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(54) METHOD AND DEVICE FOR AUTOMATIC ORIENTATION OF HOSIERY ARTICLES

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(57) **ABSTRACT**

A sock (**1**) to be oriented is put random on an elongated support (**3**). Then a rotation about its own axis is given. In case the sock (**1**) has a heel (**1***b*), notwithstanding it is elastically stretched on the support (**3**) this heel is visible since it forms a slight but relevant protrusion. In case the sock is tubular it is fully stretched on the support (**3**), but the seam of the foot is visible at the top of the support (**3**). Then during the rotation the passage of the heel (**1***b*) is detected or the seam is detected by means of an optical sensor (**4**). While sock (**1**) is in rotation on the support (**3**), and then with it the protrusion (**1***b*). An optical beam detects this protrusion (**1***b*) or seam and stops the rotation of the sock. Once the sensor (**4**) has detected the heel (**1***b*) or the seam, the rotation of the sock (**1**) is discontinued and the relative angular position is kept as reference position for following operations of finishing. The rotation of the sock can be carried out by means of axial integral rotation of the support (**3**) with the sock (**1**) with respect to a support base. Or, the rotation of the sock can be carried out by means of counter rotating movement of rollers (**6, 6'**) tangential to the support (**3**). The support (**3**) can be part of a production cycle wherein the sock follows a path that comprises various work stations (**10, 20, 30, 40**).

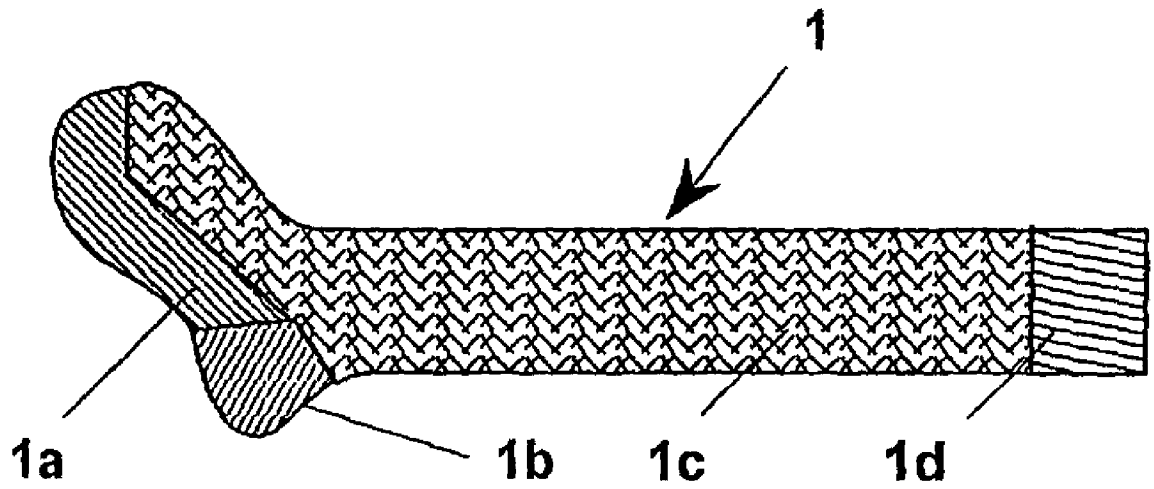


Fig. 1A

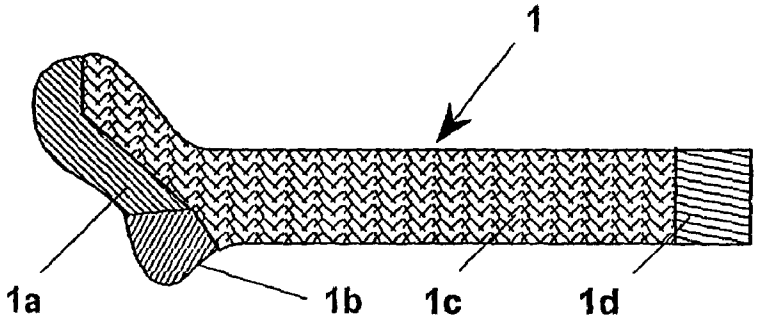


Fig. 1B

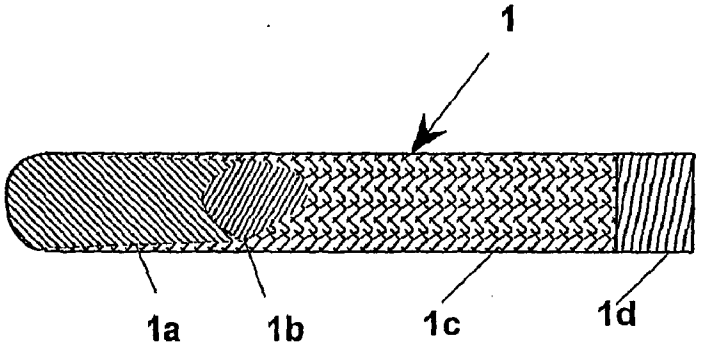


Fig. 2

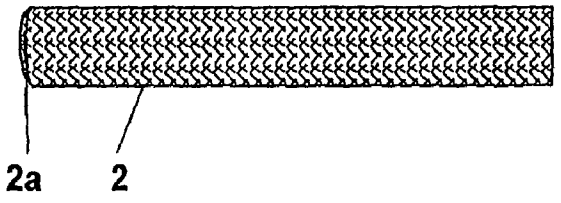


Fig. 3

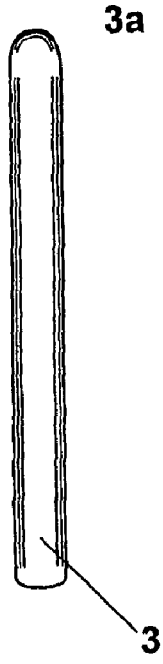


Fig. 4A

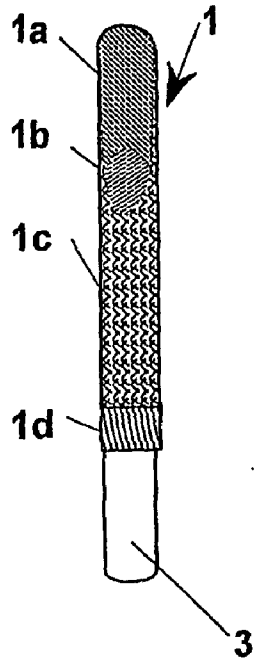


Fig. 4B

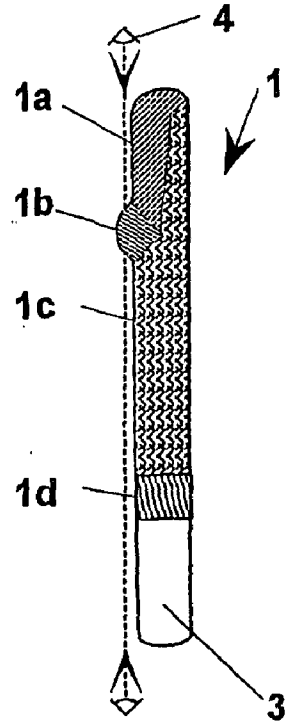


Fig. 5A

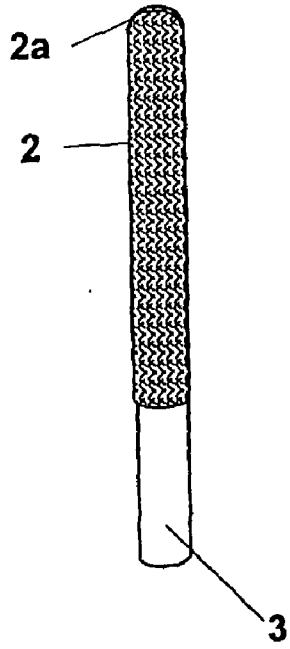


Fig. 5B

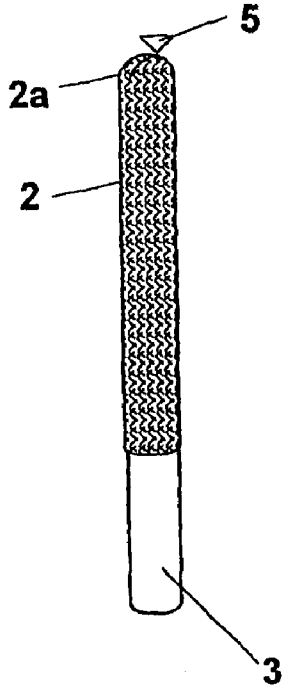


Fig. 6

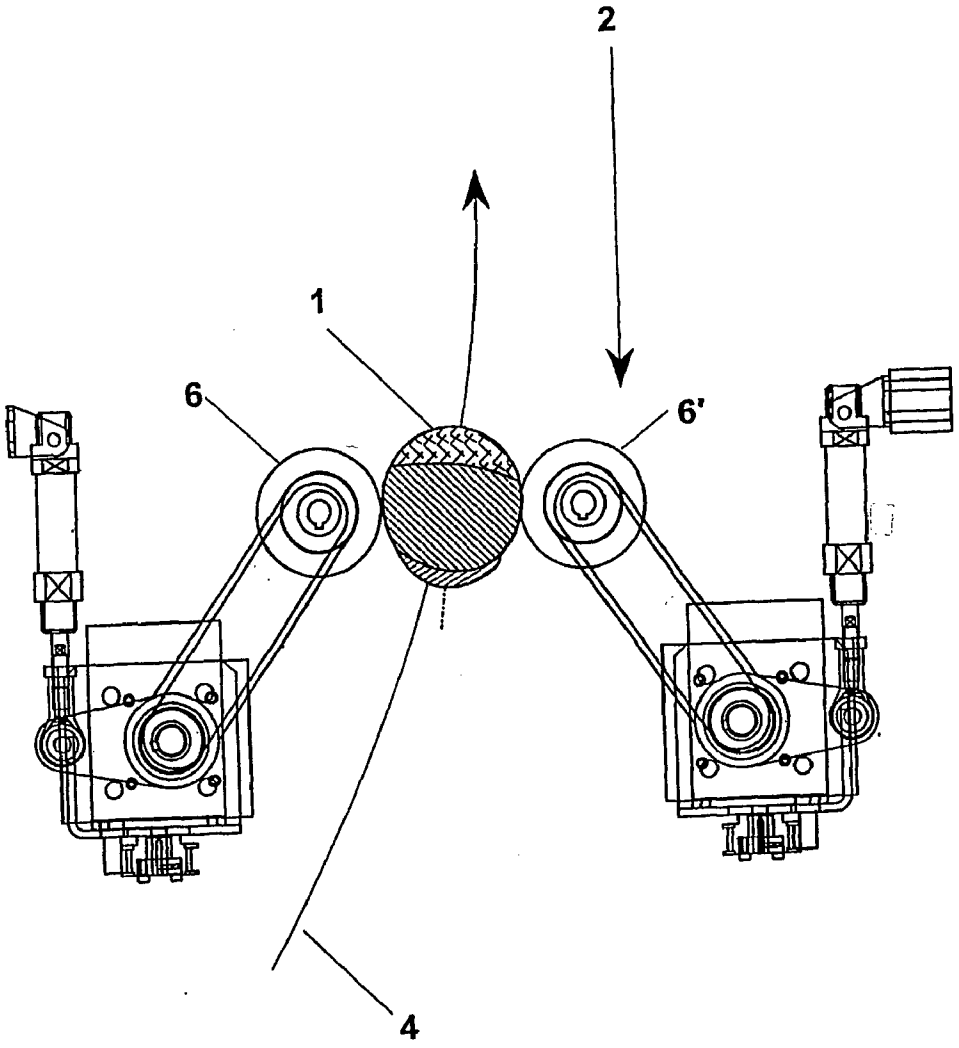
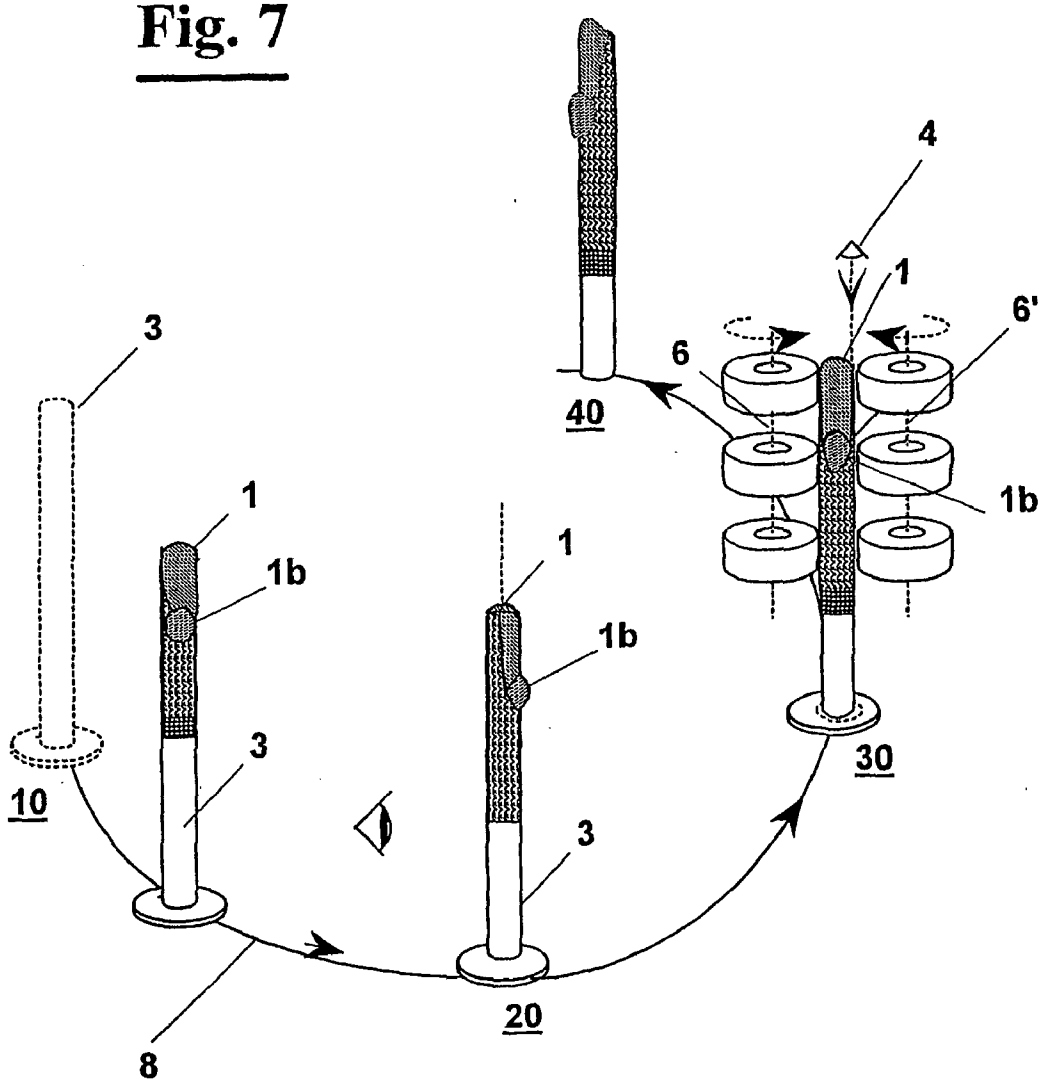


Fig. 7



METHOD AND DEVICE FOR AUTOMATIC ORIENTATION OF HOSIERY ARTICLES

FIELD OF THE INVENTION

[0001] The present invention relates to a method for automatic orientation of hosiery articles such as socks, knee socks or the like with respect to a predetermined plane.

[0002] Furthermore the invention relates to a device that carries out this method.

BACKGROUND OF THE INVENTION

[0003] In the following description reference is made to the orientation of the socks, being it clear that this method can be extended to the orientation of knee socks and other similar articles that have asymmetries that require a correct angular positioning.

[0004] The need is felt of an automatic orientation of hosiery articles such as socks, knee socks or similar in order to put them on steaming forms for example for steaming or finishing purposes.

[0005] This need is much more felt in an automatic production cycle. In particular, before reaching the final packaging of an hosiery article, it is necessary follow a path that comprises various manufacturing steps; one of them relates to its orientation according to a predetermined plane of reference, so that the sock at the end reaches the consumer arranged folded in this plane.

[0006] The point where the sock is oriented is normally upstream of the steaming step. In the traditional steaming systems, the sock is put onto the steaming forms oriented manually by an operator. This causes obviously an excessive manual workload and waste of time.

[0007] The problem of the automatic orientation of socks has been also considered and in part also solved.

[0008] In fact according to the technique of a method presently known, described in EP0878573, a sock after having been picked up from special containers, is put automatically on vertical elongated supports, reaching finally a position hanging towards below.

[0009] Then, an air flow crosses the vertical support from the above towards below inflating the hanging sock that stiffens following the shape of the foot.

[0010] Then, it is rotated coaxially to the elongated support and during the rotation an optical sensor detects the protrusion of the foot and stops immediately the rotation leaving the sock in the predetermined angular position.

[0011] Such a device, even if it is technically effective, causes a high energy consumption due to the introduction of the air flow, and furthermore a difference in the flow rate of air is required depending upon the type of knitting quality of the socks.

[0012] Furthermore a drawback is given by the impossibility of handling socks with foot not yet sewn, which cannot be inflated. This need can occur in the passage from the step of knitting to that of finishing.

SUMMARY OF THE INVENTION

[0013] It is therefore object of the present invention to provide a method for automatic orientation of socks, knee socks or similar that has not the drawbacks of the existing methods.

[0014] It is furthermore object of the invention to provide a device that carries out this method.

[0015] According to the invention, a process of orientation of socks begins with the picking up the same from a special container. These are put automatically or manually in a random way on substantially cylindrical elongated supports, i.e. without taking care of their orientation.

[0016] Even in the case of manual introduction, in any case a reduced manual workload is required since the operator puts the socks onto the supports without taking care of their orientation and then in an extremely quick way.

[0017] The elongated support has at least one cylindrical portion. The sock, even if stretched elastically in order to match the shape of the support, has a protrusion oriented towards outside at the heel.

[0018] Then, the rotation is effected of the sock same with respect to the axis of the support, in order to detect the protrusion of the heel according to a tangential longitudinal direction, by using optical sensors.

[0019] The axial rotation on the support, necessary to the detection step of the protrusion of the heel, can be carried out in one of the two ways described below:

[0020] by integral rotation, i.e. the support with the sock put on it, rotates axially with respect to a support base;

[0021] by counter rotating movement of rollers tangential to the support, which is kept still. In this case the latter is as smooth as possible, whereas the rollers are coated of a friction surface, so that a relative movement of tangential circumferential rotation between sock and support is created.

[0022] Once detected the protrusion by the optical sensors the mechanism of rotation stops automatically and the angular predetermined position of the sock is thus determined.

[0023] Reference has been made above to the extension of this method to knee socks, tubular socks with seam on the foot or similar articles; however, it must be noted that in the specific case of a knee sock or sock, of tubular shape, instead of the detection of the heel the detection of the seam at the end of the foot is effected. This detection can be carried out using optical sensors or, alternatively, of tracing points.

[0024] In both cases, once reached a predetermined position, i.e. the location of the heel or of the seam, depending upon it is a sock or a knee sock, on a chosen plane, the sock or of the knee sock is withdrawn oriented from the support.

[0025] Advantageously, the presence of the sock on the elongated support for orientation purposes is associated to steps of qualitative control of the same by an operator.

[0026] In particular, the integral rotation of the support and of the sock is provided, according to an angle of at least 180°, so that the operator can see all its surface without moving or using mirrors.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Further characteristics of the method and of the device for automatic orientation of hosiery articles according to the present invention will be made clearer with the

following description of an embodiment thereof, exemplifying but not limitative, with reference to the attached drawings, wherein:

[0028] **FIGS. 1A and 1B** show two views of a stretched sock, seen according to two orthogonal longitudinal planes;

[0029] **FIG. 2** shows a view of a stretched knee sock;

[0030] **FIG. 3** shows an elongated support on which the sock or the knee sock of the previous figures has been put;

[0031] **FIGS. 4A and 4B** show the sock of **FIGS. 1A and 1B** put on the support of **FIG. 3** and in two different positions of angular rotation;

[0032] **FIGS. 5A and 5B** show the knee sock of **FIG. 2** put on the support of **FIG. 3** and in two different positions of angular rotation;

[0033] **FIG. 6** shows a top plan view of a rotation device of the sock on the elongated support;

[0034] **FIG. 7** shows a possible path followed by the sock on the support.

DESCRIPTION A PREFERRED EMBODIMENT

[0035] With reference to **FIGS. 1A and 1B**, a sock provides differently knitted zones and precisely: a foot **1***a*, a heel **1***b*, the leg **1***c* and a leg collar id. Such zones have different functions and precisely the foot **1***a* is thickly knitted, heel **1***b* is thickly knitted and curved, the leg **1***c* has a tubular knitting, often with pattern, and the leg collar Id is a tubular collar knitted with elastic thread. Such zones have been shown with different graphical background.

[0036] A knee sock **2**, or tubular sock, instead, as shown in **FIG. 2**, has a tubular knitting with at the end a closure seam **2***a*. The foot is not knitted but is shaped when steaming the knee sock on forms.

[0037] For orienting sock **1** or knee sock **2** it is possible, according to the invention, putting them on an elongated support **3** (**FIG. 3**). The elongated support **3**, notwithstanding shown of plain cylindrical shape, can have also grooves or oval or rectangular with rounded edges shape.

[0038] With reference to **FIG. 4**, for automatic orientation of sock **1** or of knee sock **2**, they can be put random on support **3** (**FIG. 4A** or 5A) and then a rotation about its own axis is given to the support.

[0039] Notwithstanding sock **1** is elastically stretched on support **3**, heel **1***b* is visible since it has a slight but relevant protrusion.

[0040] Concerning knee sock **2**, it is stretched on support **3**, but seam **2***a* is visible at the top **3***a* of support **3**.

[0041] Then (**FIG. 4B** or 5B), during the rotation the passage is detected of heel **1***b* or of seam **2***a* by means of an optical sensor **4** or **5** eccentric with respect to support **3**. Since sock **1** rotates on support **3**, and then with it protrusion **1***b* rotates, a optical device **11** detects this protrusion **1***b* and stops automatically the counter rotating movement of dragging rollers.

[0042] Furthermore, since heel **1***b* has a curved profile with a central vertex, the range **11** of the optical sensor **4** can detect this vertex calculating an average of the measured values, with possibility of sufficient precision for detecting the plane of orientation **9** (**FIG. 6**).

[0043] Once the sensor **4** or **5** has detected heel **1***b* or seam **2***a*, the rotation of sock **1** or of knee sock **2** is discontinued and the relative angular position is maintained as reference position for following finishing steps.

[0044] In an different embodiment, for reducing the angle of rotation of the sock necessary for reaching a correct orientation, A plurality of sensors **4** or **5** can be provided, for example two, three or four angularly spaced sensors. In this case, a control software is provided which, according to the sensor that detects heel **1***b* or seam **2***a*, a further rotation to the sock up to the orientated position.

[0045] In a further embodiment, an array of optical sensors can be provided, for example CCD or equivalent, which provides a matrix of signals of presence of the heel or of the seam. In the first case the sensors detect the shape of the sock from the above. In the second case they detect a line having a greater density, i.e. the seam.

[0046] Instead of optical sensors, mechanical sensors can be provided having tracing points capable of giving signals of presence when are touched by the heel or when they feel an higher thickness of the seam.

[0047] The rotation of the sock may be carried out by means of axial integral rotation of support **3** with sock **1** on a support base. Otherwise, as shown in **FIG. 6**, the rotation of the sock can be carried out by means of counter rotating movement of rollers **6**, **6'** tangential to the support that is kept still. In this case, the elongated support **3** is as smooth as possible, whereas the rollers **6**, **6'** are coated by a friction surface, so that a relative movement of circumferentially tangential rotation is created between sock and support.

[0048] Support **3** can be a carrier in a production cycle. In fact, the sock must follow a path that comprises various work stations. In particular, with reference to **FIG. 7**, the following steps are carried out:

- [0049] station **10**; this is the step where sock **1** is put on support **3**; more precisely, sock **1** is put on support **3** manually or automatically in a random way, being support **3** of shape preferably cylindrical elongated and vertical. Furthermore said support **3** follows the direction of a guide **8**.
- [0050] station **20**; a qualitative control of the sock is carried out; in particular support **3** with sock **1**, in addition to sliding along the direction of guide **8**, rotates axially about its own vertical axis for an angle of at least 180°. This rotation allows the operator **5** to check quickly the quality of the sock excluding preliminarily from the final packaging those socks having knitting defects, color defects and other. The control can be carried out also by optical electronic instruments for defect recognition.
- [0051] station **30**; support **3** stops its movement of translation along guide **8**; then the plane of orientation **9** of the sock (**FIG. 6**) is detected in the way above described. Then the support with the oriented sock goes on along guide **8**;
- [0052] station **40**; sock **1** that is now in a predetermined plane, is withdrawn from support **3** for successive finishing steps, such as for example steaming and/or seaming.

[0053] Finally, it must be noted that the qualitative control of socks can be made both before and after the step of orientation of the socks, as well as in different steps of the same cycle.

[0054] The foregoing description a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

1. A method for automatic orientation of hosiery articles such as socks, knee socks and the like, characterized in that it comprises the steps of:

picking the articles from a container;

putting the articles on elongated supports, without taking care of their orientation, said articles, even if stretched elastically in order to match the shape of the support, creating a protruded zone that can be detected with respect to said support;

detection of said protruding zone by means of sensors;

storing said protruding zone as plane of reference of the article when it is withdrawn from the support for further manufacturing steps.

2. Method for automatic orientation of hosiery articles, in particular socks, according to claim 1, wherein the step is provided of rotation of said sock with respect to the axis of said support.

3. Method for automatic orientation of hosiery articles, in particular socks, according to claim 1, wherein said protruding zone is the protrusion of the heel, said sensors individuating said protrusion according to a tangential longitudinal direction with respect to said support.

4. Method for automatic orientation of hosiery articles, in particular knee socks, according to claim 1, wherein said protruding zone is the seam of the foot, said sensors individuating said seam by means chosen among: tracer points in contact with said support; optical sensors on said support.

5. Method for automatic orientation of hosiery articles according to claim 2, wherein the axial rotation of said sock is carried out by means of integral rotation of said support and said sock.

6. Method for automatic orientation of hosiery articles according to claim 2, wherein the axial rotation of said sock is carried out by means of counter rotating movement of rollers tangential to the sock keeping still the support.

7. Method for automatic orientation of hosiery articles according to claim 2, wherein, the rotation of said sock with respect to the axis of said support once detected the protruding zone stops, thus individuating the angular orientation of the sock.

8. Method for automatic orientation of hosiery articles according to claim 1, wherein steps are provided of qualitative control on said elongated support, the latter when passing through a station of verification at least in part rotating about itself.

9. Apparatus of automatic orientation of hosiery articles characterized in that it comprises means for carrying out the steps described in the claims from 1 to 8.

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