Oct. 28, 1958 T. E. BELL ET AL 2,858,184

HEATING TEXTILE FABRICS

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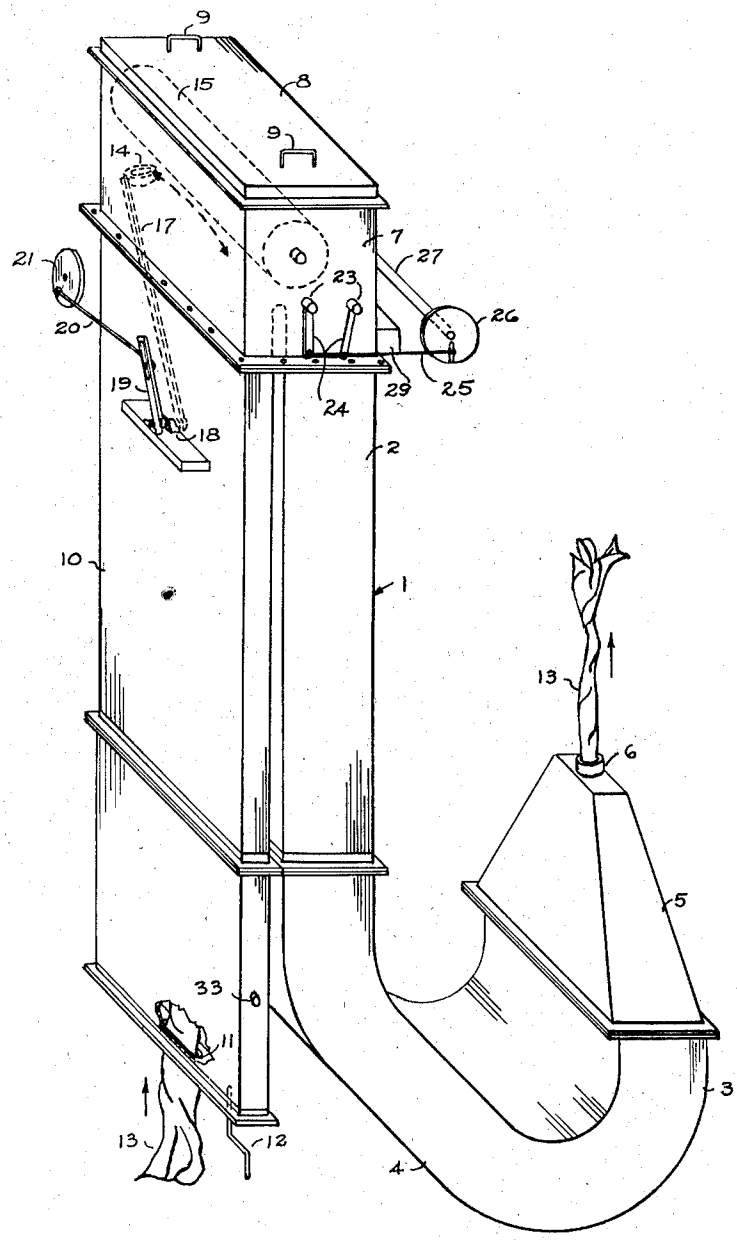


FIG. 1

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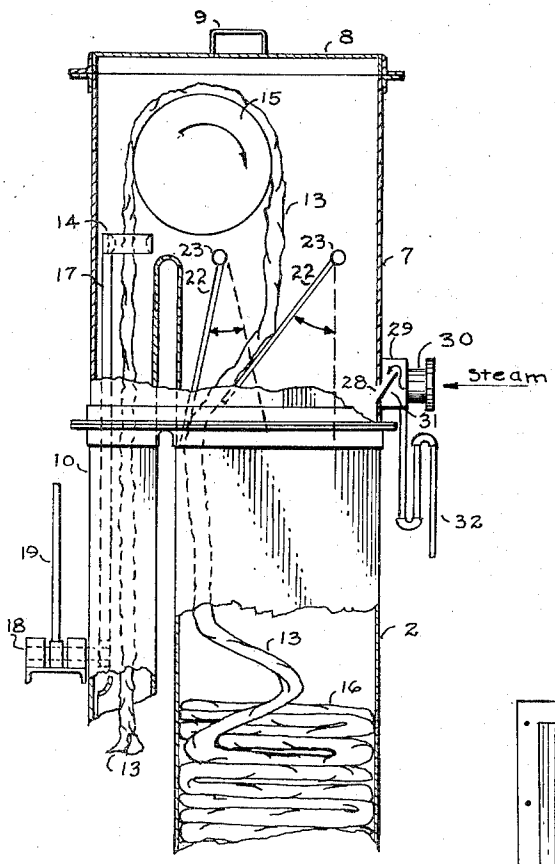


FIG. 2

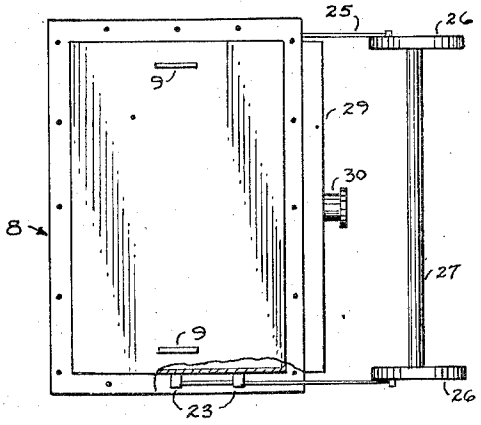


FIG. 3

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HEATING TEXTILE FABRICS

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Application October 5, 1955, Serial No. 538,574

6 Claims. (Cl. 8—149.3)

This invention relates to heating textile fabrics by direct contact thereof with steam, and to apparatus in which such heating can be effectively carried out.

Textile fabrics, in open-width or rope form, are subjected in various scouring, bleaching and similar systems to the action of steam for the purpose of heating the fabric to accelerate or improve the action of a treating agent thereon. Continuous treating systems of this type usually include the operations of dampening the fabric with a treating liquor, such as a bleach or scouring solution, heating the dampened fabric with steam and storing the heated material temporarily in a container such as a J-box, all operations being carried out continuously. Heating by means of steam is generally effected in a separate steaming tube or chamber from which the fabric passes to the J-box. Such a system for scouring or bleaching fabrics is described by Campbell et al. in U. S. Patent 2,267,718. A U-shaped steaming tube for heating the fabric in such a system is described by Poesl in U. S. Patent 2,304,474.

While such systems have found wide use, they are not entirely satisfactory for a number of reasons. One is that a relatively long heater tube, generally U-shaped and with a plurality of guide reels, is required, resulting in considerable friction between the guide reels and fabric causing uneven bleaching and/or dyeing defects. Also, the prior separate steaming tubes provide a relatively low volume ratio of steam to fabric and their use tends to trap air entrained by the fabric in the bonnet of the J-box, both of which contribute to inefficient heating. Although these and other disadvantages attending the use of separate steaming tubes have long been recognized, no practical way of overcoming them has heretofore been proposed, so far as we are aware.

An object of the invention is to provide an improved method for heating fabrics in continuous processing systems. A further object is an improved method for heating fabric in systems for continuously processing the same in which the fabric impregnated with a treating solution is heated and temporarily stored in a J-box. Another object is to provide equipment for carrying out the method of the invention whereby the disadvantages characteristic of prior systems may be overcome or largely avoided. Other objects will be apparent from the following description.

The objects of the invention are accomplished, in general, by passing steam directly into the upper part or bonnet of a storage vessel such as a J-box into which a continuous length of the fabric impregnated with a treating liquor is continuously passed and temporarily stored. The steam is introduced into the J-box above the portion thereof in which the fabric is stored as a compact mass, the introduced steam being in direct contact with the fabric in the bonnet of the J-box and flowing countercurrent to the general direction of travel of the fabric.

Preferably, the bonnet of the J-box is provided with a

downwardly extending fabric entrance leg which can be viewed as providing an extension of the space in the bonnet of the J-box in which direct contact of the fabric with the steam occurs. This extension provides an important increase in the volume ratio of steam to fabric.

The invention will be more clearly apparent from the following description considered in connection with the accompanying drawings, in which:

Figure 1 is a perspective view, with certain parts cut away, of a J-box equipped to steam fabric in accordance with the invention;

Figure 2 is a side elevational view of the upper part of the J-box of Figure 1, with parts of the side walls of the J-box cut away;

Figure 3 is a top plan view of the bonnet of the J-box of Figure 1.

In the drawings, reference numeral 1 represents generally a J-box having a relatively long upright entrance leg 2 and a relatively short upright exit leg 3 connected by a U-shaped intermediate portion 4. Leg 3 as shown includes a section 5 of progressively decreasing cross-sectional area terminating in fabric exit port 6. The longer leg 2 has an upper portion or bonnet 7 provided with a removable cover 8 having handles 9. Associated with bonnet 7 is a downwardly extending leg 10 in the form of a flat, relatively shallow box extending the full width of J-box 1. The upper end of leg 10 opens into bonnet 7 while its closed bottom is provided with a fabric entrance port 11 and a drain 12. Leg 10 in effect provides a space which is a downward extension of the free space in bonnet 7 which increases substantially the volume ratio of steam to fabric.

The fabric 13 in rope form is drawn through entrance port 11, box 10 and pot-eye 14 by the rotably driven fabric forwarding roll 15, after which it drops down and is piled into a compact mass 16 in J-box 1 from which it is pulled through exit port 6 by means not shown. Pot-eye 14 is positioned on arm 17, the lower end of which is rigidly attached to pivot rod 18. Pivot rod 18 is in turn rigidly connected to the lower end of rocker bar 19. The upper end of rocker bar 19 is pivoted to one end of connecting bar 20 whose other end is pivoted off-center to crank wheel 21. Rotation of crank wheel 21 acts through connecting bar 20, rocker bar 19, pivot rod 18 and arm 17, to oscillate pot-eye 14 back and forth across the face of forwarding roll 15. This action causes fabric passing through pot-eye 14 to be traversed back and forth longitudinally of forwarding roll 15.

Within bonnet 7 are plaiting wings 22 the upper edges of which are rigidly attached to pivot rods 23 which are pivoted at each end in the side walls of bonnet 7. The ends of pivot rods 23 extending through the side walls of bonnet 7 are rigidly connected to rocker bars 24, only two of which are shown. The lower ends of rocker bars 24 (two on each side of bonnet 7) are pivoted to a connecting bar 25 which in turn is pivoted off-center to a crank wheel 26 on drive shaft 27. Rotation of crank wheels 26 acts through connecting bars 25, rocker bars 24 and pivot rods 23 to rock plaiting wings 22 back and forth thus causing the fabric to be plaited evenly across the J-box from front to back.

The action of an oscillating pot-eye, such as pot-eye 14, together with plaiting wings, such as wings 22, to pile a rope of fabric evenly across the entire cross-section of a J-box is well-known in this art. As a result of such action, the fabric is piled into a compact mass as indicated at 16, which mass of dampened fabric effectively seals the J-box and prevents escape of steam from the exit end thereof. Each portion of the fabric in this seal is continuously being moved by the force of gravity towards the exit end of the J-box, the seal being con-

tinuously reformed and maintained by the piling of oncoming fabric. While the mechanism described for piling the fabric evenly over the cross-section of the J-box operates effectively, other well-known piling or plaiting mechanisms for accomplishing the same purpose can be used.

Steam is passed into bonnet 7 through slot 28 from steam distributor 29 into which steam is fed from pipe 30. Steam distributor 29 is provided with a baffle 31 and a U-shaped condensate drain pipe 32. Steam distributor 29 preferably extends across the entire width of the J-box as shown in Figure 3, as will also slot 28 and baffle 31. Steam may be supplied to the free space in bonnet 7 at a plurality of points and by distributing means other than that shown in the drawings. Preferably the steam will be introduced into the lower part of the bonnet 7 at any point above the cloth seal indicated at 16 to provide maximum direct contact between the steam and the fabric from the time the latter enters the equiment at port 11 until it becomes part of the seal at 16. For present purposes, the terms "bonnet" and "upper part" of the J-box have reference to that portion of the system which encloses the free space in the J-box above the seal of fabric indicated at 16.

Fabric entrance port 11 may be of circular or oblong shape, as shown, when processing fabric in rope form. If the fabric is to be processed in open width, fabric entrance leg 10 and J-box 1 over its entire extent, including section 5, should be as wide from side to side as the fabric; pot-eye 14 and the mechanism for oscillating it would be dispensed with; and, entrance port 11 and exit port 6 would be replaced by slots of a length corresponding to the width of the fabric to be processed.

Reference numeral 33 represents a connection in the lower portion of entrance leg 10 for a temperature control bulb or other suitable mechanism for controlling the introduction of steam into the system as required to maintain the desired temperature. The temperature control bulb may be inserted elsewhere in the system if desired. However, its location as shown is advantageous particularly when processing fabric in rope form. In such a case, the wide fabric entrance leg 10 provides a relatively large volume of steam to fabric at that point, with fabric entering the center of the entrance leg through port 11. As a result, the fabric does not balloon and never touches the temperature control bulb. The bulb is always surrounded by a relatively large volume of steam so that it can react rapidly to changes in temperature at the control point.

No means is shown for driving forwarding roll 15 or for rotating crank wheel 21 or drive shaft 27, it being evident that any means, such as motor driven pulley and belt arrangements, commonly employed for similar purposes, can be used.

In the embodiment of apparatus shown in the drawings, fabric in rope form which has been dampened or impregnated with a solution of a bleaching, scouring or other treating agent, is drawn by forwarding roll 15 through port 11, leg 10 and oscillating pot-eye 14. The fabric drops from roll 15 between plaiter wings 22 and is piled evenly into a compact mass across the cross-section of the J-box as shown at 16 so as to form a seal at that point. Fabric in the seal moves continuously but slowly downward and is pulled from the bottom of the mass through exit port 6, while the seal is continuously maintained by the piling of oncoming fabric.

Steam continuously supplied by pipe 30 to distributor 29 flows around baffle 31 and enters the lower portion of bonnet 7 through slot 28. The flow of steam in bonnet 7 and in fabric entrance leg 10 is counter to the direction of travel of fabric therein. This flow pattern prevents air entrained by the entering fabric from becoming pocketed or trapped as a dead-air space in bonnet 7 of the J-box, and together with the large volume ratio of steam to fabric resulting from the extension of the free space of bonnet 7 as provided by entrance leg 10, permits attainment of very efficient heating of the fabric.

In the present system, friction between fabric and guide reels in separate steaming tubes and friction caused by the sharp angle between the traverse pot-eye 14 and the forwarding roll 15 has been entirely eliminated. This is an important advantage as it reduces substantially the chances for abrasion which reduces the possibility of bleaching and dyeing defects in the finally finished fabric.

An important advantage of the present heating apparatus over apparatus previously used is that heating efficiency is increased so that very nearly the theoretical amount of steam is employed, and little or no steam escapes thru entrance port 11. In practice, a reduction of 20–25% in steam required has been attained. The resultant decrease in escaping steam is important, not only for the comfort of workmen, but also because escaping steam has a detrimental and destructive effect upon piping, roofing, and exposed equipment generally.

Entrance leg 10 can be positioned vertically, horizontally or at intermediate positions, but the vertical arrangement in close proximity to the J-box as shown in the drawings is generally preferred because of its compactness.

Although not shown in the drawings, J-box 1 and associated fabric entrance leg 10 will generally be insulated for the purpose of preventing excessive heat loss from the system.

We claim:

1. The method for continuously heating textile fabrics dampened with a solution of a treating agent comprising continuously feeding a continuous length of the fabric into the enclosed upper part of a J-box, continuously piling said fabric in said J-box to form a compact mass of piled fabric therein which seals said J-box below said upper part, continuously supplying steam into said enclosed upper part of the J-box above and adjacent said piled fabric, and flowing said steam in said upper part of the J-box in direct contact with the oncoming fabric and in a direction counter to the direction of travel of said fabric therein.

2. In a J-box apparatus for continuously and temporarily storing heated fabric into the enclosed upper part of which fabric in continuous length is continuously introduced, means for piling the oncoming introduced fabric in said J-box to form a compact mass of fabric therein constituting a seal below said upper part, means adjacent said fabric piling means for introducing steam into said J-bax above said seal and for flowing said steam in said upper part of the J-box in direct contact with said oncoming fabric and in a direction counter to the direction of travel of fabric therein.

3. In a J-box for continuously and temporarily storing heated fabric into the enclosed upper part of which fabric in continuous length is continuously introduced, means for piling the oncoming introduced fabric in said J-box to form a compact mass of fabric therein constituting a seal below said upper part, a fabric entrance chamber having a closed end provided with a fabric entrance port and an open end opening directly into said upper part of the J-box, means adjacent said fabric piling means for introducing steam into said J-box above said seal and for flowing said steam in said upper part of the J-box and in said chamber in direct contact with said oncoming fabric and in a direction counter to the direction of travel of fabric therein.

4. In a J-box for continuously and temporarily storing heated fabric into the enclosed upper part of which fabric in continuous length is continuously introduced, means for piling the oncoming introduced fabric in said J-box to form a compact mass of fabric therein constituting a seal below said upper part, a vertically disposed fabric entrance chamber having a closed lower end provided with a fabric entrance port and an open upper end opening directly into said upper part of the J-box means ad-

jacent said fabric piling means for introducing steam into said J-box above said seal and for flowing said steam in said upper part of the J-box and in said chamber in direct contact with said oncoming fabric and in a direction counter to the direction of travel of fabric therein.

5. The method of continuous heating textile fabric dampened with a solution of a treating agent comprising continuously feeding a continuous length of the dampened fabric into the enclosed upper part of a J-box, continuously piling said fabric in said J-box to form a seal of piled fabric therein below said upper part of the J-box, and continuously supplying steam into said upper part of the J-box above and adjacent said seal and flowing said steam in direct contact with said fabric in said upper part of the J-box in a direction counter to the direction of travel of said fabric therein.

6. In a J-box for continuously and temporarily storing heated fabric, into the enclosed upper part of which fabric is continuously introduced in continuous length, means for continuously piling the oncoming fabric in said J-box to form a seal of piled fabric therein below said upper part, and means adjacent said fabric piling means for continuously supplying steam into said upper part of the J-box above said seal.

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