United States Patent

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[72] Inventor **Dalton O. Hulin**
Lexington, N.C.

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[73] Assignee **Silver Knit Hosiery Mills, Inc.**
High Point, N.C.

[54] **APPARATUS FOR CLOSING HOSIERY TOES AND EVERTING HOSIERY AND METHOD**
11 Claims, 9 Drawing Figs.

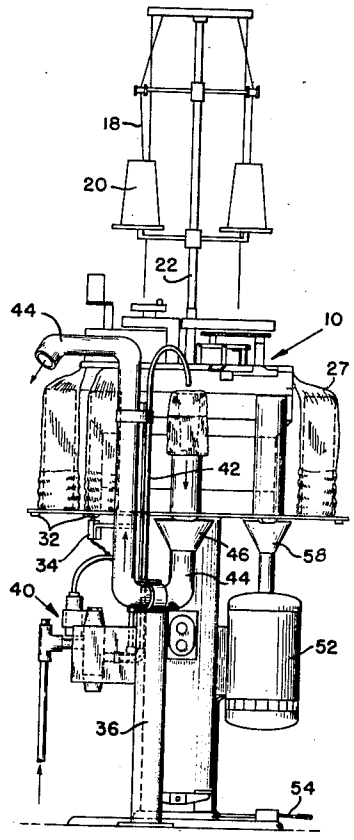
[52] **U.S. Cl.** **112/25,** 112/121.15, 223/43
[51] **Int. Cl.** **D05b 7/00,** A41h 43/00
[50] **Field of Search** ..... 112/25-—27, 121.12, 121.15, 121.29; 223/43, 112; 112/2, 262

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Primary Examiner—Patrick D. Lawson
Assistant Examiner—G. V. Larkin
Attorney—David Rabin

ABSTRACT: A method and apparatus for turning socks wherein open-toe socks are everted to wrong side out condition and impaled upon points of a rotary dial for the formation of a toe closure. Means are provided to evert the toe-closed socks to their original right side out condition after the toe-closing operation.



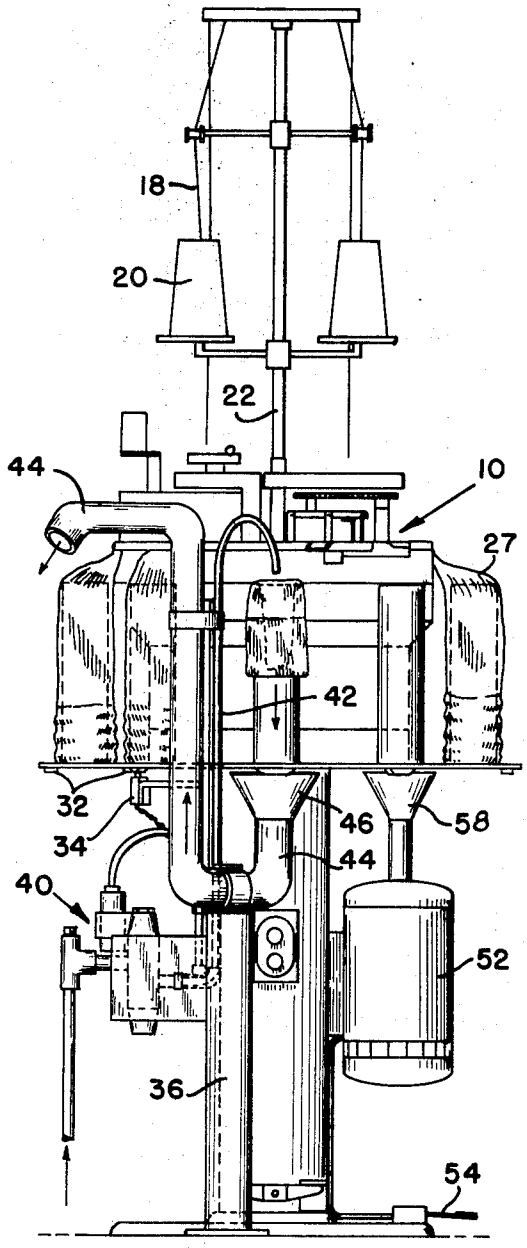


FIG. 1

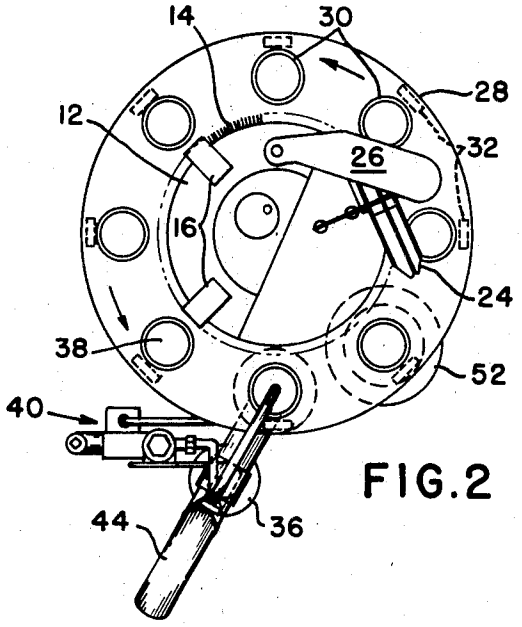


FIG. 2

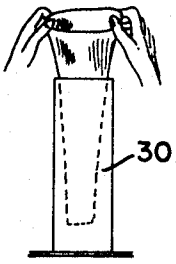


FIG. 3a

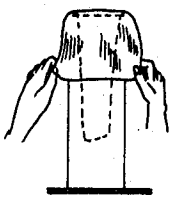


FIG. 3b

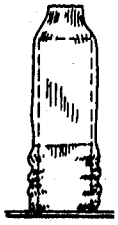


FIG. 3c

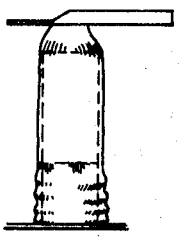


FIG. 3d

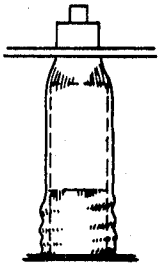


FIG. 3e

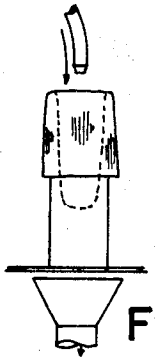


FIG. 3f

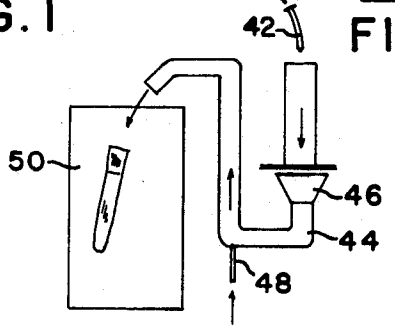


FIG. 3g

INVENTOR.
DALTON O. HULIN

BY
attorney

APPARATUS FOR CLOSING HOSIERY TOES AND EVERTING HOSIERY AND METHOD

BACKGROUND OF THE INVENTION

This invention relates to a novel method and apparatus for automatically turning or everting hosiery, both before and after the end or toe portion thereof has been closed. Seamless or circular knit socks are generally discharged from the knitting machine in a right side out condition. They thereupon have to be turned wrong side out to close the toe portion and, therefore, have to be everted or turned again to expose the right side of the fabric for subsequent operations, such as boarding and packaging, to be performed on the socks. Previously the turning of hosiery has been accomplished in three separate operations: (a) the operators attending the knitting machines manually turn the hosiery from a right side out to a wrong side out condition upon completion of the knitting operation, (b) the toes of the hosiery are closed in a subsequent operation either by looping or sewing, and (c) the hosiery is then manually or automatically turned to a right side out condition in a separate operation.

SUMMARY OF THE INVENTION

The present invention is directed to a method and apparatus for turning or everting hosiery and is used in conjunction with a radial looping machine on which socks are impaled on radially projecting points adjacent the open-toe portion thereof, and subsequently a sewing head projects a needle to sew closed the open-toe portion impaled on the projecting points.

Suitable means are provided for supporting a series of tubular forms below the rotary needle dial for coincident rotation with the dial. Pneumatic means cooperate with the rotary forms to turn the hose from a right side out to a wrong side out condition before the toes of the hose are closed, and for subsequently inverting and removing from the machine hose after the toe portions have been sewn.

One of the primary objectives of the invention is the provision of a machine and process for everting, toe closing, and again everting hosiery to its original condition.

Still another object of the invention is to increase production, reduce cost, and conserve space by performing all hosiery turning and toe closing operations at the same location.

Another object of the invention is to provide hosiery handling and sewing apparatus, for automatically stripping and everting the hose after they have been toe closed, which is easy to operate, requires little maintenance, and is reliable in service.

Another feature of the invention is to speed production by freeing operators of the task of turning hosiery by separate operations, and permitting the operator to devote full time to placing hosiery on sock-receiving forms that are mounted on a rotatable platform revolvable with the dial of a looping machine.

Another object of the invention is the provision of a mechanism associated with a radial looping device for everting a hose or sock before the open-toe end has been closed.

A still further feature of the invention is to provide novel means cooperatively arranged with a radial looping device for everting and discharging looped or toe-closed hosiery to a collection receptacle.

More particular objects and advantages will appear from the explanation of the invention in this specification and the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 illustrates a side view of a sock-looping machine having a preferred embodiment of this invention with the novel hosiery-receiving forms and hosiery-everting mechanisms mounted thereon:

FIG. 2 illustrates a top plan view of FIG. 1, with certain parts removed and, looking down upon the needle dial, sewing heads and hosiery-receiving forms;

FIGS. 3*a*, 3*b*, 3*c*, 3*d*, 3*e*, 3*f* and 3*g* are schematic views illustrating various sequential or operational steps performed upon a hose or sock from the time it is placed initially upon the machine until it is discharged therefrom.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

The radial looping machine **10** herein illustrated for convenience of exemplifying the invention is of a well-known conventional type having a rotary dial **12** with spaced points or needles **14** projecting radially beyond its periphery. The dial **12** is supported for continuous rotation in the direction of the arrow, FIG. **2**, for successive presentation of the points **14** to the usual toe-closure sewing heads **16**. Such conventional loopers may be Sotco, Exacta, or Rosso loopers, or any other looping device that impales a hose or sock by the use of needles or points and loops across the area in which the needles impale the sock along the courses thereof to lock the wales from running. Some of the aforementioned looping devices do not necessarily require that each and every one of the wales in a given course be impaled, but can have varying courses in different wales impaled on the dial needles, and also, some wales may not be impaled at all.

Looping yarns or threads **18** pass upwardly from yarn packages or bobbins **20**, supported upon frame **22**, through guides and/or tensioning means and downwardly to the looping or sewing heads **16** in a conventional manner. Two such looping or sewing headings have been provided, as illustrated in FIG. **2**.

A conventional alignment device **24**, composed of two parallel blades forming a slot, and a conveyor mechanism **26** feed the sock **27** onto the points **14** of dial **12**. The slot of the alignment device **24** is tangential to the dial **12** so that when a sock **27** is placed within the slot it is moved forward towards dial **12** until it is hooked by conveyor mechanism **26** which conveys the sock and arranges it on the points **14** of rotary dial **12**. The impaled sock is then fed by dial **12** to the looping or sewing heads **16** for closure of the open-toe portion.

A rotary platform or plate **28** is spaced below and mounted for rotary movement with the dial **12**. Supported by plate **28**, adjacent the perimeter thereof, is a series of spaced, upstanding, hollow tubes or forms **30** for receiving the socks to be looped or closed. The tubes, of course, can be of different lengths and diameters to accommodate various sizes of socks or hose, and can be spaced at different intervals around the plate **28**. However, the distance between the tubes should be constant in order to present the forms properly to the various looping or sewing heads and everting mechanisms. Openings **38** are provided in plate **28** directly below, and of substantially the same diameter as the inside diameter of the tubes, for cooperation with suitable sock-everting mechanisms.

A series of cams **32** are provided underneath the plate **28**, adjacent each of the tubes **30**, for actuating a microswitch **34** supported by machine frame **36**. Microswitch **34** actuates a suitable valve mechanism **40** for opening such valve mechanism and permitting compressed air, supplied from a suitable remote source, to flow upwardly through line **42** to a location directly above a tube **30**. A discharge tube **44** has a funneled end portion **46** mounted below and adjacent to plate **28** in alignment with the openings **38** such as to receive a sock removed from the form directly above the funnel portion **46**. An air line **48** having one end connected with valve mechanism **40** extends to and is joined to discharge tube **44** for supplying compressed air thereto. With this arrangement, valve mechanism **40** is actuated by microswitch **34** and compressed air flows simultaneously through lines **42** and **48**. Compressed air exits from the open end of line **42** above a tube **30**, having a sock with a closed-toe portion mounted thereon, as most clearly shown by FIGS. **1** and 3*f*. The compressed air reacts against the closed-toe portion thus everting the sock and blowing it through the inside of the tube **30** and into discharge tube **44**. Compressed air emerging from line **48** into tube **44** assists in transferring the everted sock to a collec-

tion receptacle **50**. Due to the continuous rotation of the platform or plate **28** with the carrying cams **32** actuating the microswitch **34**, an instantaneous blast of compressed air removes a sock positioned on each tube **30** as the tube rotates past the funnel portion **46** of the discharge tube.

FIG. **1** shows a conventional suction pump **52**, supported by the machine frame **36**, having a flared nozzle portion **58** in juxtaposition with the plate **28**. The pump is actuated through foot pedal mechanism **54** by the machine operator. As a hollow sock-receiving tube **30** passes over the nozzle portion **58**, an operator actuates foot pedal mechanism **54** to initiate a vacuum or suction downwardly through the tube **30**. This suction arrangement assists in everting the sock, as shown by FIGS. *3a*, *3b* and *3c*, from a right side out to a wrong side out condition prior to entering guide **24** and before being impaled on the points **14**.

While the turning mechanisms referred to above have been illustrated as pneumatic means, it is to be understood that other types of everting mechanisms, for example, mechanical or air-operated plungers, may be employed equally well. Furthermore, a second microswitch means may be provided for automatically actuating suction pump **52**, rather than utilizing the operator-controlled foot pedal mechanism **54**. Additionally, photoelectric means, rather than microswitches and cams, may be employed for actuating the valve mechanism **40** and/or the suction pump **52**.

The operation of the illustrated embodiment of the invention will now be described with particular reference to FIGS. *3a*—*3g* of the drawing. With the dial **12**, points **14**, plate **28** and tubes **30** rotating, an operator situated near the slotted guide alignment device **24** and the foot pedal mechanism **54** receives a sock or hose in a right side out condition as it comes from a receptacle in which the sock has been deposited directly from a knitting machine. The operator actuates suction pump **52** through foot pedal mechanism **54** to provide suction within a tube **30** as it passes over a nozzle **58** and positions the socks within the tube, as shown by FIG. *3a*. The suction tends to pull the sock downwardly within the tube, toe portion first. However, the operator, by grasping the welt or upper portions of the sock, pulls the sock downwardly around the exterior portion of the tube thus everting the sock to a wrong side out condition, as illustrated by FIG. *3b*. Thereupon, the suction pump is deactivated and the upper open-toe portion of the sock is left extended above the top of the tube as shown by FIG. *3c*. Subsequently, the operator either manually places the toe portion on points **14** or guides the toe portion into the alignment device **24** and conveyor mechanism **26** for automatically impaling the loops of the sock in the open-toe portion upon the points **14**, depending upon the manner in which the looping machine is equipped. After being impaled by points **14**, the socks are conveyed to the looping or sewing heads, FIG. *3e*, for closing the toe portion. Upon completion of the looping or toe-closing operation, one of the cams **32** mounted on the continuously rotating platform or plate contacts switch **34**, thus momentarily activating valve mechanism **40** and pneumatically everting a garment mounted on the form **30** directly beneath the open end of air pipe **42**, as illustrated by FIG. *3f*, by blowing the sock through the inside of the tube. FIG. *3g* illustrates the sock, in its original right side out condition, being discharged into a receiver **50** after being blown through tube **30** and discharge tube **44**. Obviously the two garment-turning mechanisms could be used each independently of the other in those instances where desirable.

From the foregoing it will be evident that a conventional looping machine equipped with turning mechanisms as herein disclosed would result in great savings and production costs in the manufacture of hosiery and the like. Furthermore, while the invention has been described as applied to a well-known type of looping machine, it will be apparent to those skilled in the art that the invention has many different applications and that the machine and method herein described may otherwise be varied to a considerable extent without departing from the spirit of the invention.

I claim:

1. In combination with a looping machine including a rotatable means having a series of points projecting therefrom adapted to have socks impaled thereon and toe-closing means to which the points are successively presented for closing the toe portion of a sock, the improvement comprising: a plurality of sock-receiving forms, means for supporting and conveying said forms in a prescribed path of travel, each of said plurality of forms having a free end portion and an opening extending therethrough, said rotatable means and said sock-supporting and -conveying means being rotatable simultaneously, said toe-closing means being mounted in juxtaposition to the prescribed path of travel of said forms, and intermittently actuated means cooperable with each form for discharging a sock therefrom, said intermittently actuated means including means positioned in close proximity to and cooperable with the free end portions of said forms for forcing a sock therethrough.

2. A machine as defined in claim **1**, wherein said discharging means everts a sock as it is removed from a form.

3. A machine as defined in claim **1**, further including means operatively associated with said forms for everting socks as they are placed upon said forms.

4. A machine as defined in claim **3**, each of said sock-receiving forms comprising an elongated tubular member over which the sock is adapted to be drawn.

5. A machine as defined in claim **4**, said everting means comprising fluid means communicating with said tubular members creating a pressure differential therein for drawing a sock, toe portion first, into said tubular member before the sock is inverted by withdrawing the sock over and to the outside of said tubular member.

6. A machine as defined in claim **1**, said plurality of sock-receiving forms comprising elongate, tubular members, said members being mounted in predetermined, spaced, serial arrangement for successive movement to said toe-closing means.

7. A machine as defined in claim **6**, each of said members having an open end over which a sock is adapted to be drawn for subsequently presenting the toe portion to said toe-closing means, said discharging means comprising means adapted to communicate with each member for directing a sock through said member, toe portion first, to evert the sock after the toe portion has been closed.

8. A method of looping and everting socks having an open-toe portion to be closed at one end thereof by looping comprising the steps of supporting a sock at the open-toe portion for displacement along a prescribed path of travel, supporting the other end of the sock on a sock-receiving form for movement along a prescribed path of travel similar to said toe portion, closing the toe portion while traveling in a prescribed path of travel, and everting the sock as it is removed from the form by applying a force to the exterior toe portion of said sock supported on the form to drive the sock axially therethrough.

9. A method according to claim **8**, wherein the sock is placed on the form by creating fluid currents within the form to draw a substantial portion of a sock therein, and everting the sock by drawing the sock exteriorally and axially of the form.

10. A method according to claim **8**, wherein the toe portion of the sock is closed by impaling the sock upon a series of spaced points and feeding the form and sock thereon to a looping position for looping closed the toe portion of the sock.

11. A method according to claim **8**, wherein the socks are everted by directing the looped sock through the form, toe portion first, to evert the same.