ABSTRACT

Process and apparatus for heat treating articles by passing them through a heating zone between two clongate overlying sheets which are sealed at side edges.

15 Claims, 2 Drawing Figures
HEAT TREATING APPARATUS AND PROCESS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an apparatus for heat treating textile or other goods and is particularly, but not exclusively, concerned with a heat treating apparatus or process suitable for use in the dyeing of articles.

BRIEF SUMMARY OF THE INVENTION

According to the present invention there is provided a method of heat treating an article comprising the steps of locating the article between adjacent faces of overlying portions of a pair of flexible imperforate sheets, moving said sheet portions together with the article as a unit through a heating zone, parts of one said sheet portion on each lateral side of the article being brought together in substantially fluid-tight engagement with corresponding parts of the other sheet portion, and maintaining said engagement during said movement.

The invention also provides a heat treating apparatus comprising a pair of flexible imperforate sheets, a heating device providing a heating zone and means for passing portions of the sheets in spaced overlying relationship through said zone with laterally spaced parts of said sheet portions brought together in substantially fluid-tight engagement whereby an article can be enclosed between said sheet portions and between the said parts thereof and thereby passed through the heating zone.

The sheets may consist of thin polyester plastics material although other material such as metal foil, could be utilised.

The invention also provides a dyeing process comprising the steps of impregnating an article with a liquid dye composition and then passing the article through said heat treating apparatus to fix the dye on the article.

The apparatus may be incorporated in a dyeing apparatus including means for impregnating an article with a liquid dye composition and means for moving the article through the impregnating means and then through said heat treating apparatus.

The sheets may be endless but this is not essential.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The invention is now described in detail with reference to the accompanying drawings in which:

FIG. 1 is a partly diagrammatic, longitudinal cross-section of apparatus, constructed in accordance with the invention, for dyeing textile material, and

FIG. 2 is a cross-section on the line 2—2 in FIG. 1.

DETAILED DESCRIPTION

The apparatus shown includes two sheets 17, 18 of flexible impermeable material. The sheets are in the form of endless webs. Sheet 17 passes around spaced end rollers 14, 30 whilst sheet 18 runs around spaced end rollers 20, 32. Rollers 30, 32 are driven by a drive mechanism (not shown) in the direction indicated by the arrows thereon to move the sheets continuously lengthwise in closed paths. Rollers 14 and 20 are closely spaced to form a pair of pinch rollers which operate to press portions of sheets 17 and 18 passing there around into engagement, and rollers 30, 32 co-operate in an analogous manner. The rollers are disposed so that adjacent runs 36, 38 of the respective sheets 17, 18 between respective pairs of rollers 14, 30 and 20, 32 are straight and parallel. This condition is maintained by tensioning rollers 33, 34 which engage the respective sheets 17, 18. Two electrical heaters 19 are disposed one above and one below runs 36, 38.

Marginal portions 17a, 17b (FIG. 2) of sheet 17, adjacent longitudinal edges thereof, are pressed into engagement with corresponding portions 18a, 18b of sheet 18 along the length of runs 36, 38. This is effected by means of resilient presser members 39, 40, 41, 42 extending lengthwise of the runs 36, 38. Presser member 40 is disposed above sheet 17 and bears against the upper face of portion 17a thereof, whilst presser member 39 is disposed below sheet 18 and bears against the lower face of portion 18a. Presser members 41, 42 are disposed to bear, in an analogous manner, against portions 17b, 18b. The presser members may be formed, for example, of foamed plastics material and mounted on beams (not shown) extending lengthwise of and above and below portions 17a, 17b and 18a, 18b of sheets at positions along runs 36, 38.

Two cleaning devices 44, 46 are provided for cleaning the respective sheets 17, 18. These include cleaning baths 47, 48 respectively through which the sheets are passed, the sheets running over suitably positioned rollers 51, 52 to be directed into the baths 47, 48. Squeegees 54, 56 are arranged to contact opposite surfaces of the sheets to remove excess cleaning fluid in baths 47, 48.

Material 11 is treated continuously in the apparatus, being unwound off a roll 12 and passed through the apparatus from left to right in the diagram. It passes, first, to a dye bath 13 where it is impregnated with dye, thence through rollers 14, 20, to be positioned between sheets 17, 18, and then between the pairs of rollers 14, 20 and 30, 32, being thus conveyed by the sheets. The material leaves the apparatus through rollers 30, 32 to be rolled up in a roll 60. The width of material 11 is less than that of the sheets 17, 18 so that as it is passed through rollers 14, 20 the rollers press the sheets 17, 18 over the material whilst closing together the marginal portions 17a, 18a, 17b, 18b of the sheets to seal the material between the sheets as it is passed along runs 36, 38. During such passage, the heaters 19 operate to heat the laminate comprising sheets 17, 18 and material 11 to fix the dye impregnated in the material.

Because of the sealing of the material 11 between sheets 17, 18 during heating, the material is substantially completely enveloped and moisture escape is minimal so that even dyeing is achieved. Also, because the moisture in material 11 is contained between the sheets there is some build up of pressure between the sheets and fixing is thus accomplished under a slightly elevated pressure which is advantageous to the fixing process. The cleaning devices 44, 46 ensure that dye adhering to sheets 17, 18 as they leave rollers 30, 32 is removed to prevent contamination of freshly in-fed material 11.

EXAMPLE

A length of plain-weave fabric of untreated wool 8 inches wide and 216 inches in length was passed through an apparatus like that described with reference to FIG. 1. The sheets 17, 18 were formed of polyester plastics material, 12 microns thick and 10 inches wide.
The belt runs 36, 38 were approximately 6½ feet in length. The material was dyed in dye bath 13 using a pad liquor of the following composition:

30 parts by weight urea
1 part by weight acetic acid
0.1 parts by weight of a non-ionic wetting agent
2 parts by weight of “Lanasol” scarlet 2R dye (Ciba Gelgy)
66.9 parts by weight water

This was padded onto the material so that each 10 grams of fabric picked up 10 grams of pad liquor. The dye fabric was then passed through the apparatus at a rate of approximately 2½ feet per minute. Heat was applied over some 5 feet of the length of runs 36, 38 by electric radiant heaters above and below the belt runs, these being arranged so that the padded fabric progressing through the apparatus was heated at a temperature of 100°C for 2 minutes before leaving the apparatus. The fabric emerging from the apparatus was rinsed and cleaned. Dye fixation was found to be above 90% and dye penetration was found to be acceptable.

Many modifications may, of course, be made to the described apparatus and process. Particularly, articles other than sheet or web-like material 11, such as garments may be dyed in the apparatus depicted and although the apparatus has particular application to dye fixing operations it could of course be utilised for other purposes where heating of materials is required. It has been found to be particularly suitable for treatment of keratinous fibres or of fibre blends including keratinous fibres.

The mechanical details of the apparatus may be varied. Thus, although sheets 17, 18 are, in the described apparatus, in the form of endless loops the sheets could, alternatively, be in the form of long lengths of material. For example, lengths of sheeting could be wound off two rolls at the input end of the apparatus, fed between rollers 14 and 20 with the material to be treated therebetween, and taken from the apparatus after leaving rollers 30, 32 to be wound upon separate take-up rollers. In this case, cleaning of the sheets need not be accomplished continuously as is the case in the described apparatus but could be accomplished, for example, in a separate apparatus arranged to clean used rolls of sheeting.

The preferred material for the sheets 17, 18 is a polyester plastics material, preferably having a thickness in the range 9 to 23 microns. Good results have been achieved using material sold under the trade name MELINEX and of thickness 12 microns. Whatever material is used for the sheets 17, 18, it should, of course, be capable of withstanding the relatively high temperatures occurring in the heating operation and not be such as to contaminate articles to be treated.

It has been found that use of film-like plastics material permits, under some circumstances, elimination of the sealing elements 39-42 since these materials possess considerable self-adhering properties and the mere operation of pressing the sheets together between rollers 14, 20 will cause marginal portions 17a, 18a, 17b, 18b to adhere sufficiently over runs 36, 38 without the need for any specific mechanism for maintaining the seals. The seals thus formed break easily as the sheets pass around rollers 30, 32. In any event, adherence of marginal edges may be facilitated by forming the surfaces of rollers 14, 20, 30, 32, of resilient material.

The apparatus may also be varied by varying the method of maintenance of sealing of sheets 17, 18 along runs 36, 38. For example, sealing could, as an alternative to the use of presser members 39-42, be effected by coating the marginal portions of the sheets with suitable adherent material. In cases where presser members are used, they may, themselves, be resiliently biased towards the edges of the sheets by use of suitable springs instead of being fixed as in the described construction. Sealing could also be obtained by forming the sheets with complimentary tongue and groove seals towards the edges thereof.

These and many other modifications may be made to the described apparatus and process without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A method of dyeing an article comprising the steps of applying dye to the article and subsequently fixing the dye by heat treatment comprising the steps of:
   a. locating the article between facing surfaces of overlying portions of a pair of flexible imperforate sheets,
   b. moving said sheet portions together with the article as a unit through a heating zone,
   c. maintaining parts of the said facing surface of one of said sheet portions to each lateral side of the article in substantially fluid-tight engagement with corresponding parts of the facing surface of the other sheet portion and,
   d. maintaining said engagement during movement of the overlying sheet portions and the article through the heating zone;
   said sheets being formed of polyester film whereby said parts of said facing surfaces of said sheet portions are maintained in said substantially fluid-tight engagement by self-adhesion of the sheets; said sheet portions being substantially unconstrained between said parts thereof during passage through said heating zone, against outward deformation otherwise than by virtue of resilience of that sheet portion.

2. A method as claimed in claim 1 wherein said portions of said sheets are brought together by pressing the sheets between a first pair of rollers extending transversely of said sheets.

3. A method as claimed in claim 2 wherein movement of the overlying sheet portions and the article through the heating zone comprises passage of said sheets between said first pair of rollers and thence through a second pair of rollers spaced from said first pair and extending transversely of said sheets whereby said portions are defined by sections of the sheets disposed in runs of said sheets extending between the two pairs of rollers.

4. A method as claimed in claim 3 wherein said sheets are unwound from separate rolls, pass consecutively through said first and second pairs of rollers, and are wound up upon separate rolls after passing through the second pair of rollers.

5. A method as claimed in claim 3, wherein said sheets are continuous and endless and are continuously moved in separate paths, one path extending around one roller of each of said pairs of rollers and the other path extending around the other roller of each of said pairs of rollers.
6. A method as claimed in claim 1, wherein said heating is effected by heating both sides of a laminate comprising the sheet portions and article.

7. A method as claimed in claim 1 wherein said heating is effected to raise the temperature of said article to a temperature of approximately 100°C.

8. A method as claimed in claim 1 wherein said polyester film is of thickness in the range 9 to 23 microns.

9. Article dyeing apparatus including dye impregnating means and heat treating means, said heat treating means comprising a pair of flexible imperforate sheets of polyester film, a heating device providing a heating zone, sheet transport means for passing portions of the sheets in spaced overlying relationship through said zone, and engagement means for bringing laterally spaced parts of one of said sheet portions into engagement with corresponding laterally spaced parts of the other of said sheet portions such that said portions are maintained in substantially fluid-tight engagement at said parts thereof at least partly by self-adhesion of said parts while a first of said sheet portions is externally substantially unconstrained, over a section thereof between the said parts thereof, against outward deformation other than being constrained because of resilience of that sheet portion, whereby an article can be enclosed between said sheet portions and located between said parts thereof to be thereby passed through said heating zone as the sheets are passed through said heating zone to fix dye applied to said article by said dye impregnating means.

10. Article dyeing apparatus as claimed in claim 9 wherein said engagement means includes a first pair of rollers extending transversely to the direction of said movement, said sheets passing a separate one about each of the rollers of said pair.

11. Article dyeing apparatus as claimed in claim 10 including a second pair of rollers extending transversely of said direction of movement, said sheets extending one about each of the rollers of said second pair and between these, said first and second pairs of rollers being positioned so that said portions are defined by runs of said sheets extending between the two pairs of rollers.

12. Article dyeing apparatus as claimed in claim 11 wherein said sheets are endless and are arranged in separate loops each passing around associated ones of said rollers and said transport means comprises means to synchronously drive the sheets around said loops, means being provided for tensioning said loops whereby to maintain said loops in tension.

13. Article dyeing apparatus as claimed in claim 12 including means for cleaning at least the surfaces of said sheets which face each other over said runs.

14. Article dyeing apparatus as claimed in claim 9 wherein fixed pressure members are provided to either lateral side of said sheets to assist in maintaining said parts in engagement by pressing them together.

15. Article dyeing apparatus as claimed in claim 9 wherein said polyester film is of thickness in the range 9 to 33 microns.