May 17, 1927. 1,629,167

H. KRANTZ

MEANS FOR DRYING TEXTILE MATERIALS

Filed March 24, 1922 2 Sheets-Sheet 1

Fig. 1

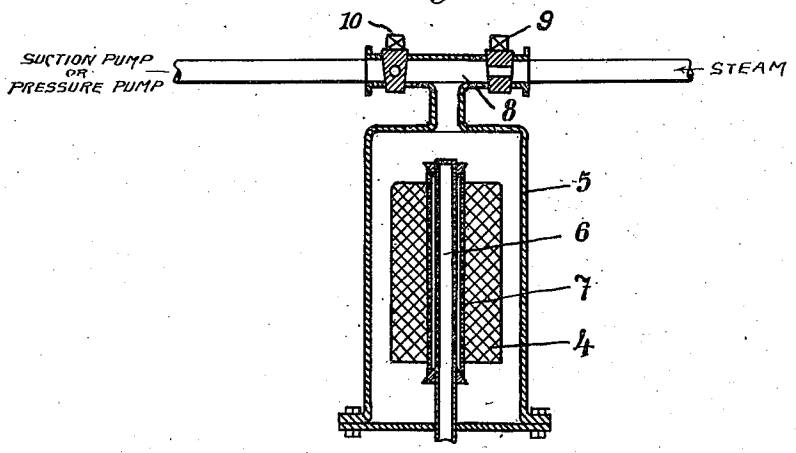


Fig. 2

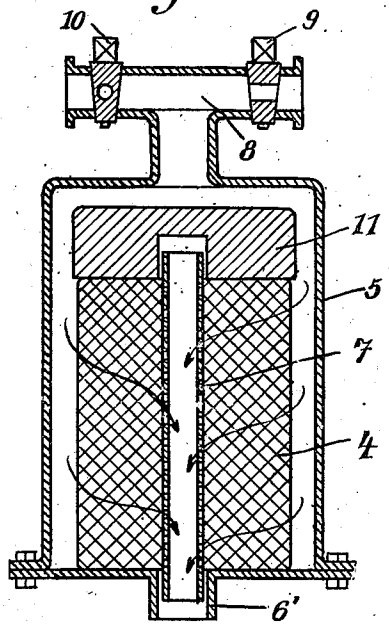
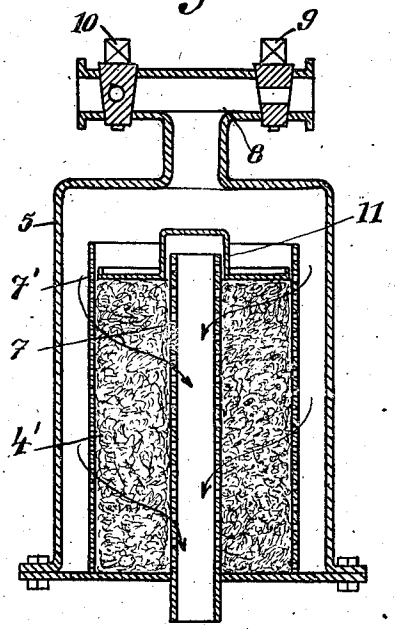


Fig. 3



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Filed March 24, 1922 2 Sheets-Sheet 2

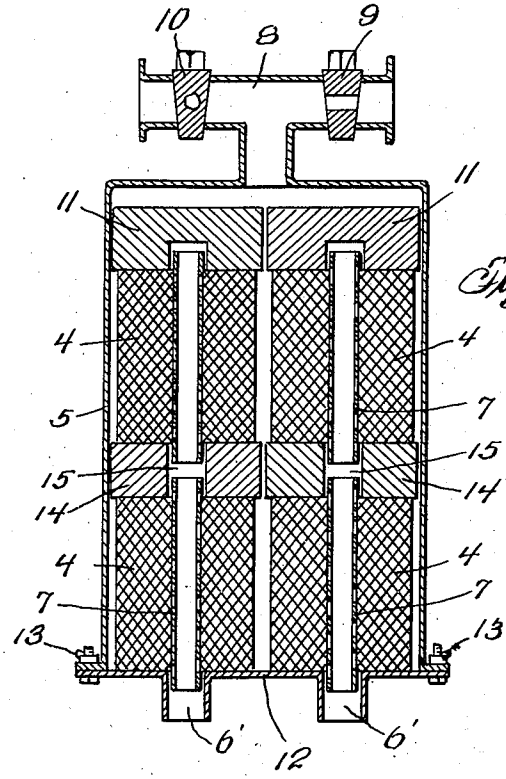

Fig. 4.

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Patented May 17, 1927. 1,629,167

UNITED STATES PATENT OFFICE.

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MEANS FOR DRYING TEXTILE MATERIALS.

Application filed March 24, 1922, Serial No. 546,426, and in Germany January 15, 1917.

This invention relates to a method and an apparatus for drying materials, especially textile materials.

At the present date textile materials are mostly dried with warm air, after part of the water has been removed therefrom mechanically by squeezing, suction (aspiration) or centrifuging. The drying is carried on in machines, e. g. tenting-dryers, and rack machines. These machines are of very large dimensions, require a large space, have high running (reliable workmen), consume much steam for heating the drying air, and a large amount of power for circulating the drying air; are slow in operation, and utilize the heat contained in the dry air in an uneconomical, unfavorable manner. It has already been proposed to dry textile materials directly with steam.

Now, the present invention has for its object to provide a process and apparatus for drying textile materials, by which the afore-mentioned disadvantages are obviated and which process may be applied for drying loose fibrous materials, yarns and fabrics.

In the drawings:

Fig. 1 is a vertical sectional view through a dryer constructed in accordance with this invention.

Fig. 2 is a similar view illustrating a modification in which a squeezing or packing disk is employed,

Fig. 3 is a similar view illustrating the manner of handling loose material, and

Figure 4 is a sectional view illustrating a modification similar to that seen in Fig. 2, but adapted for the drying of a plurality of superimposed bobbins.

According to the invention, the water contained in the textile material is partly expelled mechanically by means of steam passed through the same, the rest of the water being removed by means of heat and air, which air is blown or sucked through the material to be dried. The rest of the water can also be removed by subjecting the material to a vacuum.

In drying materials steam is first sent through the same from the inside towards the outside or vice versa. The flowing steam expels part of the water mechanically from the material. When the flow of the steam is arrested after the mechanical expulsion of the water, the material is nearly dry; but even in such event the degree of drying attained is greater than that obtained by squeezing, suction or centrifuging. The water remaining in the material can now be expelled in a favorable manner and with high rapidity by utilizing the heat accumulated in the material from the steam treatment and in the water remaining therein, by subjecting the material to a vacuum or by blowing or aspirating air or heated air through the material.

The advantages connected with the invention are economy in installation, running cost, space, steam power and time. The energy in the steam is utilized directly for driving out the water from the dripping wet material. This expulsion is quicker and cheaper than squeezing out the water, and dispenses with the squeezing apparatus, centrifuging and aspirating machines which would otherwise be required. The steam which has been used for removing the water occupies the channels between the fibres of the material which were previously filled with water, and opens them. By this means the material to be dried becomes extremely pervious to air. This permeability to air is so considerable that it is possible for example to blow large amounts of air through tightly wound quick-traverse bobbins by means of a weak low-pressure blower, i. e., without any appreciable expenditure of power. The heat of the expelling steam heats the material to the temperature of the drying air. The steam remaining in the material is condensed by the drying air, and its heat is utilized for the drying. The water removed and heated by the steam can be used again in the method.

In order to prevent any steam escaping unused it is advisable to use only so much steam as is required to bring the material into a condition specially suitable for the subsequent final drying by heated air, that is to say to remove a sufficient amount of water, heat the material to the temperature of the drying air and make it sufficiently pervious to air that large quantities of air can be blown through the direction of its largest diameter without any considerable expenditure of power.

The method described may be carried out by the aid of various devices, some preferred embodiments of which are diagrammatically illustrated, by way of example, in Figs. 1 to 3 of the accompanying drawing.

Fig. 1 shows the application of the new

method for drying a quick-traverse bobbin 4 or any other coil of fibre. The apparatus comprises a closable vessel 5 in the bottom of which is mounted a perforated spindle 6 upon which is slipped the quick-traverse bobbin 4, wound upon a perforated shell 7. The interior of the perforated spindle 6 is in communication with the outer atmosphere. Connected to the upper end of the vessel 5 is a T-shaped pipe 8, the branches of which have mounted therein controllable valves 9 and 10. The vessel 5 is connected by the valve 9 to a steam pipe (not shown) and by the valve 10 to an air pump. In the position according to Fig. 1, the valve 9 is open, while the valve 10 is closed. Therefore steam will flow through the quick-traverse bobbin 4 from the outside of same and into the spindle 6, from which the steam will escape into the atmosphere. Instead of letting the steam escape into the atmosphere, it may be collected and reheated for using it again in the process or condensed and used for any other purposes. The steam flowing through the bobbin 4 will mechanically expel therefrom part of the water contained in the same. After this has been done, the position of the valves 9 and 10 is reversed and the aforementioned air-pump operated, so that air is drawn through the open end of the spindle 6 from inside the quick-traverse bobbin towards the outside. By utilizing thus the heat accumulated in the quick-traverse bobbin 4 from the steam treatment, the final traces of water are removed from the bobbin. Instead of connecting the valve 10 to an air pump, it may also be connected with a low-pressure blower by means of which heated air is passed through the quick-traverse bobbin from the outside towards the inside after the steam treatment.

In the devices according to Figs. 2 and 3, which are similar to that shown in Fig. 1, packing discs 11 are used for the purpose of intensifying the expulsion of the water by means of steam, especially in quick-traverse bobbins, laps and loose material. The effect of these packing discs is to cause the material to be compressed on all sides by the expulsion steam, and thereby squeezed out like a wet sponge held in the hand and gripped on all sides.

Fig. 2 shows a device in which a quick-traverse bobbin 4 can be advantageously dried with the use of packing discs. The interior of the closable chamber 5 can be placed in communication with a steam pipe by the valve 9, or in communication with a pressure air pipe by the valve 10. The interior of said chamber 5 is connected to the outer atmosphere through the opening 6′ provided at the bottom of the chamber. The quick-traverse bobbin 4 to be dried is so placed on the bottom of the chamber 5 that the protruding end of the perforated shell 7 can be inserted into the opening 6′. Upon the upper end of the quick-traverse bobbin, a packing disc 11 is laid which is provided in the middle with a recess for taking up the protruding end of the shell 7 of the bobbin. The valves being in the position shown, steam passes from the outside towards the inside through the quick-traverse bobbins and into the air. The mechanical expulsion of the water by the inflowing steam is accompanied by a squeezing of the coiled yarn. In the reversed position of the valves cold or warm air is forced from the outside towards the inside through the quick-traverse bobbin, and thereby the heat accumulated therein is utilized. Instead of pressure air, suction air may be used.

Fig. 3 shows the same device in an application for drying loose material. Fastened to the bottom of the closed chamber 5, are a perforated spindle 7, the interior of which is in communication with the outer air, and a perforated cylinder 7′. The loose material 4′ to be dried is packed into the space between the spindle 7 and the cylinder walls 7′, and the packing disc 11 is placed thereon. With the valves in the position shown, steam enters from the outside towards the inside through the loose material and the same procedure is effected as has been described with reference to the quick-traverse bobbins of Fig. 2.

In order that the vessels 5 may be openable so that the material to be dried may be readily inserted and removed, the drawings illustrate the bottom walls 12 of the vessels to be held to the side walls by bolts or other devices 13 which may be removed whenever it is desired to detach the walls 12 for emptying or refilling the vessels.

Figure 4 shows a device for the drying of quick-traverse bobbins, the same being in all respects similar to that shown and described with reference to Fig. 2 except that in the present figure the device is adapted for the drying of a large number of the quick-traverse bobbins, said figure illustrating not only how these bobbins may be placed side by side within the chamber, but also how they may be superimposed one upon the other within the chamber. In superimposing the bobbins suitable spacing discs 14 are employed interposed between the bobbins and each having central openings 15 into which the protruding ends of the central shells 7 extend, the thickness of said discs being sufficient so that the protruding shell ends of the bobbins will be held spaced apart.

In this arrangement the drying steam will pass from the outside toward the inside through all of the superimposed bobbins simultaneously and into the continuous tubular opening provided by the aligned shells 7 and the openings of discs 14, thence to

the outer atmosphere through the openings 6' at the bottom of the chamber. By reversing the position of the valves the air from the outer atmosphere will be drawn or forced upwardly through the aligned shells 7 and openings 15 and will pass simultaneously outwardly through all of the bobbins.

The weight of the superimposed bobbins, as well as of the discs 14, and of the packing of cover discs 11, which are placed upon the top of the pile, will operate to mechanically squeeze or compress the bobbins, in the drying operation. The chamber or vessel may of course be made of proportions suitable for accommodating any desired number of superimposed bobbins.

Having thus described my invention, what I claim is:—

1. An apparatus for drying textile and the like materials, comprising a closable vessel for receiving the material to be dried, said vessel having at one end an opening communicating with the outer atmosphere and being provided at its other end with a controllable valve for connecting the vessel to a source of steam and with another controllable valve for connecting the vessel to a device for passing air through the vessel and the material contained therein, said material having a perforated tubular member extending through the same and being in communication with the opening communicating the vessel with the outer atmosphere, and a packing disc placed on the material which disc is provided with a recess for the reception of the end of said perforated tubular member.

2. An apparatus for drying textile materials comprising a closable vessel having an opening in its bottom wall, controllable means operable for placing the interior of the vessel into and out of communication at will with a suitable drying medium, the material to be dried being carried upon perforated shells, each shell being adapted to carry a body of said material and to be arranged within the vessel one body above the other, spacing discs arranged between the superimposed bodies each having an opening therethrough, the several perforated shells being arranged in axial alignment and protruding from the bodies into the openings of the discs, and the interior of said shells being in communication with each other and with the opening through the bottom wall of the vessel, all for use in the manner set forth.

3. An apparatus for drying textile and like materials, comprising a closable vessel having an opening through the bottom wall thereof, a perforated tubular member within the vessel open at its opposite ends and having its lower end communicating with the opening in the bottom wall of the vessel, the material to be dried being adapted to be arranged in position surrounding said tubular member, a packing disk arranged to close the upper end of said tubular member and adapted to rest upon the material to be dried, and controllable means operable for directing a blast of suitable drying medium through the vessel and through the material into the interior of said tubular member for discharge downwardly therefrom into the atmosphere.

In testimony whereof I have signed my name to this specification.

HERMANN KRANTZ.