United States Patent

Glaze, Jr. et al.

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[54] **METHOD OF SHRINKING AND/OR DYEING KNIT GARMENTS**

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[52] **U.S. Cl.** .....**28/74 H,** 8/150, 68/5 R, 68/10

[51] **Int. Cl.** **D06p 7/00,** D06c 1/00

[58] **Field of Search**.....68/10, 20, 5 R; 8/150; 28/74 H; 66/147

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Primary Examiner—Robert R. Mackey
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[57] **ABSTRACT**

Knit garments are processed in a substantially continuous process in which a plurality of small movable processing chambers are provided for receiving the garments individually or in small groups for processing therein. The garments are subjected to dyeing and/or other processing operations in the individual chambers, then conveyed therefrom for further processing or packaging. By employing a plurality of small processing chambers, garments may be delivered individually as from a knitting or sewing operation and processed individually or in small groups with the garments processed in the individual chambers remaining separated for further automatic operations such as packaging.

7 Claims, 4 Drawing Figures

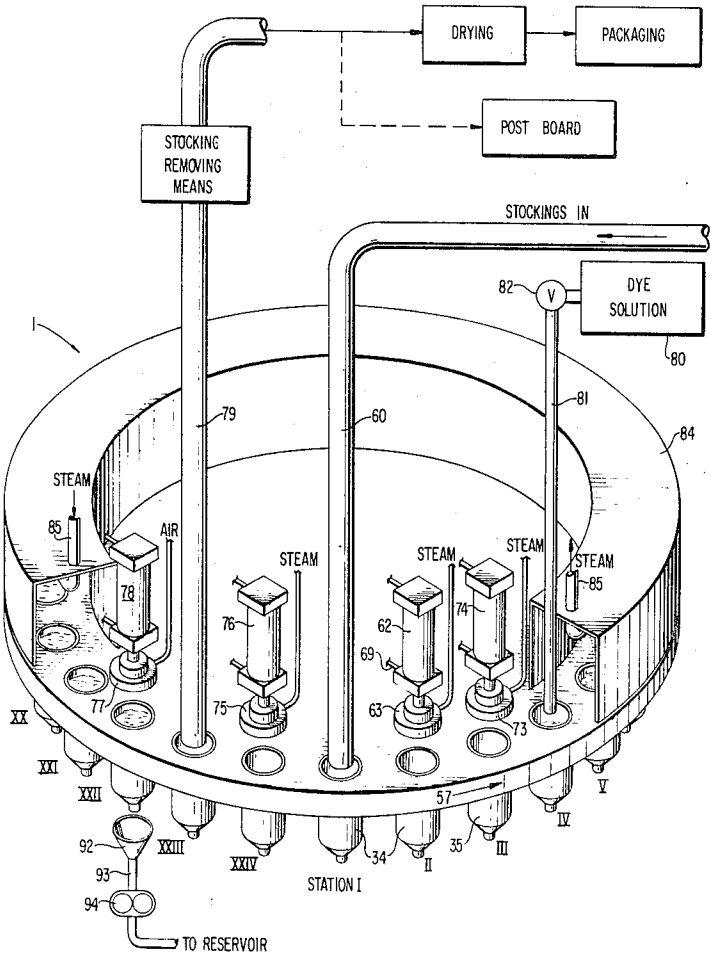
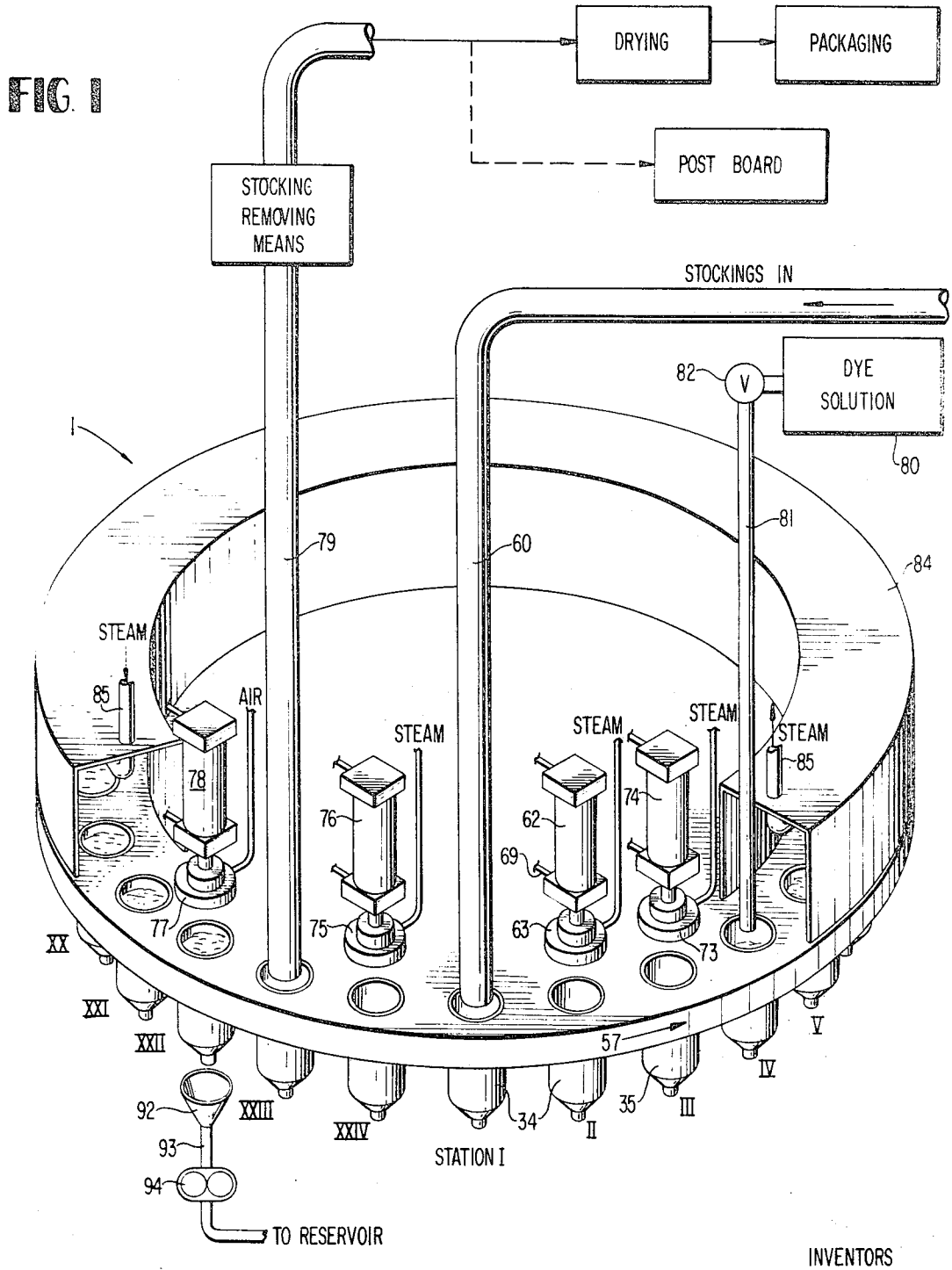


FIG. 1

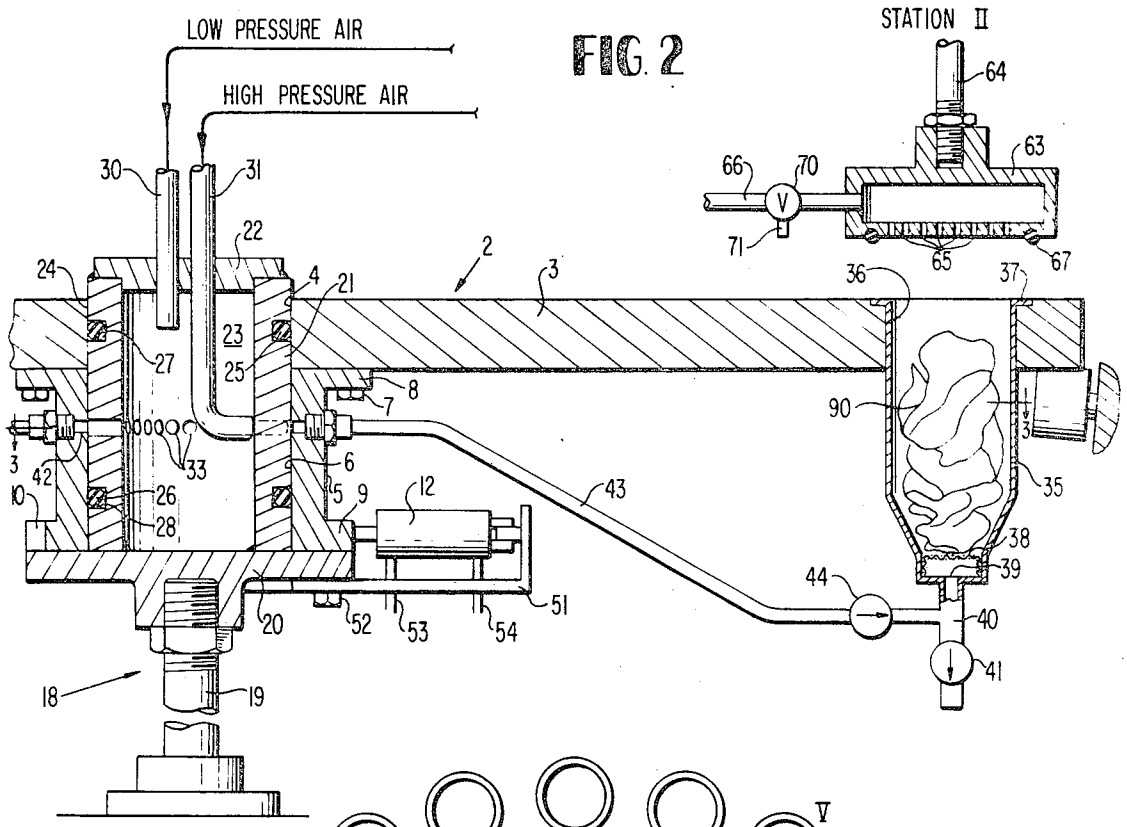


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FIG. 2


LOW PRESSURE AIR
HIGH PRESSURE AIR
STATION II
30
31
22
24
4
21
2
3
23
25
27
8
7
6
5
9
12
43
42
26
28
33
10
20
52
53
54
51
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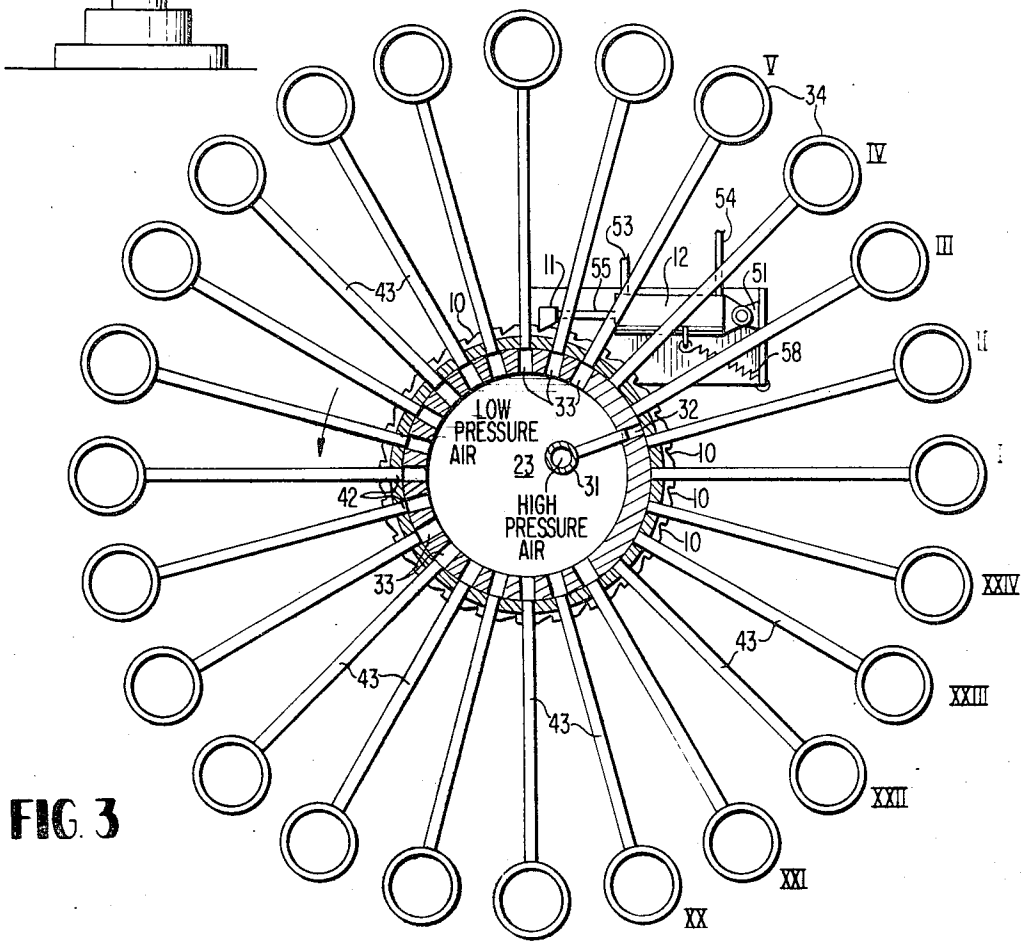

V
34
IV
III
II
I
XXIV
XXIII
XXII
XXI
XX
54
53
11
55
12
51
58
43
10
LOW PRESSURE AIR
33
32
23
31
HIGH PRESSURE AIR
42

FIG. 3

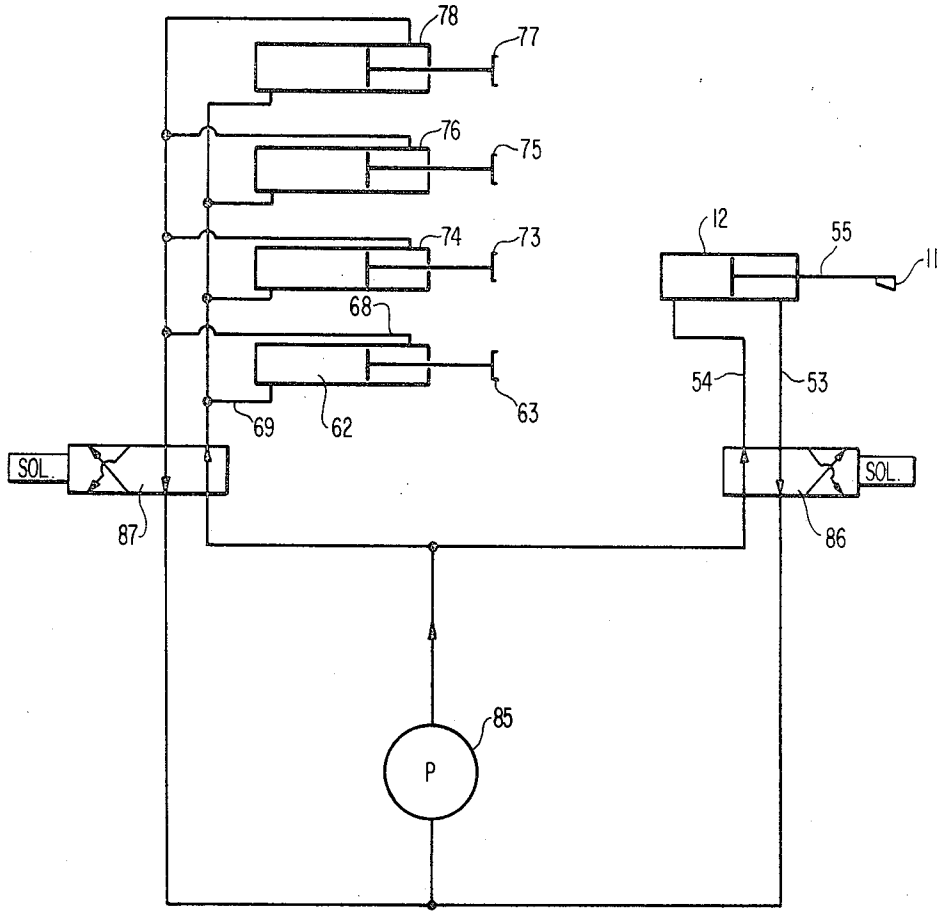


FIG. 4

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METHOD OF SHRINKING AND/OR DYEING KNIT GARMENTS

This invention relates to an improved knit garment processing method and apparatus, and more particularly to an improved method of and apparatus for processing garments knit from undyed synthetic yarn. While the invention is particularly well adapted to the processing of ladies stockings, it is equally useful in the processing of various garments such as knit leotards, panty hose, or the like, as well as component parts of such garments. Thus, while the invention is described herein with specific reference to stockings, this reference is for convenience of description and it is understood that the invention is not so limited.

In the manufacture of ladies stockings from synthetic yarns, it has long been the practice to knit the stockings in the form of an open ended tube on a circular knitting machine, and to subsequently close the toe of the tube by passing the to end through an overedge sewing machine which simultaneously trims and closes the toe of the stocking. Thereafter, the stocking, which was knit from undyed yarns, is subjected to dyeing and boarding operations to initially dye and subsequently shape the stocking on a boarding form having a contour substantially similar to that of the profile of the human leg and foot. Alternatively, the stockings may be simultaneously dyed and shaped in a dye-boarding operation in which the undyed stocking is manually placed upon a boarding form, then wet with a liquid dye solution in the heated boarding chamber to simultaneously dye and shape the stocking.

The development of the stretch stocking has presented additional problems to the industry in that difficulty has been encountered in obtaining a uniform shrinking of the knit stocking. While numerous attempts have been made to correct or compensate for this difficulty, as illustrated for example, in U.S. Pat. Nos. 3,310,966 and 3,333,314, the difficulty has in fact become more acute with the advent of the so-called super stretch, or one size stockings, leotards, and panty hose.

It is a well known characteristic of sheer stockings that repeated or continuous handling of the stockings, particularly in bulk, i.e., with the stockings in contact with one another, materially increases the number of seconds, or rejects, resulting from pulled threads or the like. Thus, it has long been the goal of the hosiery industry to produce stockings in a fully automatic process, thereby eliminating the repeated handling of the stockings. To this end, knitting machines have been developed which will automatically close the toe of the stocking, thereby eliminating the necessity for the separate sewing machine operation to close the toe. However, it has remained the general practice to collect the stockings in large groups for the dyeing, boarding, drying, inspecting, and other operations.

To overcome the difficulties of the prior art as discussed above, we have developed an improved method and apparatus adapted to the fully automatic processing of stockings. Alternatively, the method and apparatus may be employed in a semi-automatic operation for performing certain only of the steps in processing knitted stockings. This is accomplished by providing a plurality of small, movable processing chambers each adapted to receive individual or small groups of stockings for processing therein, in sequence,

as the stockings are delivered to the apparatus. Preferably the stockings are delivered individually through a conventional pneumatic or other conveying system, as from the knitting or toe closing operation, and deposited into a processing chamber positioned at a delivery station. The processing apparatus is then indexed to remove the chamber containing a stocking from the delivery station and to advance the next processing chamber in sequence to the delivery station. Subsequent indexing movement advances the individual stockings in sequence through the apparatus where various processing steps are accomplished on the stocking within the respective processing chambers. These processing steps may include such operations as scrubbing, shrinking, and dyeing, including dye extraction, with subsequent stocking removal and transportation for further processing such as drying and packaging or post boarding.

The method and apparatus of this invention may best be described with specific reference to the accompanying drawings, in which:

FIG. 1 is a fragmentary perspective view of a stocking treating apparatus according to the invention, with certain elements omitted for clarity of illustration;

FIG. 2 is an enlarged fragmentary elevation view, in section, illustrating the processing chambers mounted on a turntable;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2 and illustrating the relative position of the respective processing chambers; and

FIG. 4 is a schematic illustration of the fluid control system for the apparatus.

Referring now to the drawings in detail, an apparatus according to the present invention, and which is capable of carrying out the improved method, is indicated generally by the reference numeral **1** and includes a turret assembly **2** having a disk-shaped body **3** with an axial bore **4** formed therein. A cylindrical hub **5** having an axial bore **6** therein is mounted on body **3**, as by bolts **7** extending through flange **8**, with the bore **6** axially aligned with bore **4**. Hub **5** has a radially extending flange **9** formed on its lower end, and a plurality of ratchet teeth **10** are formed in the outer peripheral surface of flange **9** in position to be engaged by a dog **11** on the end of the piston **55** of a linear fluid motor **12** to rotate the turret about its vertical axis in the manner and for the purpose to be explained more fully hereinbelow.

Hub **5** is supported for rotation about a vertical axis by a rigid frame or pedestal **18** comprising a fixed central support column **19** having on its upper end a radially extending flange **20**. A cylindrical sleeve **21** is rigidly mounted, as by welding, on the upper surface of flange **20**, and a cover **22** is rigidly mounted on the upper end of the sleeve **21** to define a hollow pressure chamber **23**. The outer cylindrical surface **24** of sleeve **21** fits snugly within the inner bore **6** of hub **5** and cooperates therewith to define the vertical axis of rotation of the turret assembly **2**. A pair of O-rings **25**, **26**, respectively, are mounted in O-ring grooves **27**, **28** axially spaced along the outer cylindrical surface **24**, with the O-rings **25**, **26** forming a fluid seal between the hub **5** and the sleeve **21**.

A pair of conduits **30**, **31** extend through and are rigidly attached, as by welding, to the closure **22**, with

conduit 30 terminating in an open end positioned within the hollow chamber 23. Conduit 31 has its end connected in fluid communication with an opening 32 extending through the cylindrical wall of sleeve 21 at a point spaced between the O-rings 25, 26. A plurality of radially extending openings 33 are formed through the wall of sleeve 21 at spaced intervals therearound, with the openings 33 being positioned along a path defined by a plane perpendicular to the axis of sleeve 21 and spaced between the O-rings 25, 26.

The body 3 of turret 2 has a plurality of identical processing chambers 34 mounted at equally spaced intervals in a circular path adjacent its outer periphery. In the drawings, 24 such processing chambers 34 are illustrated, with the processing chambers being equally spaced at 15° intervals around the turret. Also, as seen in FIG. 3, there are 24 ratchet teeth 10, similarly spaced at 15° intervals around the outer periphery of flange 9. The processing chambers 34 each comprise an open topped cup 35 supported within an opening 36 in body 3 by an outwardly directed flange 37 formed around the open top of the cup. A screen 38 is positioned within the cup in fixed spaced relation above the bottom wall of the cup. A downwardly extending conduit 40 is rigidly attached to the bottom of the cup in fluid communication with the opening 39, and a pressure relief valve 41 is connected in the conduit 40 to permit flow of fluid from the processing chamber 34 only upon build-up of a predetermined pressure within the chamber.

The hub 5 has 24 radially extending openings 42 formed therein at 15° intervals around the outer periphery thereof, with the openings 42 being positioned so that each of the openings 33 will be in alignment with an opening 42 at 15° intervals of relative rotation between the turret 2 and pedestal 18. Each of the openings 42 is connected, by conduit 43, to the conduit 40 at a position between the opening 39 and the pressure relief valve 41. A check valve 44 is connected in conduit 43 to permit flow of fluid through conduit 43 into conduit 40, while preventing reverse flow through conduit 43.

In order to rotate the turret 2 about the vertical axis of the pedestal 18, the two-way linear fluid motor 12 is pivotally mounted, as by bracket 51 rigidly supported by suitable means, such as bolts 52, on the flange 20. Fluid, under pressure, is supplied to opposed ends of a piston within the motor 12, through conduits 53, 54 to drive the piston rod 55 in the conventional manner. The dog, or bracket 11 is rigidly mounted on the distal end of piston rod 55 in position to engage one of the rachet teeth 10 and rotate the turret in a counterclockwise direction, as indicated by the arrow 57 in FIG. 1, each time the piston rod 55 is driven outwardly from the motor. Travel of the piston rod and the positioning of the fluid motor 12 is such as to rotate the turret exactly 15° each time the piston rod 55 is projected, and to stop the turret with each opening 33 aligned with an opening 42. The bracket 11 is maintained in contact with the rachet teeth 10 by any suitable resilient means indicated generally by the spring 58 extending between the fluid motor 12 and bracket 51.

Referring particularly to FIGS. 2 and 3, it is seen that, by admitting low pressure air through conduit 30 into the pressure chamber 23, this low pressure air will be free to flow outwardly through each of the openings 33 in sleeve 21 and into an opening 42 aligned therewith, thence outward through conduits 43 and check valves 44 to be discharged into conduit 40. Since the pressure in chamber 23 is relatively low, the flow of air through the respective conduits 43 will be relatively low and the pressure in conduit 40 will be determined by the level of any liquid in the processing chambers 34. Thus, by maintaining the setting of the pressure relief valve 41 above the pressure of the air in conduit 43, this air will flow outward through opening 39 into the processing chambers 34 to agitate liquid dye in the chamber as described more fully hereinbelow.

As can be seen in FIG. 3, the location of opening 32 in sleeve 21 is such that it will be in alignment with on only of the openings 42 in hub 5 for a brief interval as the turret is rotated, or indexed, about the vertical axis of the pedestal. Thus, air under relatively high pressure in conduit 31 can pass into opening 32 and outward through one of the conduits 43 for a brief interval each time the turret is rotated by the fluid motor 12. While the high pressure air may be admitted at a pressure above the setting of the pressure relief valve 41, this air flows immediately through opening 39 into the interior of the processing cup 34 so that sufficient pressure is not built up in the conduit 41 during this brief interval to open the pressure relief valve 41. The purpose of this brief flow of high pressure air will be more fully described hereinbelow.

As indicated in FIGS. 1 and 3, reciprocal movement of the piston 55 of linear fluid motor 12 advances the respective processing chambers 34 successively through a series of work stations numbered counterclockwise consecutively I through XXIV. At Station I, sometimes hereinafter referred to as the receiving station, a processing chamber 34 is positioned with its open mouth directly beneath the open end of a pneumatic conveying tube 60. This conveying tube 60 is a part of a conventional pneumatic conveyor of the type commonly employed in hosiery mills to convey individual stockings, as for example, from the circular knitting machines to a subsequent work station such as the toe closing station. Thus, a stocking discharged from the tube 60 will automatically be deposited in an open processing chamber 34 positioned immediately therebeneath. As indicated in FIGS. 1 and 2, a two-way fluid cylinder 62 is positioned directly above the open end of a processing chamber located at Station II. A steam head 63 is mounted on the end of the piston rod 64 of the two-way cylinder 62 for movement into and out of engagement with the upper surface of the turret, with the steam head 63 overlying the open end of the processing chamber. A plurality of openings 65 in the bottom surface of the steam head permit the flow of steam through conduit 66 directly into the processing chamber. A resilient gasket carried on the bottom surface of the steam head 63 forms a seal with the top surface of the body 3 to prevent escape of steam into the atmosphere when the steam head is in the lowered position in engagement with the turret. Fluid, under pressure, is admitted to opposed ends of the fluid cylinder 62, through conduits 68, 69, respectively, to drive the motor to project steam head 63 into and out of engagement with the top surface of the turret 2. A valve 70 is connected in line 66 adjacent the steam head 63, and a

valve actuator 71 is positioned to engage the top surface of the body 3 of turret 2 to open and close the valve to admit steam into the steam head 63 only when the head is in the lowered position in engagement with the turret.

As indicated in FIG. 1, processing Station III has a steam head 73 positioned thereover for movement by a fluid motor 74, and station XXIV has a steam head 75 positioned thereover for movement by a fluid motor 76. The steam head, actuating motors, and associated components at Stations III and XXIV are identical to the corresponding components just described with respect to Station II, and accordingly these devices will not be described in detail here. It should be pointed out, however, that each of the three steam heads are actuated simultaneously to force steam, under pressure, into the associated processing chamber. A fourth pressure head 77, identical to the steam heads 63, 78, and 75, is positioned above processing Station XXII for movement into and out of engagement with the turret by fluid motor 78 identical to fluid motors 62, 74, and 76. However, air instead of steam is directed to the interior of the pressure head 77 for the purpose to be more fully described hereinbelow. A second pneumatic conveyor tube 79 has its open end positioned directly above processing Station XXIII in position to remove, by vacuum, a stocking positioned in a processing chamber 34 therebeneath.

A reservoir 80 containing a supply of heated dye solution is provided, and a conduit 81 extending from the reservoir terminates in an open end positioned immediately adjacent processing Station IV. A suitable two-way solenoid actuated valve 82 is provided in conduit 81 to control the flow of dye through the conduit 81.

Referring to the schematic illustration in FIG. 4, it is seen that fluid under pressure is supplied to the motor 12 from a suitable pump 85 through a solenoid actuated valve 86 which is operable to direct pressure fluid either through line 53 or 54 to drive the motor to alternatively project and retract the piston rod 55. Similarly, fluid under pressure is supplied to motors 62, 74, 76, and 78, simultaneously, by a solenoid actuated three-way valve 87. Operation of the solenoid actuated valves 86 and 87, as well as the solenoid actuated two-way valve 82, is controlled by a conventional electrical timer. Since such timers and their operation are well known, a detailed description thereof is not believed necessary here.

A heat shield, or hood, 84 is supported above the turret 11 and extends from processing Station V to Station XX. This hood 84 is for the purpose of preventing heat from escaping from the heated dye solution, and to this end, heat may be supplied within the hood 84 by any suitable means such as by applying live steam through a conduit 85 extending within the hood 84 above the open tops of the processing chambers.

To utilize the above described apparatus in the performance of the improved process, a stocking may be delivered form the conventional pneumatic conveying system, as from a toe closing operation and deposited into a processing chamber 34 at receiving Station I. Fluid under pressure is then directed through conduit 54 to actuate motor 12 and index the turret through 15° to advance the stocking to Station II and advance the next consecutive processing chamber to Station I in position to receive a stocking from the pneumatic conveying system. Fluid is then directed through conduit 68 to project steam head 63 downwardly into engagement with the top of the turret, thereby actuating valve 70 and admitting wet steam, under pressure, into the interior of the processing chamber. Since the stocking is deposited into the processing chamber in a loosely fluffed condition, as indicated at 90 in FIG. 2, the wet steam contacts the stocking throughout almost instantaneously, thereby quickly shrinking the stocking.

To facilitate contact of the wet steam with the stocking, the steam is permitted to flow downward through the processing chamber, past screen 38 and out through conduit 40 and pressure relief valve 41. Valve 41 is set to permit the pressure within the processing chamber to operate the valve and permit the steam to escape while maintaining the necessary pressure within the processing chamber to maintain the desired temperature for shrinking the stockings. However, check valve 44 prevents the flow of steam back through conduit 43.

The downward flow of steam through the stocking and the processing chamber tends to compact the stocking 90 slightly into the bottom of the processing chamber. After steam has been permitted to flow through the processing chamber and stocking for the desired length of time, preferably in the range of 0.5 to 1.5 seconds, fluid under pressure is admitted through line 69 to actuate motor 62 to lift the steam head 63, thereby stopping the flow of steam into the processing chamber. In the meantime, fluid under pressure has been admitted through line 53 to actuate fluid motor 12 to retract the piston rod 55 and engage the bracket 11 with the next succeeding ratchet tooth 10. Upon retraction of the steam head 63, fluid under pressure is again admitted through conduit 54 to actuate fluid motor 12 to index the turret through 15°, thereby advancing the stocking 90 for Station II to Station III.

While the stocking will normally be completely and uniformly shrunk by the wet steam at Station II, it is conceivable that some small portion may have been constrained so as not to have completely shrunk. To avoid this possibility, it may be desirable to repeat the shrinking step. It is understood, of course, that steam heads 73 and 75 and air heads 77 are actuated simultaneously with steam heat 63, though for simplicity of description, the sequence of treating a single stocking is followed in this description.

After being subjected to wet steam the second time, the turret is again indexed to advance the completely shrunk stocking to Station IV and valve 82 is actuated to admit a measured volume of heated dye solution directly into the processing chamber on top of the shrunk stocking. For treating a small amount of fabric such as one or two stockings, a pair of panty hose, or a pair of leotards, the volume of the processing chambers 34, and therefore of the dye required, may only be in the range of one pint. Thus, the volume of dye solution required to process the individual stocking by this process is comparable to the amount required by conventional bulk dyeing or dye-boarding processes. Further, the used dye solution may be salvaged, if desired, in the manner described hereinbelow.

Again referring to FIG. 3, it is seen that, when the turret is indexed to move the shrunk stocking and the dye solution from Station IV to Station V, the conduit 43 is placed in fluid communication with the low pressure air in chamber 23. This low pressure air flows through the conduit 40 and bubbles up through the dye solution while the stocking is positioned at each successive station through Station XXI to thereby keep the dye and stocking agitated to assure uniform dyeing throughout the stocking.

As the stocking emerges from beneath the hood 84 and advances to Station XXII, the low pressure air is no longer permitted to flow through the processing chamber. At Station XXII, when the air head 77 is lowered, high pressure air is admitted into the pressure chamber to quickly force the liquid dye through the pressure relief valve 41 into a suitable receptacle 92 connected, as by conduit 93, to a pump 94 to return the used dye to the dye reservoir 80, or alternatively to a suitable collection point or waste disposal facility. As the air forces the liquid dye from the processing chamber, air flowing through the stocking supported on screen 38 will effectively extract the liquid from the stocking leaving it in a damp-dry condition. The next indexing movement of the turret advances the damp-dry stocking from the extracting Station XXII to the removal Station XXIII where a suction in conveyor conduit 79 removes the fully shrunk, dyed damp-dry stocking from the processing chamber and conveys it to a suitable drying apparatus where the stocking may be dried individually then advanced again by the conventional pneumatic conveying system, to be automatically deposited in a suitable commercial package. Thus, the method and apparatus lends itself readily to the processing of the super stretch, or one-size stockings which do not require boarding or further processing after shrinking and dyeing so that the stockings may be handled in a completely automatic process from the time they are received at the apparatus from a conventional pneumatic conveying system to the ultimate consumer's package. Alternatively, stockings which require further processing such as post boarding or seaming may be delivered directly to the desired location through the conduit 79.

After removal of the stocking at Station XXIII, the processing chambers may be cleaned and purged of any dye or other residue by subjecting the interior of the processing chamber to a steam bath delivered through the steam head 75. This makes possible the ready change of dye colors or shades without requiring a shut-down and complete clean-up of the apparatus.

If desired, the stockings may be subjected to a scouring operation before shrinking by simply adding a scouring solution through a second dispenser of the type employed for the dye solution, then extracting the scouring solution with a second air head of the type employed at extracting Station XXII. This may be desired when processing some yarns containing excessive amounts of oils or when specific dyes are employed.

It has been found that a 4-second delay between indexing movements of the turret provides ample time to completely accomplish any of the steps at the various stations around the turret. Further, it has been found that, for most synthetic yarns now in common use, completely uniform dyeing may be accomplished in the individual processing chambers in one-half to 1 minute when the dye is appropriately agitated during the dyeing process. Thus, by providing 24 processing chambers in the turret, and indexing the turret about its vertical axis every 4 seconds, each processing chamber will make one complete cycle every 96 seconds. This arrangement will normally permit the stockings to remain in the dye solution for a sufficient length of time to complete the dyeing process even when the two additional stations required for the scouring process described above are utilized. A greater or lesser number of processing chambers may, of course, be provided when desired. Similarly, the time between indexing movements may readily be varied, as may the location of the various stations, to vary the time that the stockings are subjected to the various processing steps.

While the process of the present invention has been described as providing for the use of wet steam for shrinking the stockings and for the subsequent dyeing of the stockings, the basic concept of processing individual stockings (or a predetermined, relatively small number of stockings) in appropriately small processing chambers may readily be employed to dye stockings on a continuous, fully automatic basis without previously shrinking the stockings. This may be desired, for example, where the stockings are to be boarded after dyeing, or when seaming or other operations are to be completed after dyeing. Similarly, it is believed that the basic process and apparatus may be employed to shrink stockings quickly and automatically in a substantially continuous process without the dyeing steps. This may be desirable, for example, when the stockings are completed except for the dyeing, then stockpiled pending receipt of orders for specific dye shades, or where the step of dyeing per se is not required.

It is also contemplated that the basic process may be employed to simultaneously shrink and dye the individual stockings in the processing chambers. This may be accomplished with known yarns by applying the liquid dye solution to the individual processing chambers in a hot or super-heated condition whereby the heat from the dye solution is utilized to shrink the synthetic fabric. Where the fabric requires the dye solution to be super-heated, i.e., heated above 212°F, it is, of course, necessary to inject the solution into the processing chambers under pressure, and to maintain this pressure during the shrinking and dyeing process. While this requires modification of the apparatus to provide for pressurizing the process chambers during soaking, it is believed apparent that the basic concept of processing stockings in a plurality of individual processing chambers in a substantially continuous process remains unchanged.

While we have described a preferred embodiment of our invention, we wish it understood that we do not intend to be restricted solely thereto, but that we do intend to include all embodiments thereof which would be apparent to one skilled in the art and which would come within the spirit and scope of our invention.

We claim:

1. In the art of producing knit garments from synthetic yarns by initially knitting and subsequently shrinking the garments, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a

predetermined number of garments into each of said chambers at said receiving station, pressurizing said chambers successively with wet steam to shrink the garments therein, venting the chambers to atmosphere, separately transporting the garments shrunk in the respective chambers for further processing, processing, fluffing the garments in said chamber, repeating the steps of pressurizing and venting the chamber, and repeating the above steps in a substantially continuous process.

2. In the art of producing dyed knit garments from undyed synthetic yarns by initially knitting and subsequently dyeing the garments, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a predetermined number of undyed garments into each of said processing chambers at said receiving station, adding a predetermined volume of liquid dye solution to said processing chambers successively, advancing said processing chambers along a fixed path to an extracting station while soaking the garments in the liquid dye solution in the respective processing chambers a predetermined length of time, extracting the liquid dye from said garments in each said processing chamber successively at said extracting station while the garments remain in the respective processing chambers by forcing air, under pressure, through said processing chambers and retaining the garments on a screen positioned in said chambers while permitting the dye solution to be forced therefrom by said air under pressure to leave the garments in a damp-dry condition, transporting the garments dyed in each said processing chamber separately for further processing, and repeating these steps to dye garments in a substantially continuous process.

3. In the art of producing dyed knit garments from undyed synthetic yarns by initially knitting and subsequently dyeing the garments, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a predetermined number of undyed garments into each of said processing chambers successively at said receiving station, adding a predetermined volume of heated liquid dye solution to said processing chambers successively, advancing said processing chambers along a fixed path at least a portion of which extends through a heated atmosphere to an extracting station while soaking the garments in the liquid dye solution in the respective processing chambers a predetermined length of time with said heated atmosphere maintaining the temperature of the dye substantially uniform during the soaking of the garments, extracting the liquid dye from said garments in each said processing chamber successively at said extracting station, transporting the garments dyed in each said processing chamber separately for further processing, and repeating these steps to dye garments in a substantially continuous process.

4. In the art of producing dyed knit garments from undyed synthetic yarns by initially knitting and subsequently dyeing the garments, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a predetermined number of undyed garments into each of said processing chambers at said receiving stations, adding a predetermined volume of liquid dye solution to said processing chambers successively, advancing said processing chambers along a fixed path to an extracting station while soaking the garments in the liquid dye solution in the respective processing chambers a predetermined length of time, agitating the dye solution in said processing chambers during at least a portion of said predetermined time by bubbling air upwards through the dye solution, extracting the liquid dye from said garments in each said processing chamber successively at said extracting station, transporting the garments dyed in each said processing chamber separately for further processing, and repeating these steps to dye garments in a substantially continuous process.

5. In the art of producing knit garments from synthetic yarn by initially knitting and subsequently shrinking and dyeing the garment, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a predetermined number of garments into each of said processing chambers at said receiving station, pressurizing said chambers with wet steam to shrink the garments contained therein and subsequently venting the steam from said chambers, adding a predetermined volume of liquid dye solution to said chambers, advancing said processing chambers along a fixed path to an extracting station while soaking the garments in said liquid dye solution in the respective chambers for a predetermined time, extracting the liquid dye from the garments at said extracting station by applying a gas under pressure to said processing chambers to force said liquid dye solution through a pressure-regulating valve, and retaining said garment within said processing chamber during said extraction by use of a screen positioned within said processing chamber, transporting the shrunk, dyed garments for further processing, and repeating these steps to shrink and dye garments in a substantially continuous automatic process.

6. In the art of producing knit garments from synthetic yarn by initially knitting and subsequently shrinking and dyeing the garment, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, depositing a predetermined number of garments into each of said processing chambers at said receiving station, pressurizing the chambers with wet steam, venting the chambers to atmosphere, fluffing the garments within the chambers, and repeating the steps of pressurizing the processing chambers with wet steam and venting the steam therefrom, adding a predetermined volume of liquid dye solution to said chambers, advancing said processing chambers along a fixed path to an extraction station while soaking the garments in said liquid dye solution in the respective chambers for a predetermined time, extracting the liquid dye from the garments at said extracting station, transporting the shrunk dyed garments for further processing, and repeating these steps to shrink and dye garments in a substantially continuous automatic process.

7. In the art of producing knit garments from synthetic yarn by initially knitting and subsequently shrinking and dyeing the garment, the improvement comprising the steps of moving a plurality of processing chambers successively past a receiving station, deposit-

ing a predetermined number of garments into each of said processing chambers at said receiving station, pressurizing said chambers with wet steam to shrink the garments contained therein and subsequently venting the steam from said chambers, adding a predetermined volume of liquid dye solution to said chambers, advancing said processing chambers along a fixed path at least a portion of which extends through a heated atmosphere to maintain the temperature of said dye solution substantially uniform to an extracting station while soaking the garments in said liquid dye solution in the respective chambers for a predetermined time, extracting the liquid dye from the garments at said extracting station, transporting the shrunk, dyed garments for further processing, and repeating these steps to shrink and dye garments in a substantially continuous automatic process.

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