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(54) APPARATUS AND METHOD OF OPERATION FOR KNITTING HOSIERY

(57) An apparatus for knitting hosiery comprises a circular knitting machine (C), a sewing device (3), a transfer mechanism (4), and an upper mechanism (1) configured in the upper portion of a sewing machine (S); the lower mechanism (2) configured in the lower portion of the sewing machine (S), wherein the upper mechanism (1) and the lower mechanism (2) are spaced apart vertically, wherein the lower mechanism (2) moves back and forth to the circular knitting machine (C); when the transfer mechanism (4) transfers a semi-finished tubular knitted article to a sewing platform, an open end (211) of the lower mechanism (2) moves toward the circular knitting machine (C) in a horizontal direction at the same vertical level, so that the semi-finished tubular knitted article cannot be sucked smoothly is avoided.

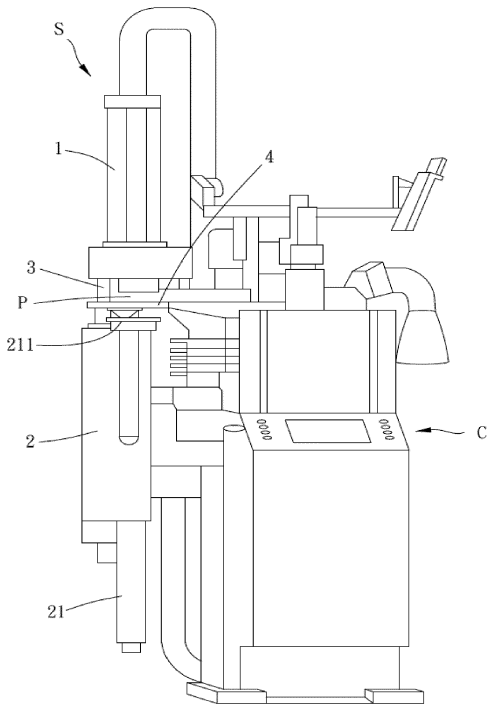

FIG 1

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Description

BACKGROUND

a) Technical Field

[0001] The present disclosure relates to a manufacturing process and a manufacturing apparatus of semi-finished tubular knitted article, and specifically relates to an apparatus for knitting hosiery and a method of operation thereof.

b) Related Art

[0002] A semi-finished product of socks is a semi-finished tubular knitted article made by a circular knitting machine, and there are openings at the both ends of a knitted article. The semi-finished product of the socks is removed from the circular knitting machine and transferred to a sewing platform to sew an opening of one end of the knitted article to complete the finished product of socks. For the aesthetics of sock products, stitches produced by the sewing platform when sewing the knitted article should be on the inside of the socks. Therefore, the sewing machine is equipped with a sewing device to flip over the knitted article before and/or after sewing process.

[0003] As disclosed in Chinese Patent Publication No. CN101970740B, a conventional sewing machine has a supporting device for fastening a semi-finished tubular knitted article, and an upper portion and a lower portion are respectively configured at the upper and lower sides of the supporting device; wherein the lower portion has a tubular body for sucking the semi-finished tubular knitted article; wherein the tubular body is tilted vertically, which helps reduce the space occupied by the lower portion.

[0004] The sewing machine tilts the tubular body to cause lateral and downward displacement of the open end of the tubular body simultaneously. Considering only lateral displacement in the tilted angle of the tubular body, the downward displacement is confined, for longer semi-finished tubular knitted articles, such as stockings, cannot be sucked smoothly, thus cannot be flipped over smoothly, which affects production efficiency.

[0005] In response to the aforementioned shortcomings, Chinese Patent Publication No. CN208201288U discloses another sewing machine, wherein the tubular body is configured on a tilted guide rail, so that the tubular body can produce larger downward displacement compared with the sewing machine of CN101970740B, which is suitable for longer semi-finished tubular knitted articles.

[0006] However, the manner that the tubular body tilts tends to cause a soft semi-finished tubular knitted article from an original hanging state to produce unpredictable distortion, and in fact, the semi-finished tubular knitted article cannot be sucked smoothly, so the sewing machine still needs to be improved.

Summary

[0007] The present disclosure provides an apparatus for knitting hosiery, which can reduce the problem that the apparatus for knitting hosiery cannot suck smoothly, so as to improve production efficiency.

[0008] To this end, the present disclosure provides an apparatus for knitting hosiery, comprising a circular knitting machine, a sewing device, a transfer mechanism, an upper mechanism and a lower mechanism; wherein the circular knitting machine weaves a semi-finished tubular knitted article; wherein the transfer mechanism removes an end of the semi-finished tubular knitted article, and transfers the semi-finished tubular knitted article from the circular knitting machine to the sewing platform; wherein the sewing platform and the circular knitting machine are spaced from each other; wherein the upper mechanism is configured in the upper portion of a sewing machine and the lower mechanism is configured in the lower portion of the sewing machine; wherein the upper mechanism and the lower mechanism are spaced apart vertically; wherein an operating space is configured between the upper mechanism and the lower mechanism, and the transfer mechanism moves to the operating space; wherein the sewing device is corresponding and adjacent to the operating space, which is characterized in that the lower mechanism can move back and forth to the circular knitting machine; wherein an open end is mounted at one end of the upper mechanism corresponding to the lower mechanism; wherein when the transfer mechanism transfers a semi-finished tubular knitted article to the sewing platform, the open end of the lower mechanism moves toward the circular knitting machine in a horizontal direction at the same vertical level; wherein after the transfer mechanism transfers a semi-finished tubular knitted article to the sewing platform, the open end moves away from the circular knitting machine in a horizontal direction at the same vertical level.

[0009] Preferably, after the transfer mechanism transfers the semi-finished tubular knitted article to the sewing platform, the open end moves away from the circular knitting machine in a horizontal direction at the same vertical level.

[0010] The present disclosure further provides a method of operation for knitting hosiery, including following steps: a transfer mechanism removes a semi-finished tubular knitted article from a circular knitting machine and transfers it to a sewing platform; wherein when the transfer mechanism transfers a semi-finished tubular knitted article to a sewing platform, an open end of the lower mechanism of the sewing platform moves toward the circular knitting machine in a horizontal direction at the same vertical level to suck the semi-finished tubular knitted article into the lower mechanism.

[0011] Preferably, after the transfer mechanism transfers the semi-finished tubular knitted article to the sewing platform, the open end moves away from the circular knitting machine in a horizontal direction at the same vertical

level.

[0012] By this way, an air suction unit moves in the same horizontal level, and each operation sucks the same part of the semi-finished tubular knitted article to avoid unpredictable distortion of the semi-finished tubular knitted article, so that the semi-finished tubular knitted article cannot be sucked smoothly can be avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 illustrates a three-dimensional diagrammatic representation of an apparatus for knitting hosiery according to an embodiment of the instant disclosure;

FIG. 2 illustrates a schematic diagrammatic representation of a continuous action showing the movement of a lower mechanism according to an embodiment of the instant disclosure;

DETAILED DESCRIPTION

[0014] In order to better understanding of the present disclosure, the present disclosure will be described more fully with reference to the accompanying drawings. The drawings show a preferred embodiment of the disclosure. However, the present disclosure is implemented in many different forms and is not limited to the embodiments described below.

[0015] The present disclosure provides an embodiment of an apparatus for knitting hosiery wherein a circular knitting machine (C) and a sewing machine (S) are configured adjacently therein.

[0016] Please refer to FIG. 1, the sewing machine (S) of the apparatus for knitting hosiery comprises an upper mechanism (1) and a lower mechanism (2) respectively configured at the upper and lower ends in the same axial of the sewing machine (S); wherein an operating space (P) is configured between the upper mechanism (1) and the lower mechanism (2); wherein the sewing device (3) is configured between the upper mechanism (1) and the lower mechanism (2) and is adjacent to the operating space (P); wherein the transfer mechanism (4) is configured at one side of the sewing device (3).

[0017] The instant disclosure provides an embodiment, wherein the sewing machine (S) and the circular knitting machine (C) (not shown in the drawings) are spaced from each other; wherein the transfer mechanism (4) moves between the sewing machine (S) and the circular knitting machine (C) and reaches the operating space (P); wherein the transfer mechanism (4) transfers the sock body (6) (e.g., the semi-finished product of socks) finished by the circular knitting machine (C) to the sewing machine (S), so that the sock body (6) reaches a sewing platform, and the opening portion of the sock body (6) to be sewed reaches the operating space (P).

[0018] The instant disclosure provides an embodiment, wherein the lower mechanism (2) has an air suction unit (21) configured vertically beneath the lower mechanism (2); wherein the air suction unit (21) moves back and forth actuated by at least an actuator, and the open end (211) at the top end of the air suction unit (21) moves in a horizontal equal level during the transferring process to maintain the equal horizontal level. Furthermore, the air suction unit (21) connects with a suction pump to generate suction force.

[0019] The instant disclosure provides an embodiment, wherein the transfer mechanism (4) is an electric mechanical arm; wherein a free end of the electric mechanical arm is an annular support frame which removes the sock body (6) from the circular knitting machine (C) and transfers to the sewing device (3). In some embodiments, the transfer mechanism (4) may also utilize a ball screw.

[0020] The sewing device (3) has a weaving head, and sews one end of the sock body (6). Before and after the sewing steps are performed, the upper mechanism (1) and the lower mechanism (2) cooperate with each other to flip over the sock body (6), and finally send out the finished product of socks.

[0021] Please refer to FIG. 2, an actual operation procedure of the apparatus for knitting hosiery, wherein the transfer mechanism (4) transfers to the circular knitting machine (C), and removes the finished sock body (6) from the circular knitting machine (C), wherein the sock body (6) hangs on the support frame of the transfer mechanism (4) and is transferred to the sewing platform.

[0022] Subsequently, the air suction unit (21) of the lower mechanism (2) moves toward the circular knitting machine (C); wherein the open end (211) moves in a horizontal direction at the same vertical level when the air suction unit (21) moves, and then reaches the lower portion of the support frame of the transfer mechanism (4); meanwhile the suction pump actuates to generate suction force, so that the sock body (6) is sucked into an internal of the air suction unit (21).

[0023] Since the open end (211) that generates suction force maintains moving in a horizontal lateral direction, excessive distortion or deflecting in the wrong direction of the sock body (6) can be avoided during the movement, so that the open end (211) stably sucks a specific portion of the sock body (6), so that the semi-finished tubular knitted article cannot be sucked smoothly is avoided.

[0024] After the sock body (6) is sucked into the air suction unit (21), the support frame of the transfer mechanism (4) moves away from the circular knitting machine (C) toward the lower portion of the upper mechanism (1) while the air suction unit (21) also moves away from the circular knitting machine (C) to reset, and the open end (211) also maintains moving in a horizontal equal level during the reset of the air suction unit (21), so that the upper mechanism (1), the support frame and the air suction unit (21) are configured on the same axis of the sewing machine (S); meanwhile, the sock body (6) reaches the operating space (P) adjacent to the sewing device

(3), the sock body (6) is flipped over so that the inner surface of the sock body (6) is exposed, and then the sewing device (3) is actuated to sew the sock body (6).

[0025] The instant disclosure provides an embodiment, wherein the moving path of the open end (211) is a straight path. In some embodiments, the moving path of the open end (211) may be an arc-shaped path or any optional path.

[0026] After the sock body (6) is sewed and the sewing process is completed, the sock body (6) is flipped over again to return to the original state, and finally sent out of the sewing machine (S).

[0027] The instant disclosure provides an embodiment, wherein the air suction unit (21) moves up and down vertically to adjust the horizontal level of the open end (211). In this way, before the sewing operation, the horizontal level of the air suction unit (21) is adjusted to adapt to different lengths of the semi-finished tubular knitted articles.

[0028] The open end (211) of the air suction unit (21) moves in a horizontal equal level, so that in each operation the same part of the sock body (6) is sucked, and the sock body (6) does not produce unpredictable distortion, so the semi-finished tubular knitted article cannot be sucked smoothly is avoided. In addition, the air suction unit (21) can perform two-stage horizontal and vertical movements, which improves flexibility of production process and raises operation yield.

Claims

1. An apparatus for knitting hosiery, comprising: a circular knitting machine (C); a sewing device (3); a transfer mechanism (4); an upper mechanism (1); and a lower mechanism (2), wherein the circular knitting machine (C) weaves a semi-finished tubular knitted article, the transfer mechanism (4) removes one end of the semi-finished tubular knitted article and transfers the semi-finished tubular knitted article from the circular knitting machine (C) to a sewing platform;

   wherein the sewing platform and the circular knitting machine (C) are spaced from each other;
   wherein an upper mechanism (1) is configured in the upper portion of a sewing machine (S), the lower mechanism (2) is configured in the lower portion of the sewing machine (S), the upper mechanism (1) and the lower mechanism (2) are spaced apart vertically;
   wherein an operating space (P) is configured between the upper mechanism (1) and the lower mechanism (2), the transfer mechanism (4) moves to the operating space (P), the sewing device (3) is corresponding and adjacent to the operating space (P), which is **characterized in that**, the lower mechanism (2) moves back and forth to the circular knitting machine (C), an open end (211) is mounted at an end of the upper mechanism (1) corresponding to the lower mechanism (2);
   wherein when the transfer mechanism (4) transfers a semi-finished tubular knitted article to a sewing platform, the open end (211) of the lower mechanism (2) moves toward the circular knitting machine (C) in a horizontal direction at the same vertical level.

2. The apparatus for knitting hosiery of claim 1, wherein after the transfer mechanism (4) transfers the semi-finished tubular knitted article to the sewing platform, the open end (211) moves away from the circular knitting machine (C) in a horizontal direction at the same vertical level.

3. The apparatus for knitting hosiery of claim 1, wherein the lower mechanism (2) has an air suction unit (21).

4. The apparatus for knitting hosiery of claim 1, wherein the moving path of the open end (211) is a straight path or an arc path.

5. The apparatus for knitting hosiery of claim 1, wherein the transfer mechanism (4) is a robot arm, and a free end of the robot arm is an annular support frame.

6. The apparatus for knitting hosiery of claim 1, wherein the transfer mechanism (4) is a ball screw.

7. A method of operation for knitting hosiery, including the following steps:

   (a) A transfer mechanism (4) removes a semi-finished tubular knitted article from a circular knitting machine (C) and transfers to a sewing platform;
   (b) When the transfer mechanism (4) transfers the semi-finished tubular knitted article to a sewing platform, an open end (211) of a lower mechanism (2) moves toward the circular knitting machine (C) in a horizontal direction at the same vertical level to suck the semi-finished tubular knitted article into the lower mechanism (2).

8. The method of operation for knitting hosiery of claim 7, further including step (c) after step (b);
   wherein after the transfer mechanism (4) transfers the semi-finished tubular knitted article to the sewing platform, the open end (211) moves away from the circular knitting machine (C) in a horizontal direction at the same vertical level.

9. The method of operation for knitting hosiery of claim 8, wherein the lower mechanism (2) has an air suc-

tion unit (21).

10. The method of operation for knitting hosiery of claim 7, wherein the moving path of the open end (211) is a straight path or an arc path.

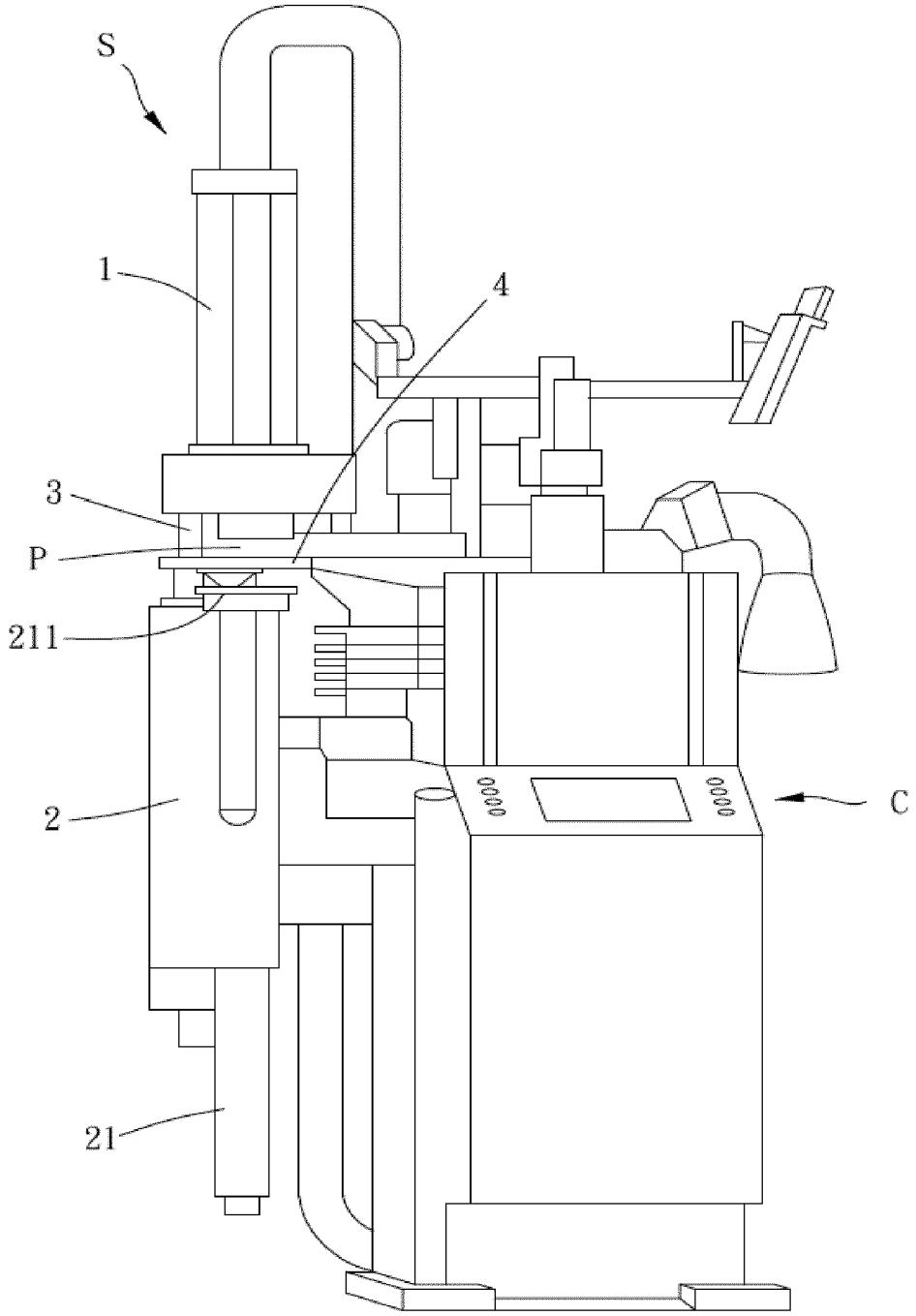

FIG 1

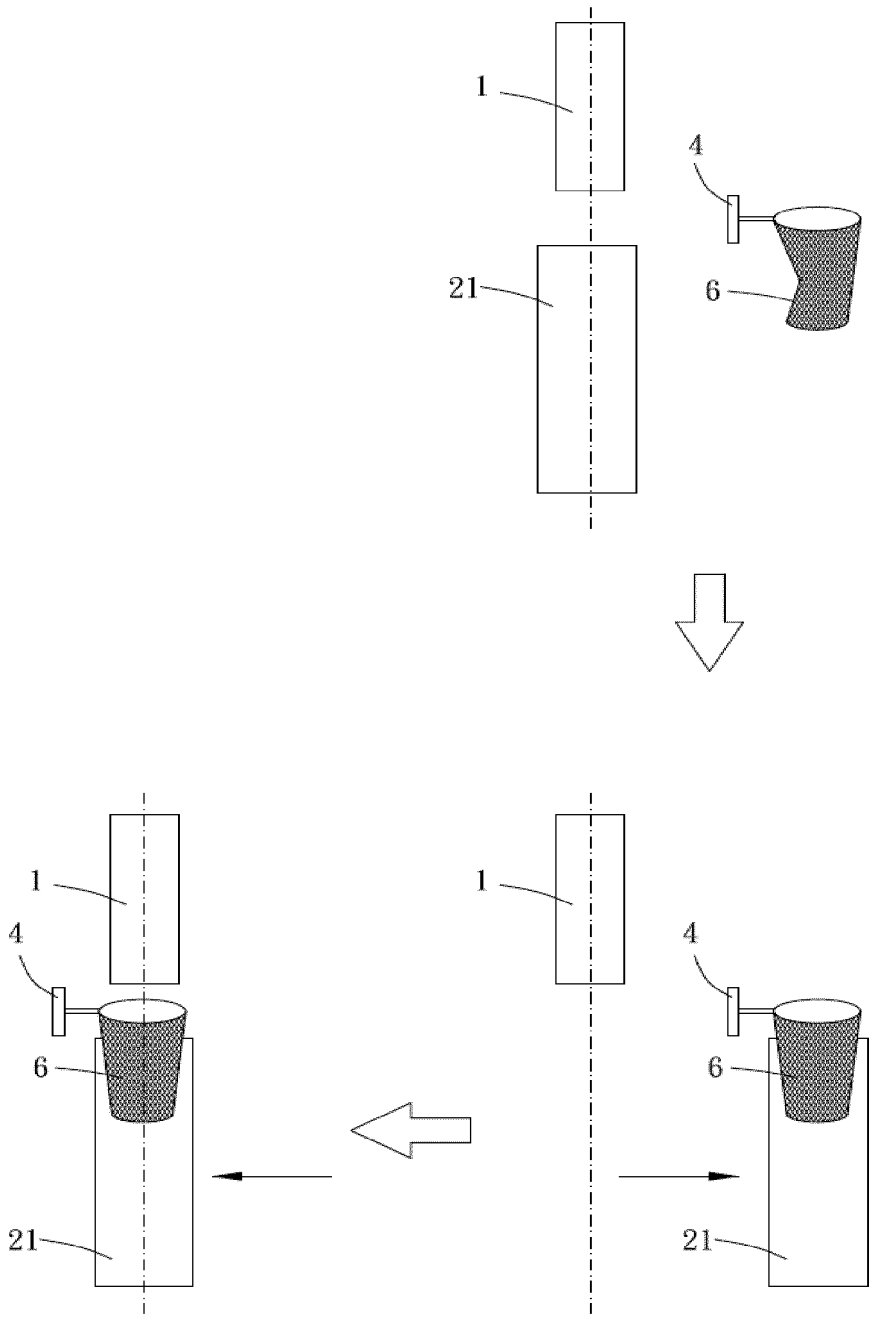

FIG 2

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 0263

DOCUMENTS CONSIDERED TO BE RELEVANT

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TECHNICAL FIELDS SEARCHED (IPC)

D04B
D06G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 October 2020	Messai, Sonia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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