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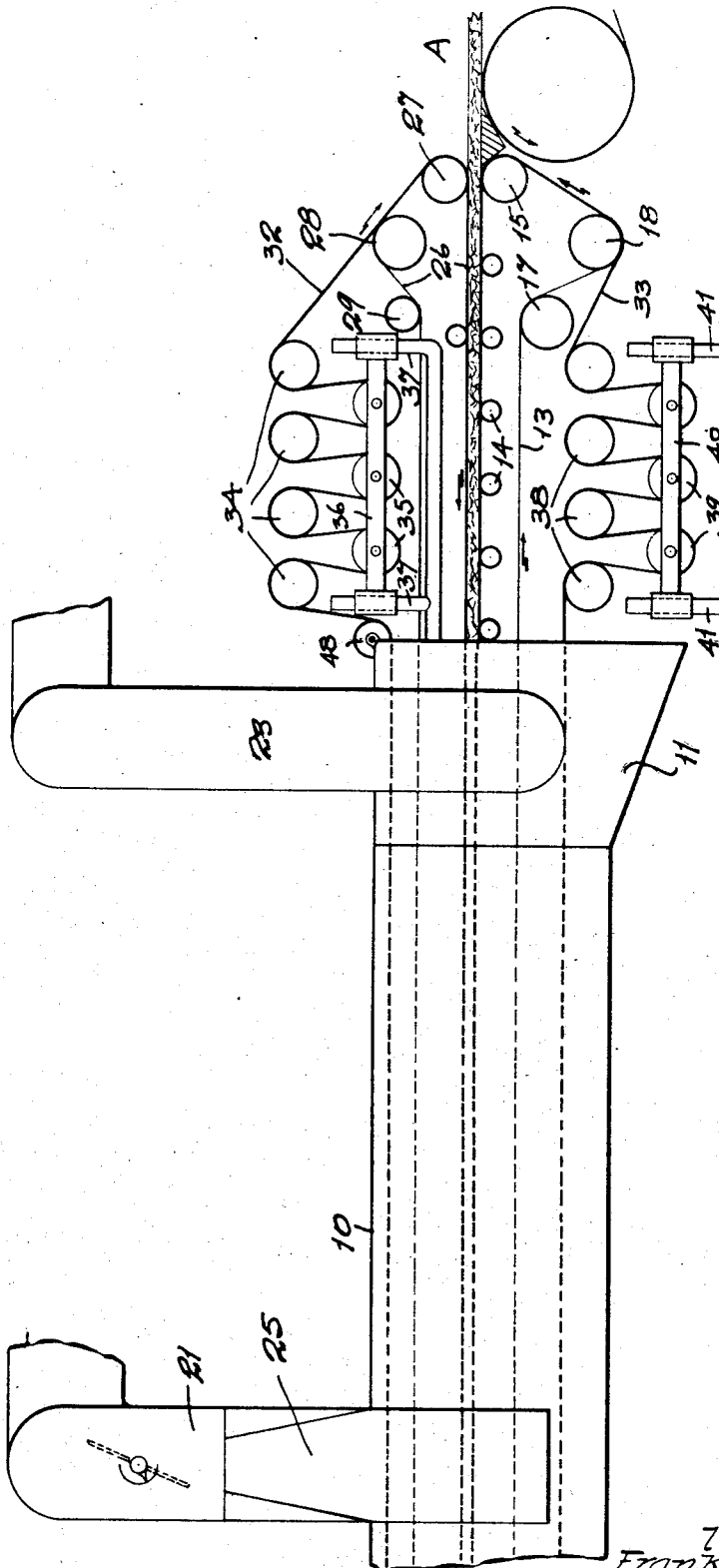
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DRYING APPARATUS FOR LAYERS OF FIBROUS MATERIALS

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3 Sheets-Sheet 1

Fig. 1



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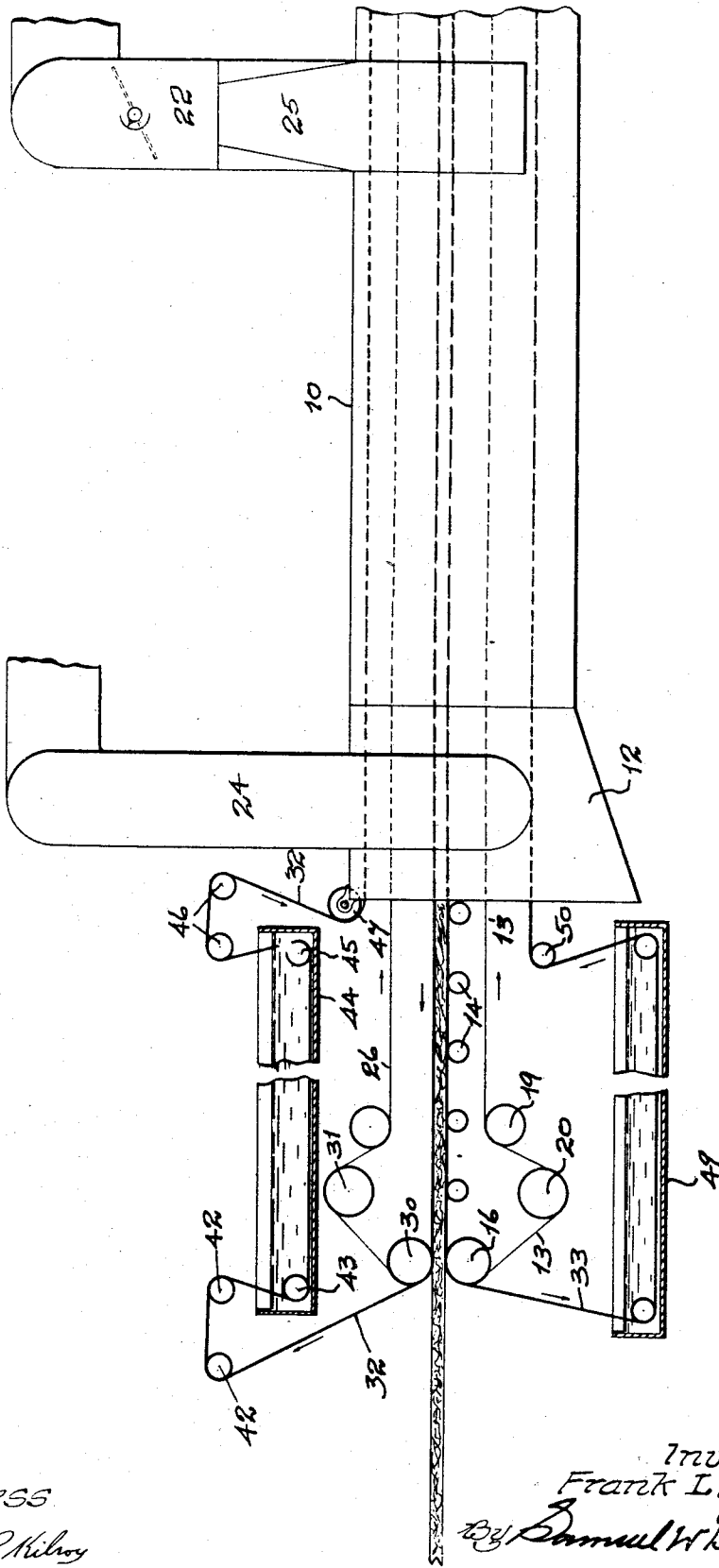
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Fig. 2.



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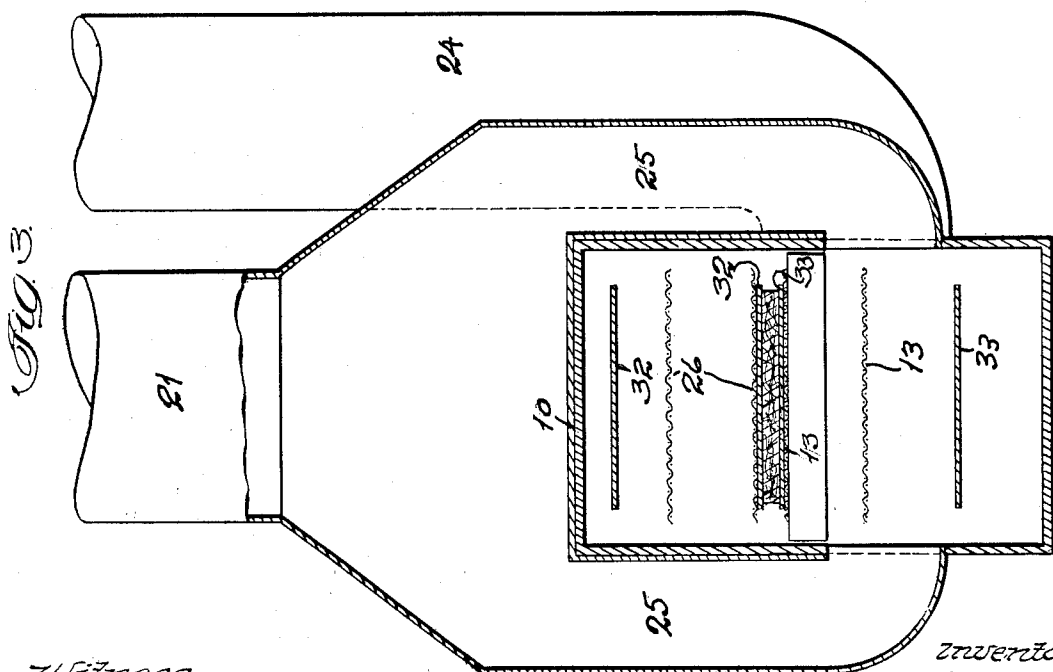
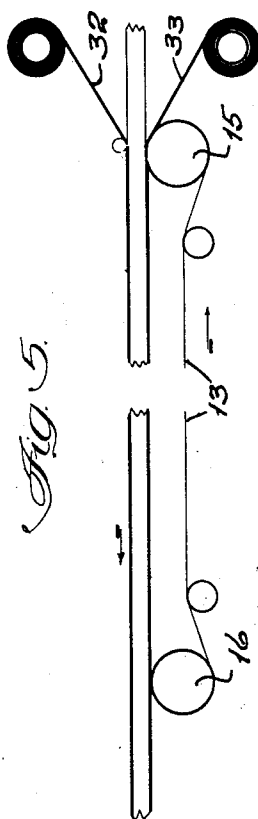
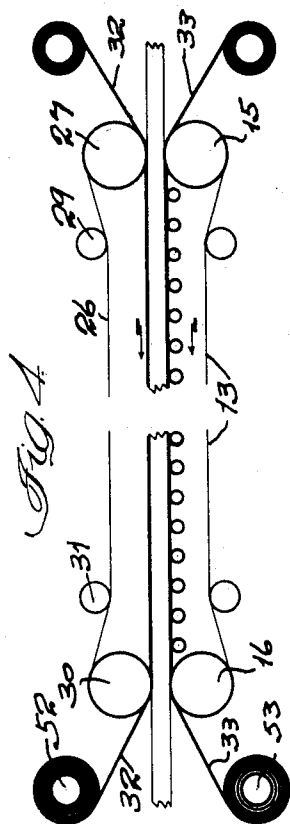
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DRYING APPARATUS FOR LAYERS OF FIBROUS MATERIALS

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3 Sheets-Sheet 3



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1,929,090

DRYING APPARATUS FOR LAYERS OF FIBROUS MATERIALS

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Application May 16, 1930. Serial No. 452,902

8 Claims. (Cl. 34—12)

This invention relates to drying apparatus for layers of fibrous materials.

The apparatus of the present invention is designed primarily for use in the drying of a continuous strip or layer of distended fluffy fibrous material of the character more particularly set forth and described in Patent No. 1,740,280, issued December 17, 1929.

This material is delivered in the form of a continuous strip or layer which may be an inch more or less in thickness, and it is necessary, in the treatment of this material, to carry it in undisturbed condition through a drying room or oven in order to ultimately deliver it in the dry fluffy condition without being compressed or compacted, and also to make provision for the elimination of the moisture and soluble chemicals which are employed to create minute cells or bubbles within the mass in order to give it the distended condition. If these chemicals were permitted to dry upon the surface of the strip or layer they would cause discoloration, and in view of the fact that the material is intended primarily for use for sanitary purposes, it is of utmost importance that provision be made to deliver it in a perfectly clean and unsoiled condition.

The strip of material as it enters the drying chamber contains considerable moisture, and it is necessary to subject it to heat in order to completely remove the moisture without disturbing its distended condition.

The present invention conforms to the above requirements, and the general relation of the present apparatus to the remaining mechanism dealing with the complete method of handling and drying said material is fully set forth in copending application, Serial No. 452,900 filed May 16, 1930.

In the drawings:

Figure 1 is a more or less diagrammatic side elevation of the forward portion of the drying chamber of the present invention;

Fig. 2 is an extension of Fig. 1, and shows the rear portion thereof;

Fig. 3 is a cross sectional elevation; and

Figs. 4 and 5 are diagrammatic views showing modifications in the arrangement of the mechanism for feeding the protective absorbent strips intended to preserve the surface of the material against staining.

Referring to Figures 1 and 2, the drying chamber 10 is of elongated boxlike formation, which terminates at its forward end in a flaring mouth

11, and at its rear end in a similar flaring mouth 12.

The material to be dried is fed rearwardly upon a continuous carrier 13, which is preferably of a wire mesh or other foraminous material, the upper turn of which rests upon supporting idle rollers 14 which extend throughout the length of the drying chamber and furnish a support for the carrier and hold it against sagging.

The endless carrier 13 passes around a forward roller 15 and a rear roller 16, the latter of which is power driven by any suitable mechanism, and the lower turn of the carrier passes over a forward guide roller 17 and under a guide roller 18, which arrangement is duplicated at the rear end in the guide rollers 19 and 20.

Heat is supplied through ducts 21 and 22, which discharge heated air to the interior of the drier, and return ducts 23 and 24 are provided which communicate with suitable fan mechanism, not shown, for creating a suction of hot air through the drier.

As shown in Fig. 3, the ducts 21 and 22 are divided at their lower ends and embrace the drying chamber on opposite sides thereof, and serve to deliver the hot air through branch ducts 25 which open into the drying chamber at or near the level of the carrier.

The principal figures show an arrangement in which the carrier which underlies the layer of material co-operates with an upper endless band or belt 26 which is intended to overlie or rest lightly upon the upper surface of the layer of material, without, however, subjecting it to any appreciable pressure which might tend to crush down or compact the distended fibres.

The endless band or belt 26 passes around a forward roller 27 which lies immediately above the roller 15, and thence over a guide roller 28 and under a guide roller 29, and thence through the drying chamber, as indicated diagrammatically in Fig. 4, and at the rear end the rollers are duplicated in the rollers 30 and 31.

The arrangement shown carries the layer of material between upper and lower bands or belts, and in order to guard against the staining action of chemicals which in evaporating might stain the layer if deposited upon the surface, upper and lower absorbent strips or bands 32 and 33 are provided, which may be variously arranged as indicated in the different figures.

The absorbent strips may be of thin absorbent paper, or may be of fabric, and if fabric is employed it is desirable to provide means for wash-

ing and returning the fabric for further service.

Where the fabric is employed, the arrangement shown in Figs. 1 and 2 is preferred. In this case, the upper and lower bands 32 and 33 take the form of endless strips which are fed respectively under and over the belts with which they co-operate. That is to say, the upper endless absorbent strip 32 passes onto the roller 28, at which point it encounters the endless strip or belt 26, and travels therewith around and under the roller 27 which brings the absorbent strip into contact with the upper surface of the layer of material undergoing drying.

Likewise, the absorbent strip 33 passes under the roller 18, at which point it encounters the carrier band or belt and overlies the surface thereof, so that the strip of material, during its progress through the drying oven, will lie between the upper and lower absorbent strips, so that moisture evaporating from the layer of material, together with chemicals in solution, will pass outwardly from the upper and lower surfaces of the layer of material and into the contacting absorbent strips which will thus act to carry moisture and chemicals to the surfaces of the absorbent strips, so that the ultimate evaporation thereof will not stain the surfaces of the material under drying treatment.

Where endless strips of absorbent fabric or the like are used for absorbent purposes, it will be necessary to provide tensioning means to take up any slack which may be developed in the strips or bands, and for this purpose a group of fixed rollers 34 are provided which co-operate with adjustable rollers 35 carried by a tension bar 36 which is adjustably mounted upon uprights 37, so that, by shifting the tension bar 36, the rollers 35 can be adjusted as a group to increase or diminish the lengths of the turns taken in the endless strip, thereby regulating the tension and serving to take up any slack which may develop.

A similar arrangement is provided for the lower absorbent strip 33, which passes over fixed rollers 38 which co-operate with adjustable rollers 39 carried by a tension bar 40 adjustably mounted upon uprights 41 similar in all respects to those first described.

At the rear or delivery end of the drying chamber, the upper absorbent strip 32 passes under the roller 30 and is carried upwardly around a pair of rollers 42, and thence downwardly and under a roller 43 located in a bath tank 44 in which is a cleansing solution adapted to wash out the endless strip before it re-enters and passes through the drying chamber. The strip 32 passes under a roller 45, and thence out of the tank and over rollers 46, and finally under a roller 47, from which it runs forwardly into and through the drying chamber and under a similar roller 48 at its point of emergence from the forward end of the drying chamber.

This completes the circuit and delivers the absorbent strip in cleansed and dried condition to again subserve its absorbent function in contact with the layer of material entering the drying chamber.

The lower absorbent strip 33 is similarly conducted through a lower tank 49, from which it emerges and passes around a roller 50, and thence forwardly through the drying chamber, until it encounters the first of the group of rollers 38.

In cases where it is not deemed desirable to use endless absorbent bands or strips of fabric or the like, the strips 32 and 33 may assume the character shown in Fig. 4, in which case they are

respectively wound up on spools or rollers 52 and 53, and after use may be replaced by other strips, and thereafter cleaned and dried in any suitable way.

Fig. 5 shows an arrangement in which the upper belt or band 26 is dispensed with, and in this case the absorbent strips may, if desired, be of paper which after use may be destroyed. In some cases, however, it may be desirable to surface the layer of fibrous material with a sheath or surface of paper, in which case a certain amount of adhesive liquid may be employed in the composition and the paper strips 32 and 33 permanently adhered thereto and delivered therewith.

Various other modifications in the arrangement may suggest themselves, but where the material is employed for sanitary purposes, it is in all cases desirable to protect the surface against the staining action of the chemicals employed in the composition of materials.

In use, as illustrated in Figs. 1 and 2, the layer of material A is fed continuously onto the endless carrier 13, which furnishes the support required for maintaining the layer in a level undisturbed condition during its course of travel through the drier. The layer of material, instead of lying directly upon the carrier, rests upon the lower absorbent strip 33, which in Fig. 1 will be preferably of fabric, and will present itself in dried condition at the intake end of the apparatus.

The upper endless belt or band 26 affords a backing for the upper absorbent strip 32, which is held firmly but lightly against the surface of the distended fibrous layer of material A, so that on both sides of the layer a contact will be maintained sufficient to permit the moisture containing the solvent chemicals to absorb into and through the absorbent strips, thereby guarding the surface of the layer of material against staining.

The layer of material will be fed slowly and evenly and in undisturbed and non-compressed condition through the drier, and during this interval the moisture will be completely extracted and the chemicals absorbed into the absorbent strips, so that the layer of fibrous distended material will be delivered at the far end of the apparatus in a dry, clean, coherent condition, uncompressed or uncompacted to any substantial degree, at which point the layer of material may be cut into lengths for subsequent use. Thereafter, the upper and lower absorbent strips will pass through the respective cleaning baths and be delivered therefrom into the rear end of the drier and fed forwardly at a suitable speed to permit the strips of fabric to become thoroughly dry before they again encounter the layer of fibrous material.

The apparatus of the invention is one which is peculiarly adapted to the requirements of the material forming the subject matter of Patent No. 1,740,280, and is designed to thoroughly dry such material in a continuous manner, but it is not the intention to limit the invention strictly to use in the treatment of such material, since it might be employed in the drying of layers of other material in which it is necessary to feed the material forward in a continuous layer without subjecting it to substantial pressure or disturbance.

I claim:

1. In drying apparatus of the character described, the combination of an elongated drying chamber, an endless carrier extending there-

through, and means for mounting and feeding said carrier from end to end thereof in the drying of a layer of light, uncompacted fibrous material, and means associated with said carrier and movable conformably therewith, and adapted to feed a strip of absorbent material in contact with the layer of fibrous material to prevent discoloration of the latter, said means including a bath tank through which the strip of absorbent material is carried to cleanse the same.

2. In drying apparatus of the character described, the combination of an elongated drying chamber, an endless carrier extending there-through, and means for mounting and feeding said carrier from end to end thereof in the drying of a layer of light, uncompacted fibrous material, and upper and lower roller means associated with the carrier and movable conformably therewith, and adapted to feed upper and lower endless strips of absorbent material in contact with the fibrous layer of material supported upon the carrier to absorb moisture from the surfaces of said layer.

3. In drying apparatus of the character described, the combination of an elongated drying chamber, an endless carrier extending there-through, and means for mounting and feeding said carrier from end to end thereof in the drying of a layer of light, uncompacted fibrous material, and upper and lower roller means associated with the carrier and movable conformably therewith, and adapted to feed upper and lower endless strips of absorbent material in contact with the fibrous layer of material supported upon the carrier to absorb moisture from the surfaces of said layer, said roller means being associated in each instance with a cleansing tank into which the endless absorbent strip is emersed for cleansing, and thereafter returned by said roller means through the drying chamber for drying in preparation for renewed contact with the fibrous material.

4. In drying apparatus of the character described, the combination of an elongated drying chamber, an endless carrier, and means for supporting and feeding said endless carrier from end to end through said drying chamber in the drying of a layer of light uncompacted fibrous material, an upper endless band, and roller mountings therefor adapted to present the lower turn of said endless band in parallel spaced relation to the endless carrier, upper and lower endless absorbent strips adapted respectively to overlie the endless carrier and underlie the endless upper band, and to move respectively therewith in contact with the lower and upper surfaces of the layer of fibrous material to absorb moisture from the surfaces thereof, upper and lower bath tanks, and roller means for directing the endless absorbent strips through said bath tanks for cleansing said strips and returning them through the drying chamber and in position to recontact with the fibrous layer entering the drying chamber.

5. In drying apparatus of the character described, the combination of an elongated drying chamber, an endless carrier and means for supporting and feeding said endless carrier from end to end through said drying chamber, in the drying of a layer of light, uncompacted fibrous material, an upper endless band and roller mountings therefor adapted to present the lower turn

of said endless band in parallel spaced relation to the endless carrier, upper and lower endless absorbent strips adapted respectively to overlie the endless carrier and underlie the endless upper band and to move respectively therewith in contact with the lower and upper surfaces of the layer of fibrous material to absorb moisture from the surfaces thereof, upper and lower bath tanks and roller means for directing the endless absorbent strips through said bath tanks for cleansing said strips and returning them through the drying chamber and in position to recontact with the fibrous layer entering the drying chamber, and means for tensioning said upper and lower absorbent strips.

6. The method of drying a moist continuously advancing layer of uncompacted fibrous material containing in the moisture of the layer chemical ingredients tending to cause surface discoloration, which consists in covering and lightly contacting the surface of the layer with a continuously advancing light thin strip of absorbent material adapted to permit the moisture from the layer to be withdrawn by evaporation through the strip and without retention therein and to afford a surface for the deposition thereon of ingredients tending to cause surface discoloration of the layer, and in feeding the strip and layer in a non-compressive and non-disturbing manner through a heated zone to cause evaporation of the moisture through the strip and deposition of the discoloring ingredients on the surface thereof, to prevent deposition of the discoloring ingredients on the surface of the layer by the removal of the moisture therefrom.

7. The method of drying a moist layer of uncompacted fibrous material containing in the moisture of the layer chemical ingredients tending to cause surface discoloration, which consists in covering and lightly contacting the surface of the layer with a light thin strip of absorbent material adapted to permit the moisture from the layer to be withdrawn by evaporation through the strip and without retention therein and to afford a surface for the deposition thereon of ingredients tending to cause discoloration of the layer, and in subjecting the strip and layer in a non-compressive and non-disturbing manner to heat to cause evaporation of the moisture through the strip and deposition of the discoloring ingredients on the surface thereof, to prevent deposition of the discoloring ingredients on the surface of the layer by the removal of the moisture therefrom.

8. The method of drying a moist layer of uncompacted fibrous material containing in the moisture of the layer chemical ingredients tending to cause surface discoloration, which consists in covering and lightly contacting the surface of the layer with a light thin strip of absorbent material adapted to permit the moisture from the layer to be withdrawn by evaporation through the strip and without retention therein and to afford a surface for the deposition thereon of ingredients tending to cause surface discoloration of the layer, and in causing evaporation of the moisture through the strip and deposition of the discoloring ingredients on the surface thereof, to prevent deposition of the discoloring ingredients on the surface of the layer by the removal of the moisture therefrom.

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