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W. T. RUNALS

2,339,557

DRYING APPARATUS

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Fig. 1.

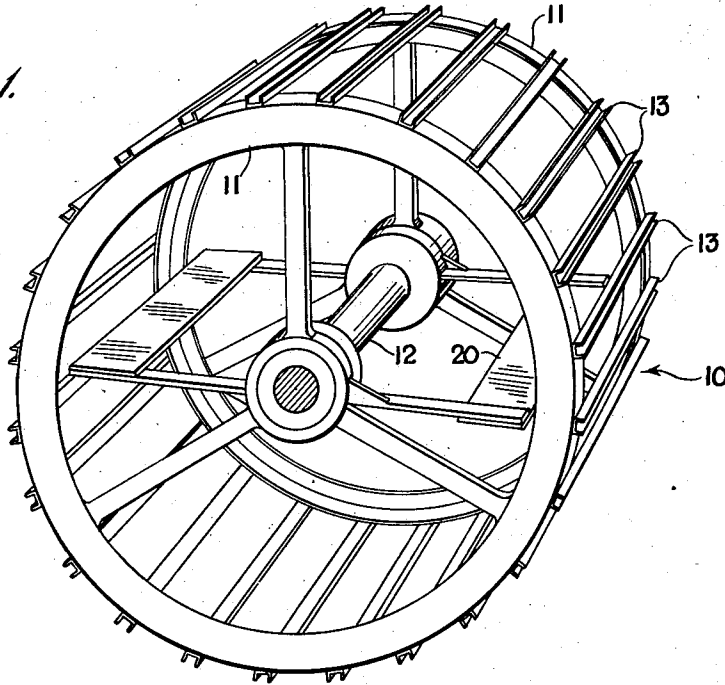


Fig. 2.

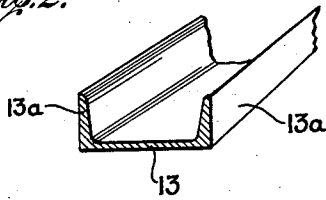


Fig. 3.

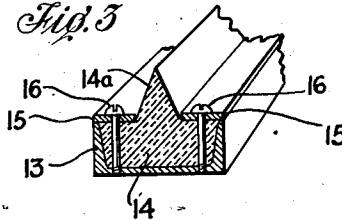
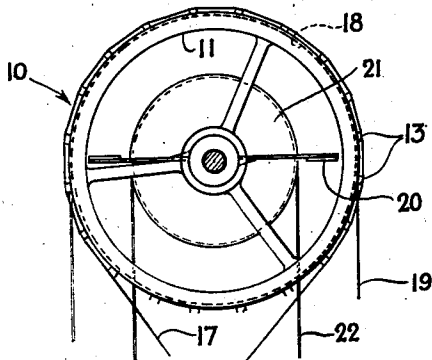


Fig. 4.



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DRYING APPARATUS

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6 Claims. (Cl. 34-115)

This invention relates to drying apparatus, and more especially it relates to apparatus for drying a moving continuous web of material.

This application is a continuation-in-part of application Ser. No. 194,348, filed March 7, 1938.

The apparatus is of primary utility in the paper, textile and rubber industries for drying paper, fabric, webbing and the like, that has been impregnated or compounded with resinous materials, natural or artificial aqueous dispersions of rubber such as latex, or other impregnating, coating, compounding, or treating materials which have a tendency to adhere to drying rolls or drums. The invention is of special utility in the impregnation of tire building fabric preparatory to the application of a skim coating of rubber to the fabric by the use of a calendering operation, or in the impregnation and coating of tire building fabric with latex or other rubber or resinous compounds, eliminating the calendering operation.

A primary object of the invention is to provide improved apparatus for drying a continuous web of material.

Another object is to provide drying apparatus having web-supporting means adapted to prevent fouling or marking the web.

Another object is to provide improved web-supporting means for use in a drying apparatus.

A further object is to provide apparatus capable of efficiently drying latex-impregnated tire fabric without marking or otherwise disturbing the deposit on the fabric.

The above and further objects will be manifest in the description of the invention and in the accompanying drawing, in which:

Figure 1 is a diminished view in perspective of an embodiment of the invention;

Figure 2 is a fragmentary transverse sectional perspective view of web-engaging means shown in Figure 1;

Figure 3 is a similar view of modified web-engaging means; and

Figure 4 is a diminished end view of the embodiment shown in Figure 1, as it appears in operation.

The invention broadly comprises improved means for receiving and/or propelling continuous web material through a drying chamber, with web-contacting means constructed and arranged to prevent fouling or marking the web, or disturbing any material deposited thereon by a previous impregnation of the web. The drying apparatus includes a web-receiving means, such as a drum or other rotatable structure, preferably of open or skeletal construction to facilitate circulation of drying fluid through and around the web of material being dried. In the case of a skeletal drum, preferably, inner air circulating means, such as a rotating vane or paddles, is provided to circulate the drying fluid in the interior of the

drum. The rotatable web-receiving structure is provided with a plurality of web-supporting means on the peripheral surface thereof, said means being constructed and arranged to make substantially line contact with the web. An embodiment of the invention is a web-receiving means comprising a plurality of web supporting bars of U-shaped transverse cross section. A modification of the invention is a web supporting bar or strip of water resistant material having low heat conductivity.

Referring to the drawings, a web drying drum 10 comprises a pair of axially spaced annular members 11, 11 journaled on, and for rotation around, a shaft 12. A plurality of circumferentially spaced bars 13, 13 are connected to peripheral portions of the annular members 11, 11 to span the space therebetween. Each bar 13 is U-shaped in transverse cross section, and is so connected to said members 11, 11 as to present the open portion of said U outwardly from the axis of the drum.

In the enlarged view of U-shaped bar 13 shown in Figure 2, it is seen that the legs 13a, 13a of the U-shaped bar define a channel. The top edges of the legs 13a, 13a are relatively sharp so as to make substantially line contact with the web of material being dried upon the drum 10. The U-shaped bar or channel bar 13 is of sufficient strength to support a moving web of material being dried, and may be made of any suitable material which is not deleteriously affected by moisture or the heat of the drying atmosphere.

In the specific embodiment of the modified web-supporting means shown in Figure 3, a channel bar 13 is provided with a filler strip 14, which is mounted in the channel formed by the bar 13. The filler strip has a raised portion 14a adapted to make line contact with a web of material supported thereon. The filler strip 14 is held in the channel of bar 13 by suitable strips 15, 15 resting upon the shoulders of filler strip 14 and connected to bar 13 by suitable means such as bolts 16, 16.

The filler strip is composed of a suitable water resistant material having low heat conductivity in order to prevent any appreciable amount of heat from flowing from the drum or strip into or onto the web contacted by the strip. Suitable material for filler strip 14 is "Transite," a cement-asbestos composition, or other water resistant material composed essentially of a fibrous material and a binding material and having a low heat conductivity.

Other materials suitable for use in the filler strip 14 are heat-hardened plastic materials, such as hard rubber compositions and certain phenol-aldehyde resin compositions adapted to withstand the effects of the drying temperatures utilized in and around the drying apparatus.

In addition to the specific embodiment of the web-contacting means shown in Figure 3, the in-

vention contemplates other forms of water resistant web-contacting strips or bars of low heat conductivity. The channel bar 13 may be replaced by any suitable rigid supporting member, and is for the purpose of imparting additional mechanical strength to the insulating web supporting member, and in mounting said member on the drum.

In Figure 4 of the drawing the drum 10 is shown as it appears in operation, carrying a web 17 of material to be dried on the edges of the channel bars 13, 13. Mounted on the outer surface of the back annular member 11 is a pulley 18. The drum 10 is rotated by means of a belt 19 passing around pulley 18 and driven by suitable means (not shown). Mounted within the drum 10 for counter rotation therewith is a vane 20, rigidly attached to the shaft 12. The back end of the shaft 12 is connected to a pulley 21, around which passes a belt 22, driven by suitable means (not shown).

The improved drying drum 10 finds important application in the type of drying apparatus broadly disclosed in said application Ser. No. 194,348, wherein a drum carrying channel bars 13, 13 is suitably placed near the input side of the drying chamber, or near the center thereof. Near the exit end of the drying chamber, there is suitably placed one or more drums carrying web contacting members of low heat conductivity, such as filler strip 14, mounted on supporting members 13.

It has been found that as the web proceeds through the drying chamber and loses moisture content, its temperature progressively increases, and it becomes more sensitive to any heat transferred to it by the web contacting portions of the drums when near the exit side of the drying chamber. Therefore, it has been found particularly advantageous to utilize the novel insulating web supporting members near the exit end of the drying chamber in order to prevent any fouling of the web or marking of any deposit thereon. This invention has been of great value in the rubber industry when applied to drying tire fabric impregnated with a latex composition since such latex composition, and the rubber deposited on the fabric therefrom, is generally quite sensitive to the high temperature of the drums.

Other modifications may be resorted to without departing from the spirit of the invention, which includes all features of patentable novelty residing in the foregoing description and accompanying drawing.

I claim:

1. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular members, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced rigid supporting members connected to peripheral portions of the annular members and to span the space therebetween, and strips of a water resistant material of low heat conductivity, said strips being mounted on said supporting members and having outwardly extending portions adapted for line contact with the web transversely thereof.

2. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular mem-

bers, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced channel bars, and connected open side outwardly to peripheral portions of the annular members and to span the space therebetween, filler strips having low heat conductivity, said strips being mounted within the respective channel bars and having outwardly extending portions adapted for line contact with the web transversely thereof and air circulation means within the drum, said means comprising a vane mounted for counter rotation with respect to the drum.

3. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular members, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced rigid supporting members connected to peripheral portions of the annular members and to span the space therebetween, and strips of a water resistant cement-asbestos composition of low heat conductivity, said strips being mounted on said supporting members and having outwardly extending portions adapted for line contact with the web transversely thereof.

4. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular members, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced rigid supporting members connected to peripheral portions of the annular members and to span the space therebetween, and strips of a material of low heat conductivity, said strips being mounted on said supporting members and having outwardly extending portions adapted for line contact with the web transversely thereof, said material being composed essentially of fibrous material and a binding material.

5. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular members, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced rigid supporting members connected to peripheral portions of the annular members and to span the space therebetween, and strips of a water resistant heat hardened plastic material of low heat conductivity, said strips being mounted on said supporting members and having outwardly extending portions adapted for line contact with the web transversely thereof.

6. In apparatus for drying a continuous moving web of material, a web drying drum adapted to receive and propel the web while simultaneously removing moisture therefrom, said drum comprising a pair of axially spaced annular members, means mounting said members for rotation about a common axis, a plurality of circumferentially spaced rigid supporting members connected to peripheral portions of the annular members and to span the space therebetween, and strips of a water resistant hard rubber composition of low heat conductivity, said strips being mounted on said supporting members and having outwardly extending portions adapted for line contact with the web transversely thereof.

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