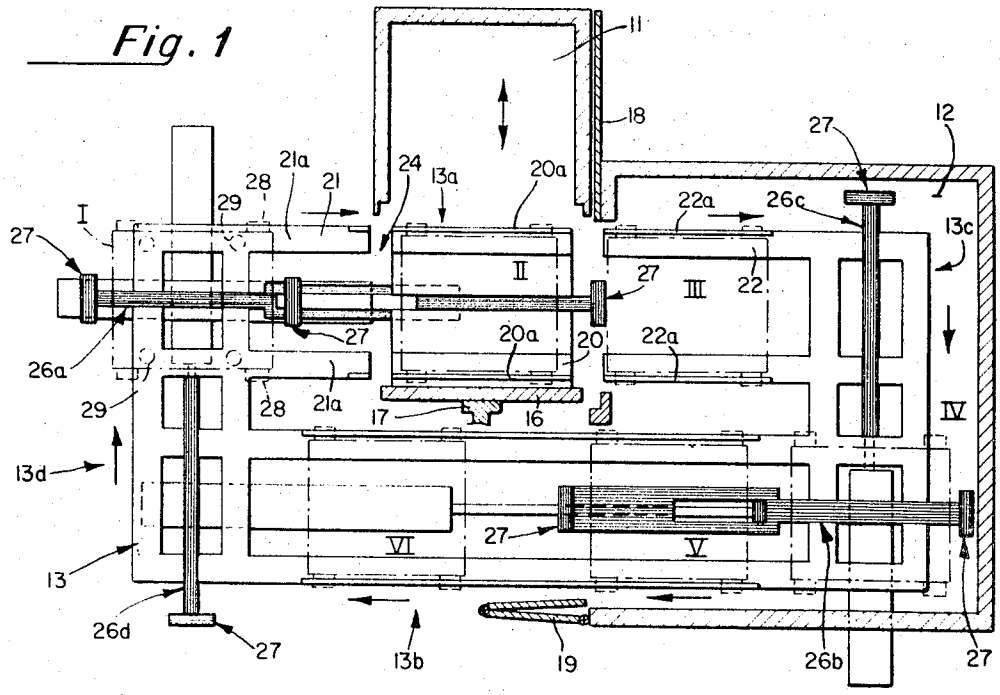
June 24, 1969 G. A. CARRUTHERS 3,451,600

TEXTILE TREATING METHOD

Filed Sept. 11, 1967 Sheet 1 of 2

Fig. 1



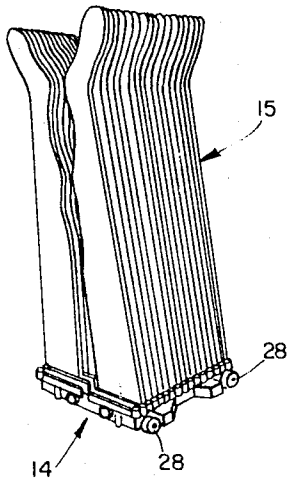


Fig. 2

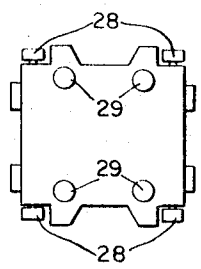


Fig. 3

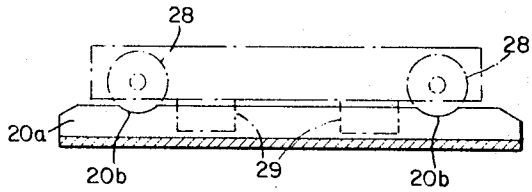


Fig. 4

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TEXTILE TREATING METHOD

Filed Sept. 11, 1967 Sheet 2 of 2

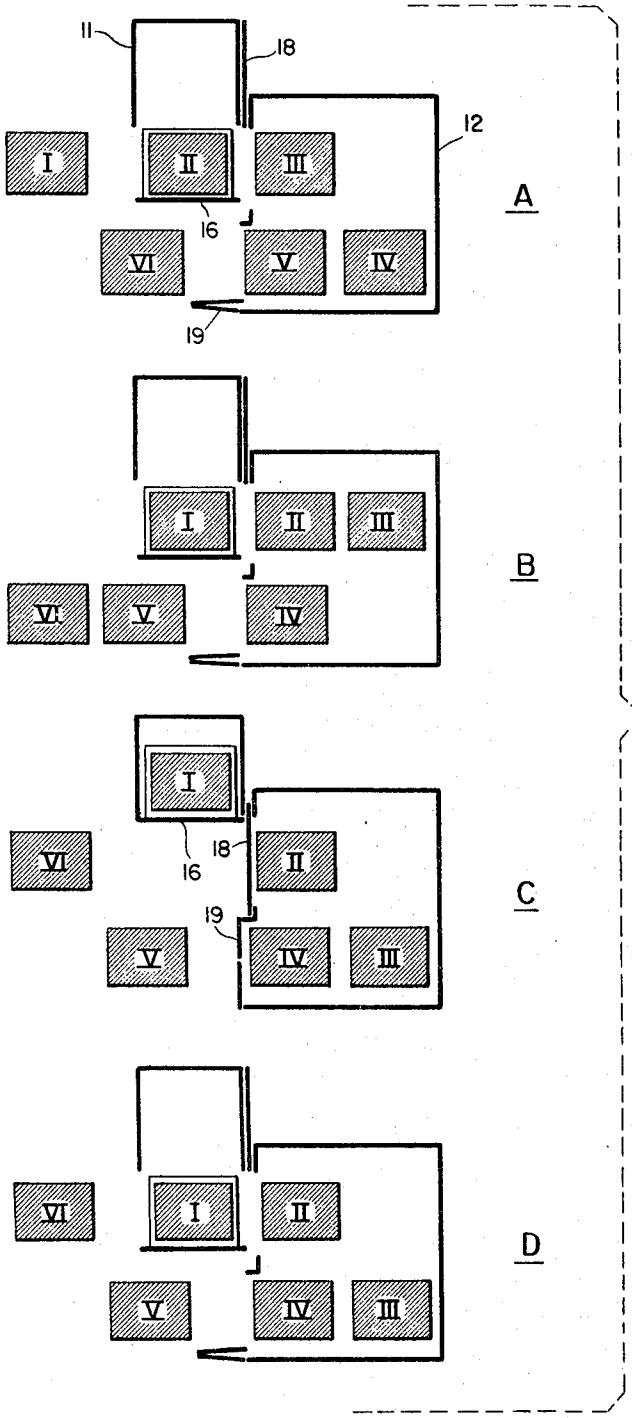


Fig. 5

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3,451,600

TEXTILE TREATING METHOD

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Int. Cl. D06c 5/00, 7/00
U.S. Cl. 223—76 7 Claims

ABSTRACT OF THE DISCLOSURE

In an automated method of finishing greige goods, preferably made of thermoplastic yarns, greige goods are placed upon boarding forms mounted on a carriage. The carriage is automatically moved to a second position in front of an open autoclave. It then is inserted into the autoclave and the door of the autoclave is closed. The goods undergo dyeing and heat setting in the autoclave, subsequent to which the door is opened and the carriage is removed. The carriage then is passed into a drying chamber, after which the chamber is closed, and the stockings are dried therein. At least two carriages are in the drying chamber at a time. Each time a carriage is inserted into the drying chamber, another is ejected therefrom. Each time the autoclave door closes, the doors are closed on the dryer, so that drying proceeds simultaneously with the treatments in the autoclave. The goods remain in the dryer at least twice as long as they remain in the autoclave.

Cross references to related applications

Reference is made to British patent application No. 53,065/66, filed Nov. 26, 1966, on the basis of which claim of priority is made under 35 U.S.C. §119.

Background of the invention

This invention concerns a method for dyeing, heat setting and drying textile articles preferably made of thermoplastic synthetic yarn, wherein greige articles are placed on shaping forms mounted on carriages and passed through successive chambers in which the articles are first subjected to dyeing and heat setting treatments, whereby they are dyed and set to the shape of the forms, and then dried. The expression "thermoplastic synthetic yarn" includes spun yarn and plural filament yarn comprising thermoplastic material; and also includes a monofilament of thermoplastic material. The invention is particularly applicable to the dyeing and finishing of ladies' stockings made of nylon or other thermoplastic synthetic yarn. However, it is also applicable to the treatment of other textile articles which require dyeing and setting to shape, and even for non-thermoplastic materials, such as those requiring dyeing and drying without setting.

The apparatus used in the prior art is similar to that shown in U.S. Patent 3,162,031 issued Dec. 22, 1964 and U.S. Patent 3,131,840 issued May 5, 1964. These patents disclose textile treating apparatus for heat setting and finishing textile articles while mounted on shaping forms. Basic to the apparatus is the element of a plurality of shaping forms for the textile articles, which forms are mounted on movable carriages. The carriages are attached to a conveyor system which has a number of stations or stops where work is performed on the textile material. For example, at the first station the greige textile articles are loaded onto the forms on a carriage. The carriage is then moved to the second station, which may be a position in an autoclave or similar chamber, wherein the articles undergo heat setting, dyeing and drying treatments. Next, the carriage is removed from the autoclave

and moved to a station where the finished textile materials are removed from the forms. Such an apparatus is shown in U.S. Patent No. 3,131,840.

U.S. Patent No. 3,162,031 discloses a similar type of apparatus, wherein the stockings are heat set and dyed in an autoclave. After they leave the autoclave, they are placed temporarily on a storage rack, and then moved into a second chamber where they are dried.

Summary of the invention

This invention provides a method of handling textile shaping forms mounted in groups on carriages, in which the carriages are traversed intermittently in a closed path through two successive heat treatment chambers, one of which is also a dyeing chamber, and through a loading and unloading region exterior to said chambers; the intermittent travel providing a pause of each carriage in each chamber and in said region. This path may include a branch along which the carriages are moved into and out of one of the chambers, such as the dyeing chamber. This branch may be unidirectional in the sense that the carriages are moved to and fro along it.

The principal object of this invention is to provide an improved, simple and efficient, automated method for treating thermoplastic textile products, such as nylon stockings, which utilizes a minimum number of steps and which reduces the time required to produce the finished product.

Brief description of the drawings

FIG. 1 is a diagrammatic plan view illustrating the closed track system, the two chambers, and the various stations to which the carriages are successively moved;

FIG. 2 is a perspective view of a carriage showing shaping forms for stockings mounted thereon;

FIG. 3 is a diagrammatic plan view of the underneath of the carriage showing the position of the pads and wheels used to negotiate the track system shown in FIG. 1;

FIG. 4 is a detail showing the carriage positioning means in the track portion disposed on the inside of the door of the smaller chamber shown in FIG. 1; and

FIGS. 5A through 5D diagrammatically illustrate the manner in which the carriages are shifted about the closed path shown in FIG. 1.

Description of the preferred embodiments

Referring to FIG. 1, the two successive chambers are illustrated at **11** and **12**; **11** being an autoclave or dyeing chamber; and **12** being a drying oven. The closed path is indicated by the track system, designated generally **13**, having longitudinal portions **13***a* and **13***b* and cross portions **13***c* and **13***d*. The direction of movement is indicated by the arrows. In the apparatus shown there are six carriages designated by the Roman numerals I through VI, and shown in phantom lines in their initial positions on the track system.

Each carriage is similar to that shown in FIG. 2, designated **14**, and carries a group of shaping forms designated **15**. These forms are themselves well known in the art and each consists of a substantially flat board-like member shaped to give a textile article disposed thereon its appropriate final shape. For example, in the case of ladies' stockings, each form has the shape of a leg and foot of the stocking. The normal loading and unloading procedure does not entail removal of the boards from the carriage. Stockings are loaded and unloaded with the boards in place. However, it is within the scope of the invention to effect loading by mounting on the carriages forms on which the greige articles have already been placed, and to effect unloading by removing from the carriages forms carrying the finished articles, which may

thereafter be stripped from the forms. In the preferred arrangement, the forms are mounted vertically on the carriages, so that they stand upright therefrom in parallel vertical planes with a gap between successive forms on each carriage. The forms on each carriage preferably are hingedly mounted so that they open out like the leaves of a book, in order to permit the articles to be readily put on and stripped off of them. Any mounting may be provided as is well known in the art.

Referring once again to FIG. 1, the chamber **11** has a vertical door **16** horizontally movable on a suitable guide (not shown) by a power mechanism, such as a hydraulic jack **17**, between the open position shown in FIG. 1, and a closed position more clearly shown in FIG. 5C, all as disclosed in U.S. Patents 3,131,840 and 3,162,031. In the closed position, door **16** hermetically seals the chamber **11**.

The oven chamber **12** has a suitable sliding door **18** for closing its entrance and a folding or hinged door **19** for closing its exit. These doors are power operated.

The track system **13** on which the carriages **14** travel around the path, has a portion **20** which is mounted on the inside of door **16**. In the open position of the door **16**, track portion **20** is aligned with the adjacent portions **21** and **22** of the track system, on either side thereof. In this position, track portion **20** is capable of receiving a carriage from track portion **21** and discharging a carriage onto track portion **22**. As the door **16** moves to its closed position, it carries into the chamber **11** track portion **20**, and any carriage which is supported thereon.

As will be seen in FIG. 1, the track system **13** is in the form of a rectangular closed path. Thus, in travelling around this path, each carriage **14** has to be capable of moving at right angles to its prior direction of travel. For this reason, each carriage is provided with two pairs of spaced rollers **28** and two pairs of spaced slide pads **29** (see FIG. 3).

It will be noted that the track system is continuous and uninterrupted save for the portion **20**, previously described, which moves into and out of the chamber **11**. To pass a carriage across the gap **24** between the portion **21** and the portion **20** of the track, the slide pads **29** supporting the carriage slide along the horizontal slide bars **21***a* until the rollers **28** at the leading end of the carriage engage the vertical rails **20***a* on the track portion **20**. The same principle is used to move the carriage from track portion **20** to track portion **22**, that is, the slide pads **29** support the carriage until the lead rollers **28** cross the gap between the portion **20** and the portion **22** and engage the vertical rails **22***a*.

The vertical rails **20***a* of track portion **20** have depressions **20***b* in the upper surface thereof, as shown in FIG. 4. The rollers **28** of the carriage progress along the vertical rails **20***a* until they will drop into the depressions **20***b* which serve to accurately position the carriage in register with the chamber **11**.

Each carriage is moved from one position to another on the track system by positioning means, such as hydraulic rams. In FIG. 1, rams **26***a* and **26***b* function to engage the carriages and position them along the longitudinal track portions **13***a* and **13***b* respectively. Rams **26***c* and **26***d* function to engage the carriages and position them along the cross portions **13***c* and **13***d* respectively. The hydraulic rams are actuated by conventionally operated hydraulic cylinders (not shown), and engage the carriages at the base thereof by means of pushers designated **27**.

When the carriages reach the ends of the respective longitudinal portions **13***a* and **13***b* of the track system, the longitudinal rams **26***a* and **26***b* respectively are disengaged and returned to their initial positions as shown in FIG. 1. Next, the carriages are moved along the cross portions **13***c* and **13***d* respectively in the direction of the arrows. For example, in moving the carriage III from its

position shown in FIG. 5B to its position shown in FIG. 5C, the hydraulic ram **26***c* engages the carriage and slides it on the pads **29** along the slide bars of portion **13***c* of the track system. Note that the vertical rails do not extend over the full longitudinal portions of the track system. Thus referring to FIGS. 1, 5A and 5B, when the carriage III leaves the vertical rails **22***a* in FIG. 1 and is moved from its position in 5A to its position in 5B, it is supported on the pads **29** and not the rollers **28**. It slides on the pads **29** along the slide bars of the track portion **22** until it comes to rest in the position shown in FIG. 5B. In this position the rollers **28** no longer engage the vertical rails **22***a* and therefore there is no interference with the rails when the carriage is moved to the position shown in FIG. 5C. The pushers are so constructed and arranged that, on the return of the respective rams, they are depressed to an inoperative position so as not to drag the carriages back.

The door **16** is interconnected with the doors **18** and **19** of the chamber **12**, so that the three doors open and close simultaneously in conjunction with the movement of the carriages.

Referring to FIG. 5, six carriages are shown schematically in operative position in the apparatus. It is to be assumed that the door **16** has just been opened after a dyeing operation, and that the doors **18** and **19** of the chamber **12**, which contains the carriages III, IV, and V, are open. Carriage I has been loaded with goods to be treated. For covenience this may be considered the starting point of the cycle of operations.

In the next step, the hydraulic jacks are brought into operation to shift the carriages to the positions shown in FIG. 5B, that is, all the carriages are moved longitudinally along the tracks to their new stations. Thus, carriage I which has been loaded with a fresh supply of goods to be treated is now in register with the opening to the autoclave or chamber **11**, so that in the next step it may be inserted into the autoclave for treatment. Carriage II, which had been in the autoclave **11**, is now moved into the dryer **12**. Carriages III and IV remain in the dryer **12**. Carriage V is moved out of the dryer **12**, and to a position where its goods may be removed from the forms. The hydraulic rams **26***a* and **26***b* are then withdrawn to their original positions, as shown in FIG. 1. As soon as they reach the end of their travel, the rams **26***c* and **26***d* operate to move the carriage III to the position shown in FIG. 5C, and carriage VI to the position shown in FIG. 5C. Simultaneously, the doors **18** and **19** of the dryer and the door **16** of the autoclave are closed, and track section **20** with the carriage thereon is moved into the autoclave. At this point the processing in the autoclave and the dryer begins, and the rams **26***c* and **26***d* are withdrawn to their original positions. During this time interval, the finished goods are unloaded from carriage V and a new batch of greige goods is loaded on carriage VI.

After the goods in the autoclave **11** are dyed and heat set, the door **16** is opened, withdrawing the carriage I to the position shown in FIG. 5D. Simultaneously the doors **18** and **19** are opened. It will now be noted that the relative positions of the carriages are exactly the same as that shown in FIG. 5A; each carriage having advanced one step in the process. The cycle is now repeated.

The drying operation in chamber **12** is affected by the circulation therethrough of heated air. The admission of the heated air is suspended while the doors **18** and **19** are open.

The various step by step operations, the duration of the pauses, and the timing and duration of the admission of the steam and the dye set to the chamber **11**, are variable or adjustably controlled by a suitable timing and temperature control apparatus (not shown).

It will further be understood that the "Abstract of the Disclosure" set forth above is intended to provide

a non-legal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the United States Patent Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. In the method of heat-setting, dyeing and drying textile articles made of synthetic thermoplastic yarns capable of being heat-set to a predetermined shape, the steps which comprise:

(a) mounting said articles on forms conforming to said predetermined shape, said forms being mounted on a carriage,

(b) advancing said carriage along a closed substantially rectangular path to a first station and admitting the carriage into a treatment chamber at said station,

(c) dyeing and heat-setting the articles on the carriage in said treatment chamber,

(d) removing the carriage from the chamber,

(e) advancing the carriage to a second station in said closed path within a drying chamber,

(f) closing said drying chamber and subjecting the articles on the carriage to drying therein,

(g) advancing the carriage to at least one additional station in the closed path within the drying chamber and subjecting said articles to further drying in said chamber, whereby said articles are dried for a period at least twice as long as that during which the articles remained within the treatment chamber,

(h) opening the second chamber and ejecting the carriage from said chamber to a subsequent station in said closed path, and

(i) removing the articles from the forms on the carriage.

2. The method of claim 1 wherein:

(a) a plurality of carriages move along the closed path from station to station in successive relationship, and

(b) at least two carriages are disposed within the drying chamber concurrently with the disposal of a third carriage in the treatment chamber.

3. In the method of claim 1, the step of advancing the carriage into said first treatment chamber along a unidirectional path which extends outwardly from said substantially rectangular path.

4. A method as in claim 3 wherein a plurality of carriages move along the closed path from station to station in successive relationship and at least three carriages are disposed within the drying chamber concurrently with the disposal of a fourth carriage in the treatment chamber.

5. A method as in claim 4 wherein the steps of simultaneously sealing the treatment chamber and the drying chamber when said carriage has been admitted into the treatment chamber and simultaneously opening the drying chamber and the treatment chamber when said carriage is removed from the treatment chamber.

6. In the method of heat-setting, dyeing and drying textile articles made of synthetic thermoplastic yarns capable of being heat-set to a predetermined shape, the steps which comprise:

(a) mounting said articles on forms conforming to said predetermined shape, said forms being mounted on a carriage,

(b) rolling said carriage along a closed substantially rectangular path to a first station and admitting the carriage into a treatment chamber at said station,

(c) dyeing and heat-setting the articles on the carriage in said treatment chamber,

(d) removing the carriage from the chamber,

(e) rolling the carriage to a second station in said closed path within a drying chamber,

(f) closing said drying chamber and subjecting the articles on the carriage to drying therein,

(g) sliding the carriage to at least one additional station in the closed path within the drying chamber and subjecting said articles to further drying in said chamber, whereby said articles are dried for a period at least twice as long as that during which the articles remained within the treatment chamber,

(h) opening the second chamber and rolling the carriage from said chamber to a subsequent station in said closed path,

(i) removing the articles from the forms on the carriage, and

(j) sliding the carriage to a subsequent station for mounting similar articles and repeating the process.

7. In the method of dyeing and drying textile articles made of yarn, the steps which comprise:

(a) mounting said articles on forms, said forms being mounted on a carriage,

(b) advancing said carriage along a closed substantially rectangular path to a first station and admitting the carriage into a treatment chamber at said station,

(c) dyeing the articles on the carriage in said treatment chamber,

(d) removing the carriage from the chamber,

(e) advancing the carriage to a second station in said closed path within a drying chamber,

(f) closing said drying chamber and subjecting the articles on the carriage to drying therein,

(g) advancing the carriage to at least one additional station in the closed path within the drying chamber and subjecting said articles to further drying in said chambers, whereby said articles are dried for a period at least twice as long as that during which the articles remained within the treatment chamber,

(h) opening the second chamber and ejecting the carriage from said chamber to a subsequent station in said closed path, and

(i) removing the articles from the forms on the carriage.

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34—236; 68—10