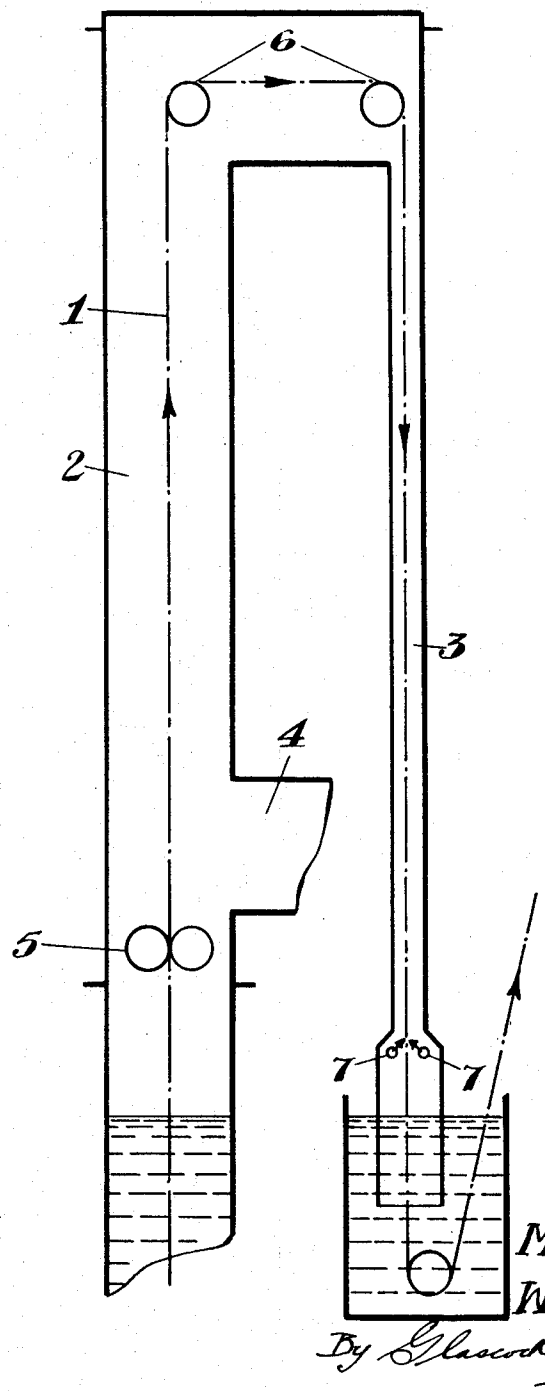
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PROCESS FOR REMOVING ORGANIC SOLVENT FROM WET MATERIAL

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PROCESS FOR REMOVING ORGANIC SOLVENT FROM WET MATERIAL

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This invention relates to the treatment of textile materials for the purpose of removing a volatile organic solvent after the materials have been passed through the solvent in a continuous manner in order to extract substances which are soluble in the solvent.

Hitherto such solvents have been removed by passing the textile continuously through a bath of hot water in which the solvent is volatilized and subsequently condensed for re-use.

The object of the invention is to enable the volatile solvent to be removed from continuously moving textile materials using less elaborate and less costly equipment than has been proposed hitherto.

According to the invention, the solvent is removed by subjecting the moving textile materials to treatment with steam in such a manner that the flow of steam and volatilized solvent runs counter to the direction of movement of the textile materials.

One solvent, which can be used for removing wax, fat or oil from unbleached cotton fabrics, is trichlorethylene. When this is used, advantage can be taken of its pysical properties. The pure solvent boils at 88° C., but in presence of water forms an azeotropic mixture boiling at 71° C. Furthermore, the vapor is more than four times heavier than air and seven times heavier than steam and therefore tends to fall relative to these lighter gases. The latent heat of vaporization is low and it is thus clear that cloth saturated with the hot solvent will readily part with a proportion of the solvent by evaporation, if it meets a moving stream of vapor consisting of a mixture of water vapor and trichlorethylene vapor at a temperature above the azeotropic boiling temperature. These conditions are achieved according to the invention by passing the saturated cloth upward against the stream of hot vapor descending because of its relatively high density.

The accompanying drawing illustrates diagrammatically an apparatus suitable for use in one convenient manner of carrying out the invention.

A moving band of cloth 1 saturated with trichlorethylene is treated in a steam chamber of inverted U section having one leg 2 larger in cross section than the other leg 3. The foot of the wider leg 2 is sealed in trichlorethylene and the foot of the narrower leg 3 is sealed in water and solvent vapor and steam are forced to leave through a side arm 4 which leads to a suitable condenser. The cloth emerges from the solvent after extraction of soluble matter and passes through a mangle 5 where excess solvent is removed. A system of rollers 6 enables the saturated cloth to be carried through the apparatus in continuous fashion passing up the wider leg and then down the narrower leg to emerge through the water seal. Perforated pipes 7 at the foot of the leg 3 enable jets of steam to be directed upward and against both sides of the descending cloth. These jets of steam impinge on the cloth with sufficient velocity to reach the top of the narrower leg, volatilizing and sweeping away solvent as it does so. The amount of solvent still left for removal during the descent of the cloth through the narrower leg is a relatively small proportion of the total. The mixed vapor now at the top of the chamber passes into the larger cross section leg 2 with consequent drop

in velocity and as it passes down the wider leg 2 the fall in temperature and increase in density consequent upon evaporation of solvent cause an effective flow of the vapor to the bottom of the wider leg 2 and to the side arm 4 from whence it is led away to suitable condensers.

Our invention is further illustrated by the following example:

A loom state cotton fabric weighing 5.3 ozs./sq. yd. having been solvent extracted in known manner using trichlorethylene passes to a steaming apparatus as already referred to while still saturated with an equal weight of solvent.

In the steaming chamber the cross section of the one leg is 12 ins. x 48 ins. and that of the other leg 3 ins. x 48 ins. The saturated fabric is passed through the machine at a speed of 60 yds./min. giving a treatment time of 7.6 secs. and under such conditions the solvent content is reduced to 0.016% of the cloth weight.

Such an apparatus is simple and compact and gives a flow of all the solvent vapor in a trunking of relatively small cross sectional area from which it is easy to condense it and thus the major disadvantage of the known methods can be avoided.

The apparatus also has the advantage of removing substantially all the solvent before the cloth is immersed in water thus minimizing the solvent losses which occur where vaporization is by hot water.

The carrying out of the invention is not restricted to the form of apparatus described above. Many modifications are envisaged. Additional heating of the vapor may be brought about by introduction of a further supply of live steam at one or more points in the system. Alternatively the vapor may be heated by closed steam coils or electrically.

The time required for complete removal of solvent, besides depending on the detailed construction of the steaming chamber, depends on the nature of the cloth and the amount of solvent carried by it. Times may vary from a few seconds to one minute or more but times of from 3 to 15 seconds are found to be particularly suitable.

What is claimed is:

1. A method for treating textile webs for the purpose of removing a volatile organic solvent therefrom comprising passing upwardly said textile web from an organic solvent bath, into and through a first elongated zone, said bath being a seal means for one end of said first elongated zone, then passing said web downwardly and through a second elongated zone and through an aqueous bath, said aqueous bath being a seal means for one end of said second elongated zone, angularly impinging steam on both sides of said web in said second elongated zone prior to passing said web into the aqueous bath and out of said second elongated zone whereby the organic solvent is vaporized from said web passing said steam from said second zone to said first zone, and removing said steam and vaporized organic solvent from said first zone at a point proximate and directly above the seal means at said first elongated zone.

2. The method of claim 1 wherein the organic solvent is trichlorethylene.

3. The method of claim 1 wherein the time of treatment is from 2–60 seconds.

4. The method of claim 1 wherein the first zone has a greater cross-sectional area than said second zone.

5. A method for treating textile webs for the purpose of removing a volatile organic solvent therefrom comprising passing upwardly said textile web from an organic solvent bath, passing said web through a set of rollers whereby a portion of the excess solvent is removed from said web, then passing said web into and through a first elongated zone, said bath being a seal means for one end of said first elongated zone, then passing said web downwardly

and through a second elongated zone and through an aqueous bath, said aqueous bath being a seal means for one end of said second elongated zone, angularly impinging steam on both sides of said web in said second elongated zone prior to passing said web into the aqueous bath and out of said second elongated zone whereby the organic solvent is vaporized from said web passing said steam from said second zone to said first zone, and removing said steam and vaporized organic solvent from said first zone at a point proximate and directly above the seal means at said first elongated zone.

6. The method of claim 5 wherein the organic solvent is trichlorethylene.

7. The method of claim 5 wherein the time of treatment is from 2–60 seconds.

8. The method of claim 5 wherein the first zone has a greater cross-sectional area than said second zone.

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