the surface in contact with plate 34. Unless carried away, moisture vapor will collect in the air above the sheet material and drying thereof will become slower as the air becomes saturated. However, since air is directed by blowers 38 and 40 into second compartment 28, the air layer above a sheet material placed on plate 34 is constantly moving laterally across the sheet material and discharging through open end 29. Since the air has been heated, as previously described, it is capable of absorbing a greater amount of moisture than if it had not been heated. Also, the upper surface of the sheet material is additionally heated by the hot air passing through second compartment 28. This combined effect tends to prevent curling of the sheet material being dried, which would result if one surface only were heated, and moisture allowed to collect in the air above the sheet surface. Flanges 64 are provided around plate 34 to prevent air coming from openings 48 and 50 from getting under the sheet material and blowing it off of plate 34. Tabs 66 and 68 provide an additional stop to prevent the sheet material from being blown out of second compartment 28. Electric heaters 36 and motor 42 are wired in a conventional manner, as seen in FIG. 3, by suitable electrical leads 70, and cord 72 having a plug 74 which may be connected to a conventional electrical outlet. Power may be supplied to both heaters 36 and motor 42 by throwing switch 76.

Top wall 20 forms a hinged lid which may be raised, as shown in FIG. 1, to gain access to second compartment 28. The sheet to be dried is placed on plate 34, top wall 20 is closed, as in FIG. 2, and switch 76 is moved to the "on" position. If the sheet to be dried is wet on one surface only, the dry side is preferably placed in contact with plate 34, allowing the air to circulate over the wet surface. If desired, previously known insulating means may be provided within the housing means to prevent heating of the outer surfaces thereof.

The above-described apparatus is well adapted to dry both sheet materials which are wet on both surfaces and those wet on one surface only, as previously described. Two electric heaters of 660 watts each, of the type shown in the illustrated embodiment, will heat the upper surface of an aluminum plate to approximately 140° F. and the air passing through second compartment 28 will be at about 115° F. at room conditions. Other arrangements of the heating elements, such as a network of wires strung on racks beneath plate 34, may also be used to heat the plate. If air is circulated through the apparatus at approximately 120 cubic feet per minute, a 10" x 12" photographic print, to one surface of which a conventional protective coating has been applied, can be completely dried in fifteen seconds or less.

The drying of photographic sheet materials in the described manner offers the advantages of minimizing the

drying time, uniformly drying the sheet material and lessening the tendency to curl. Also, it will be noted that the sheet material remains stationary while being dried, the only moving parts of the apparatus being the small electric motor and centrifugal blowers, both of which are common articles of manufacture.

Since certain changes may be made in the above process and apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. The method of drying photographic sheet materials comprising:
 - (a) placing the sheet to be dried with one surface thereof in substantially continuous contact with a solid, heat-conducting plate;
 - (b) radiating heat from a heat source to the side of said plate opposite that side on which said sheet is placed;
 - (c) heating an air supply by means of said heat source; and
 - (d) moving said air supply, subsequent to heating thereof, over the other surface of said sheet, whereby said one surface of said sheet receives heat conducted through said plate and said other surface receives heat from said air supply.
2. The method of drying photographic sheet materials comprising:
 - (a) placing a solid, heat-conducting plate having at least one substantially flat surface in proximity to a heating source to receive heat radiated thereby on the surface opposite to said flat surface;
 - (b) placing one surface of the sheet to be dried in substantially continuous contact with said flat surface;
 - (c) supplying heat from said heating means to an air supply; and
 - (d) supplying heat from said air supply to the other surface of said sheet, whereby said sheet receives heat on said one surface substantially solely from said plate and on said other surface substantially solely from said air supply.
3. The method of drying photographic sheet materials according to claim 2 wherein the temperatures of said plate and said air supply are so maintained that said one surface of said sheet becomes heated more rapidly than said other surface.

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