Sept. 15, 1964 H. FLEISSNER 3,149,004

APPARATUS FOR TREATING TEXTILE MATERIALS

Filed Dec. 7, 1960

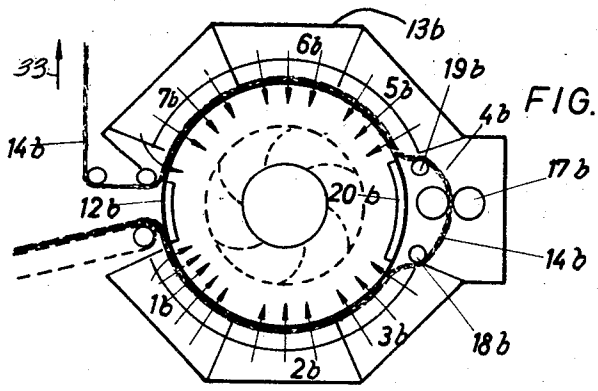


FIG. 1

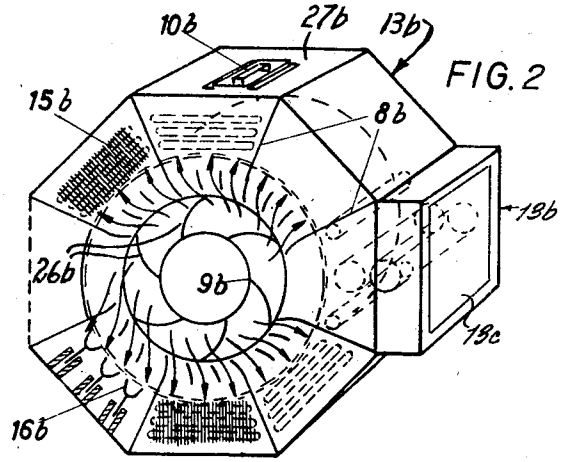


FIG. 2

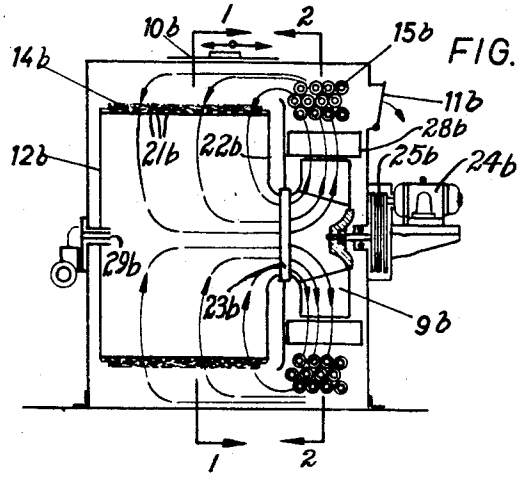


FIG. 3

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United States Patent Office 3,149,004 Patented Sept. 15, 1964

3,149,004

APPARATUS FOR TREATING TEXTILE MATERIALS

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Filed Dec. 7, 1960, Ser. No. 74,336
Claims priority, application Germany Dec. 22, 1959
7 Claims. (Cl. 118—65)

This invention relates in general to apparatus for treating textile materials and in particular to a new and useful apparatus for treating textile materials within one or more closed housings for effecting a change in the structural and surface appearance of the material the apparatus including means for coating and spraying the materials with synthetic resins and calendering the material as desired to obtain the desired texture.

The invention has particular application for treating textile webs with synthetic resins and similar treatment fluids to produce crease resistant materials, air permeable carrier webs such as fleeces, fabrics, knitted goods, paper webs from cotton and celluose, fully synthetic fibers, etc., which may be suitable for example, for cloths, shoulder paddings, tent canvas, artificial leather, all kinds of decorative material such as curtains, upholstery, etc., and materials for soling shoes and the like. The invention is also concerned with the treating of webs of the kind referred to above in a manner to obtain permanent glazing or calendering of such webs.

The invention is concerned with the "treating or equipping" of the materials of the types set forth above and in this connection these terms are used in connection with any one of the following procedures:

(1) The obtaining of a silk-like finish by treating webs with glazing rollers or calenders which are grooved or have a surface pattern.

(2) The production of chintz by friction calender treatment.

(3) The special embossing or imprinting on textile webs that includes both fine imprinting and deep imprinting or embossing.

Prior to the present invention several distinct devices were employed for separately conducting the various stages of treatment of the material and the apparatus thus employed was necessarily expensive and required a large amount of floor space for its disposition. In addition treatment was complicated and in some instances required repetition of stages such as reheating, etc., in order to insure that the finished product was of high quality. The present invention is an improvement over prior art constructions particularly in the provision of apparatus for conducting the treatment of the textile materials in a single arangement or device or a combination thereof.

In accordance with the invention there is provided a perforated drum or sieve drum which is arranged to rotate within a housing which is divided into a plurality of zones between the exterior of the drum and the interior wall of the housing. The construction includes a fan disposed at the open end of the drum and arranged to withdraw air through the perforations of the drum and direct or recirculate this fluid through one or more of the zones surrounding the drum. In accordance with the arrangement it is possible to coat the material which is to be treated within the zone as it is directed into the housing and to carry out one or more successive stages of treatment on the material held to the perforated drum by the interior suction thereon. The zones in the housing may be provided with means for spraying materials such as resins onto the textile material being treated on the drum and fluid such as air is circulated over the material

and through the perforations of the drum to effect uniform distribution of the treatment fluids. In addition the zones may include heaters or other treatment apparatus to successively operate on the fabrics held to the drum by the suction therein as the material and the drum is rotated around through the housing.

In accordance with one arrangement of the invention there is included means for conducting a coated web into the housing divided into zones and for transporting this web around on a rotating sieve drum and the material being held thereon by a suction created on the interior of the sieve drum and acting through perforations thereon as the drum rotates through zones in the housing to effect successive stages of drying and hardening or curing of the coated web and thereafter cooling. The invention includes means for changing the speed of advance of the web through the housing and the various treatment zones and for rapidly and easily changing the temperatures of the treatment fluids which are circulated over the material and through the perforations of the drum. The hardening or curing of the web may be accelerated by the use of high frequency heaters. In some instances guide roller feeding means are provided which are heated in order to preheat the web before it is directed into the housing for further treatment.

For example, if it is desired to obtain a predetermined permanent calender effect on the web when it is successively treated as it is transported through the sieve drum in the various zones with a solution of synthetic resin in one of the zones, whereafter it is dried, subjected to calendering or glazing and thereafter the web is further treated by drying or cooling as desired in the remaining zones in the housing. The actual calendering procedure is carried out within the housing at the location of one of the zones at a residual moisture or humidity of about 8 to 20%.

Accordingly it is an object of this invention to provide improved apparatus for treating textile materials.

A further object of the invention is to provide an apparatus for transporting textile materials on a perforated surface through a plurality of zones and for circulating treatment fluid through the textile materials as it is advanced through the zones.

A further object of the invention is to provide a device for treating textile materials by transporting the materials on a perforated surface through a plurality of zones and including in particular means for directing a coating of material onto the web as it is being transported, for spraying resinous material onto the web and for calendering the web.

A further object of the invention is to provide a textile material treatment device which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a transverse section taken on the line 1—1 of FIG. 3 of a device for treating web material constructed in accordance with the invention;

FIG. 2 is a perspective view taken in the vicinity of the line 2—2 of FIG. 3 of the device indicated in FIG. 1; and

FIG. 3 is a longitudinal sectional view of the device shown in FIGS. 1 and 2.

Referring to the drawings in particular the invention embodied therein includes means for conducting a web,

fleece or mat of material 14*b* into a housing generally designated 13*b*.

In accordance with the invention a perforated or sieve drum generally designated 12*b* is rotatably mounted on bearings 29*b* and has a peripheral wall with a multiplicity of perforations 21*b*. One end 22*b* is provided with a central opening 23*b* which is disposed at the inlet of a fan generally designated 9*b*.

The fan 9*b* is rotated by a motor 24*b* driving through belts and pulleys 25*b*. The fan 9*b* includes a central inlet and blades 26*b* arranged to take fluid in centrally and discharge it radially into one or more zones 1*b* to 7*b*. The zones 1*b* to 7*b* are defined by plates 8*b* disposed around the inner periphery of the housing 13*b* between the exterior periphery of the drum 12*b* and the interior wall thereof.

In the embodiments indicated in FIGS. 1 to 3 zone 1*b* is a spraying zone in which treating fluid is directed into the zone through nozzles 16*b*. In zones 2*b* and 3*b* means, such as heaters 15*b*, are disposed to dry the fluid circulating through the interior of the drum through the perforations 21*b* and through the textile material and which is sucked by the fan 9*b*.

Zones 5*b* through 7*b* indicate condensation zones, suitable means such as heaters 15*b* being defined therein to effect condensation as desired.

In the type of treatment set forth in FIGS. 1 to 3 the nozzles 16*b* are advantageously provided with means for directing synthetic resin either into the fluid flow current or directly against the web. For this purpose the nozzles 16*b* are adjustably mounted so that they may be moved toward or away from the web as desired. In the condensation zone, heat exchangers 15*b* may be provided which consist of high frequency heaters in order to effect the desired condensation.

An adjustable air inlet register 10*b* is provided on a side wall 27*b* and an adjustable exit or discharge register 11*b* is provided on an end wall 28*b*. The air discharge register 11*b* and the air inlet register 10*b* may be adjusted between a fully opened or a fully closed position if desired. In the fully closed position of course the treatment fluid is constantly recirculated. In the arrangement described the material 14*b* advances over guide rollers and onto the drum 12*b* which rotates counter clockwise as viewed in FIG. 1 to transport the material thereon through the successive zones and out through an outlet opening over guide rollers.

It should be appreciated that the basic arrangement indicated in FIGS. 1 to 3 may be modified to provide for various types of circulating fluid flow either in the direction of advance of the web or counter to the direction of advance of the web as desired. Various wash baths, dressings or finishes may be applied in one or more zones and if desired a plurality of housings 13*b* may be arranged side-by-side for successive stages of treatment.

In this embodiment, zone 4*b* is a calendering zone and this is advantageously located on one side of the device. For this purpose the housing is elongated laterally to accommodate a pair of cooperative rotatable calender rollers which include heating elements therein for the purposes of effecting proper calendering. The rollers are enclosed by an extension portion of the housing 13*b*.

In some instances the zones may be extended to the next adajcent zone, for example, the drying zone may be restricted to zone 2*b* and the zone 3*b* may be arranged as a cooling zone. Any such arrangement, of course, is within the scope of the invention.

In the spraying zone 1*b* there are provided the spraying devices 16*b* which advantageously spray or inject a resin solution either into the air current or directly onto the textile web 14*b*. Heat exchangers 15*b* are arranged in all the zones in the path of the air circulation which directly or indirectly act on the textile web 14*b* as it moves through the various drying or condensation zones.

In order to insure that the web material is advanced between the calender rollers 17*b* there are provided guide rollers 18*b* and 19*b* for the web. A cover plate 13*c* is provided in the extension of the housing at the location of the zone 4*b*. This cover plate is provided for access to the interior of the zone for adjusting the calender rollers 17*b* if desired. A second cover plate 20*b* is provided within and extending circumferentially of drum 12*b* through the arcuate extent of calender zone 4*b*, as no suction through the drum and the work material is needed at the calendering zone 4*b*.

The present invention has particular application where the drums are made very large such as one and one-half meters in diameter. The arrangement is easily adaptable for both single drum and multiple drum driers or treatment arrangements. In the event that a series of drums is used then the calender rollers 17*b* are preferably arranged between the two drums in a series. In such an instance spraying and drying and cooling are carried out on the first sieve drum. In the embodiment illustrated the web is transported in the direction indicated by the arrow 33 but of course it may be advanced through the housing 13*b* in an opposite direction if desired.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A device for treating permeable materials, comprising a rotatable, perforated drum having a substantially uninterrupted interior and closed at one end and having an opening at its opposite end, a casing surrounding said drum and having a regular polygonal periphery the sides of which are tangent to a circle which is concentric with the axis of rotation of said drum but which has a diameter substantially greater than that of said drum, partitions extending radially from the intersections of the sides of said regular polygon toward the exterior surface of said drum and terminating at a distance from the periphery of said drum only sufficient to permit passage of material on said drum beneath the inner ends of said partitions, said partitions defining a plurality of treatment zones in said casing between the interior surface thereof and the periphery of said drum, one of said zones being a calendering zone having calendering rollers therein for passage of the material in contact with the calendering rollers to calender the material, the entire interior of said drum being constantly in communication with all of said zones, except said calendering zone, through the perforated periphery of said drum, a cover plate disposed within said drum adjacent the inner periphery thereof at said calendering zone and having an arcuate extent substantially equal to that of said calendering zone to inhibit communication between the interior of said drum and said calendering zone, and draft means having an inlet communicating with the opening in said opposite end of said drum for drawing fluid from said zones through the materials on said drum and through the perforations of the drum, for maintaining the materials against the outer surface of the drum solely by suction, and for discharging said fluid into at least one of said zones.

2. A device for treating textile materials according to claim 1, including at least one zone having means for heating the fluid directed onto said textile material.

3. A textile material treatment device according to claim 1, including vent means for admitting makeup fluid to at least one of said zones.

4. A textile teratment device according to claim 1, including guide rollers in the zone containing said calender rollers and respeceively disposed in advance of and be-

hind said calender rollers in the direction of movement of the material thereover to lift the material from the drum surface in said calendering zone.

5. A textile treatment device according to claim 1, in which the zone immediately in advance of said calendering zone, in the direction of travel of the material, has cooling means therein.

6. A textile treatment device, according to claim 1, in which said casing, at said calendering zone, has four walls extending from the edges of the side of the polygon to define a substantially rectangular compartment forming an extension of said calendering zone; at least one of said calendering rollers being located in said extension.

7. A textile treatment device, according to claim 6, including a removable cover plate closing the outer end of said compartment extension for access to said calendering zone.

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