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METHOD OF DYEING OR IMPREGNATING TEXTILES AND AN APPARATUS FOR CARRYING THE MFTHOD INTO EFFECT
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Fig. 1

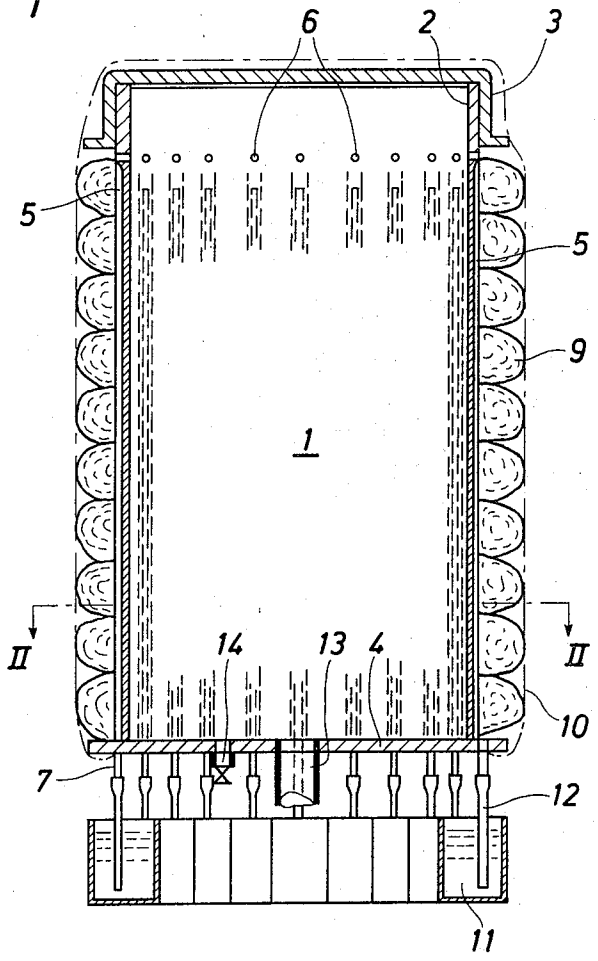
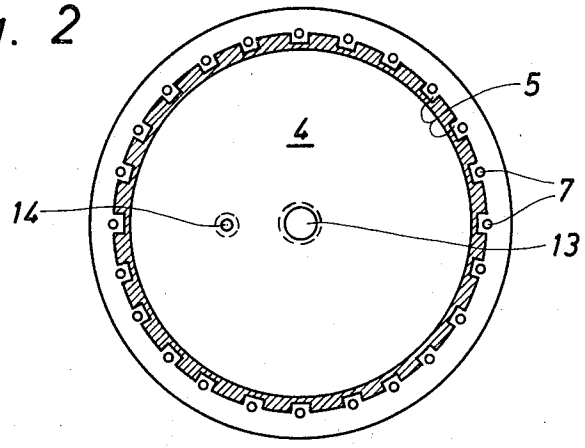


Fig. 2



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3,671,180

METHOD OF DYEING OR IMPREGNATING TEXTILES AND AN APPARATUS FOR CARRYING THE METHOD INTO EFFECT

Bent Koch, Kornagervej 81, Lyngby, Denmark

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ABSTRACT OF THE DISCLOSURE

Textile material is placed in a container having a flexible wall portion and air is evacuated from the material which is compressed by the flexible wall portion simultaneously with impregnating or dyestuff liquid being sucked in and flows into the textile material from supply pipes which are connected with containers for dyestuff or impregnating liquid. Then the pressure difference between the outer and the inner side of the container is equalised during elastic expansion of the textile material. In this way blurred colours after completion of the impregnation are avoided and the consumption of dyestuff liquid is very small.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to a method of dyeing or impregnating textiles and to an apparatus for carrying out the method of the invention.

The object of the invention is to devise a method of the aforesaid kind in which blurred colours are avoided, simultaneously with obtaining an economy in the consumption of liquid, the object being more particularly to render dyeing of multicoloured yarn possible in such manner that it is easy to provide a succession of densely located colour zones in the yarn which alternate in any desired manner in succession, so that the colours will not be located in zones within which the different colours are always succeeding each other in a specific sequence. This has, in fact, the drawback that woven or knitted textiles made of such yarns with regularly changing sequence of colours will be inclined to produce a pattern (for example a pattern of arrowheads) that cannot be predicted and therefore is irreproducible. This phenomenon is due to the fact that sections of uniform colour in the consecutive threads of the weaving or knitting will sooner or later coincide along certain lengths. If, however, yarn is used which is dyed in zones in which the succession of the individual colours is continually changing, it is possible to obtain a product with a flecked appearance and a homogeneous mixture of the colours used without forming a more or less casual pattern, that is, the product becomed reproducible.

Description of the prior art

Dyeing of yarns in skeins with several colours changing in succession has hitherto been performed by hanging the skeins over a bar and immersing them successively to varying depths in different solutions of dyes. In this way the yarn can only be provided with very few different

colours changing in a specific sequence. It is furthermore known to dye yarn which is advanced as a web between different dyeing rollers, but this method requires that the yarn has an undyed length between the individual colours applied, and with this method it is not possible either to work with much more than about four different colours.

Further, it is known to dye yarn wound on reels by introducing different dyestuff liquids into the reel by means of injection needles, or by the action of the centrifugal force to press out different dyestuff liquids simultaneously through small pipes which open into the textile material on the rotating reel. The two last mentioned methods are rather complicated and produce effects varying with the diameter of the reel.

SUMMARY OF THE INVENTION

An essential feature of the method according to the invention is that the textile material is placed in a container having partly movable walls consisting, for example of elastically deformable material compressing the textile material. This is accomplished for example by the establishment of a pressure difference between the inner and the outer surface of the container with simultaneous or subsequent intake by suction of impregnating or dyestuff liquid flowing into the textile material from supply pipes. The supply pipes are separately connected with one or more containers with dyestuff liquid, the compression being subsequently relieved simultaneously with an elastic expansion of the textile material. The elastic expansion of the material and the slight amount of liquid that can be absorbed in proportion to the weight of the material in this manner ensure that blurred colours after completion of the impregnation are avoided and that the consumption of liquid will be very small.

Owing to the uniform supply of different dyes all the way round along the textile material covering the cylinder and the possibility of connecting the different liquid pipes to different dyestuff containers, it becomes possible to dye, for example yarns with a large number of different colours in varying succession.

The object of the invention is also to manufacture a simple and effective apparatus for carrying the method into effect. As will be seen, the apparatus consists of few parts and is easy and cheap to manufacture, and owing to the regular design of the outer wall of the cylinder it is possible to obtain a quick and uniform supply of liquid to the different sections of the yarn so that the colours do not become blurred, but meet at sharply defined boundaries. The method requires no more than a minimum of liquid so that an economy of dyeing liquid is obtained.

When the cover is of transparent plastic foil, the process may be controlled from outside, and as the dyestuff containers are readily exchangeable or the pipes connecting the dyestuff containers and the liquid channels may be used to connect different dyestuff containers with different pipes, the succession of the colours may readily be varied perfectly freely.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described in detail with reference to the drawing, in which

FIG. 1 shows diagrammatically an axial section through an embodiment of the apparatus according to the invention, and

FIG. 2 is a section taken on the line II—II of FIG. 1.

The apparatus illustrated has a cylinder **1** forming a casing with an outer wall **2** which is closed above by a cover **3** and below by a welded end plate **4** which at the circumference constitutes a flange projecting from the cylinder. In the outer side of the wall **2** are at regular intervals formed grooves which open outwards and constitute liquid channels **5** extending along generatrices from the flange at the end plate **4** and upwards through the major part of the height of the cylinder. At the upper end of each groove **5** the cylinder wall **2** has a throughgoing hole **6**.

The textile material, for example skeins **9** of yarn to be dyed, is placed one skein on top of the other around the cylinder **1**. When the skeins have been brought into position and the cylinder has been closed by the cover **3**, a flexible cover in the form of an air-tight transparent plastic bag **10** is pulled down over the cylinder **1** so as to cover the skeins **9**, and the edge of the bag mouth is connected tightly with the projecting flange of the end plate **4**; the said flange acts as supporting edge for the lowermost skein.

Each of the channels communicates through a hole **7** provided in the bottom **4** with a container **11** for dyestuff liquid, the said container having a connecting pipe **12** or another pipe which is immersed in a container with the dyestuff liquid which is to be passed up through the pipe for dyeing the skeins opposite same. The interior of the container **1** may through an opening **13** be put into communication with a vacuum source (not shown) and through an opening **14** be put into communication with the atmosphere.

The dyeing of multi-colored yarn takes place after the individual channels **5** have been connected with a dyestuff container so that the supply of dyestuff to the channels alternates in the predetermined succession along the circumference of the cylinder. At first a vacuum is produced in the cylinder **1** by evacuation through the opening **13**, and owing to the holes **6** and the grooves **5** the plastic bag forming the cover **10** is pressed towards the skeins **9** so that these are compressed and caused to rest tightly and regularly around the cylinder **1** and the channels **5**. Timed to the evacuation the dyestuff liquids are sucked from the containers through the pipes **12** and with increasing vacuum through the holes **7** and into the channels **5** communicating therewith, from which the dyestuff liquids simultaneously flow freely into the textile material (the skeins).

After the impregnation having been finished, the vacuum in the cylinder is destroyed by the vacuum source being cut off and the passage **14** being opened to atmospheric air, by which excessive dyestuff liquid in the channels returns to the respective dyestuff containers and the compressed textile material may again expand freely. This will ensure that the material after the process being finished contains no more dyestuff liquid than required so that the colours will not blur each other.

It has surprisingly been found that it is possible by this method to dye textile material, for example yarn, with successive colours that are distinctly separated. If the cover **10** is a transparent plastic bag, the actual processing of the dyeing may at once be checked, and in case of accidents such as failure in the supply of liquid to one or more of the pipes, the process may be discontinued, if necessary, before all the skeins have been discolorised.

It will be appreciated that with the method and the apparatus according to the invention it has become possible to dye e.g. yarn with a number of colours alternating successively in a desired varied manner, the supply of dyestuff to the individual pipes from the containers **11** being readily determined to suit requirements and is readily varied by modifying the connecting pipes **12** between the individual pipes and the containers with the different dyestuffs.

The apparatus may easily be cleaned by passing the connecting pipes **12** to a container with cleaning liquid instead of to the dyestuff containers.

I claim:

1. A method of forming and/or impregnating textile material, characterised in that the textile material is placed in a container having partly movable walls consisting, for example of elastically deformable material compressing the textile material, for example by the establishment of a pressure difference between the inner and the outer surface of the container with simultaneous or subsequent intake by suction of impregnating or dyestuff liquid flowing into the textile material from supply pipes, each of which are separately connected with one or more containers with dyestuff liquid, the compression being subsequently relieved simultaneously with an elastic expansion of the textile material.

2. A method as claimed in claim **1** for dyeing or impregnating textile material, more particularly yarn, laid up in circular fashion, for example in skeins or in windings, characterised in that the material is placed around a cylinder or a prism, the outer circumference of which corresponds to the inner circumference of the material laid up which is then covered by means of an air-tight cover of flexible material which when the pressure difference between the inner and the outer surface of the cover is established, preferably by evacuation of the air from the textile material, is pressed inwards in the direction towards the cylinder, liquid being supplied to the material in the space between cover and cylinder from channels which are each separately connected with a container with a dyestuff liquid and which are provided in rows along generatrices of the cylinder and are wholly or partly open towards the outer surface of the said cylinder, by which a pattern of coloured impregnation is produced in the textile material in conformity with the distance between the individual channels and their location, the arrangement of the textile material and the character of the dyestuff liquids in the containers connected, the volume of dyestuff solution absorbed being so negligible compared to the weight of the corresponding textile material that the inclination of the different dyestuff liquids to produce blurred colours during the impregnation or to become immersed in the material is negligible after finished impregnation and equalisation of the pressure difference between the outer and inner side of the flexible cover and the consequent elastic expansion of the textile material.

3. An apparatus for dyeing or impregnating circularly arranged textile material, characterised in that it has a cylinder with a circumferential length substantially equal to the circumferential length of the textile material, such as skeins to be dyed, and with a number of regularly distributed, longitudinal grooves which form liquid channels in the outer wall of the cylinder and are adapted to be connected with a vacuum source, the said channels being each connected with a dyestuff container, and the apparatus having an outer cover of flexible material and of such form that it is capable of enclosing the cylinder and the textile material, for example skeins, arranged on same and to form a sealed closure around the said skeins.

4. An apparatus as claimed in claim **3**, characterised in that the cylinder is vertical and constitutes a closed container having at its lower end an end plate with openings for connecting the interior of the cylinder with the vacuum source and the atmosphere, respectively, and with a flange edge which projects from the circumference of the cylinder and has regularly distributed holes through which the liquid pipes communicate with the dyestuff containers, and that at the upper end of each groove there is a through-going hole in the cylinder wall, the cover being of bag form and adapted so that the edge

of its mouth may be tightly connected with the circumference of the projecting flange of the end plate.

5. An apparatus as claimed in claim 3, characterised in that the cover is of transparent material such as transparent plastic foil.

6. An apparatus as claimed in claim 3, characterised in that the dyestuff containers are readily exchangeable.

7. An apparatus as claimed in claim 3, characterised in that connecting pipes between the dyestuff containers and the liquid pipes are adapted to connect a dyestuff container to any one of several pipes.

References Cited

UNITED STATES PATENTS

2,351,701	6/1944	Perkins	8—155 X
2,922,696	1/1960	Miller	8—155.1

WILLIAM I. PRICE, Primary Examiner

U.S. Cl. X.R.

8—155.1, 155.2; 68—189, 198, 199