United States Patent [19]

Rothert

[11] **3,842,973**

[45] **Oct. 22, 1974**

[54] **METHOD AND APPARATUS FOR TREATING KNIT GOODS, PARTICULARY HOSIERY MADE OF SYNTHETIC MATERIAL**

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[73] Assignee: **Karl Fischer Apparate-und Roheleitungsbau,** Berlin, Germany

[22] Filed: **Feb. 18, 1972**

[21] Appl. No.: **227,484**

[30] **Foreign Application Priority Data**

Mar. 2, 1971 Germany 2110487

[52] **U.S. Cl.** **198/240,** 8/150, 198/131, 223/75

[51] **Int. Cl.** **B65g 47/24,** D06c 5/00

[58] **Field of Search** ..... 198/33 AC, 33 AA, 19; 223/75, 76, 77; 8/150

[56] **References Cited**

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Primary Examiner—Richard E. Aegerter
Attorney, Agent, or Firm—Spencer & Kaye

[57] **ABSTRACT**

A method for treating knit goods which are drawn over supported form members, the knit goods being passed through a treating installation. The form members are placed with the knit goods thereon in a vertical or horizontal position relative to the form of the installation. The form members are then passed through certain of the different stages of a treating installation in the vertical position and through other of the different stages in the horizontal position. The form members are intermittently rotated about their longitudinal axes while in both the vertical or horizontal position and while in the treating installation.

A transporting unit for knit goods used in the above method including a runner, a supporting arm, and a form member. Structure is provided for pivotally fastening the support arm to the runner. Structure is also provided for rotatably mounting the form member to the support arm.

The transporting unit is driven by a drive including a plurality of sprockets and structure for supporting the sprockets for engagement with the transporting unit.

16 Claims, 8 Drawing Figures

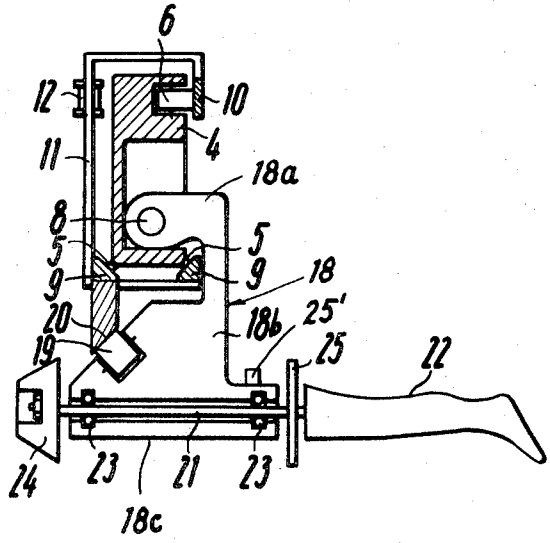


Fig. 1

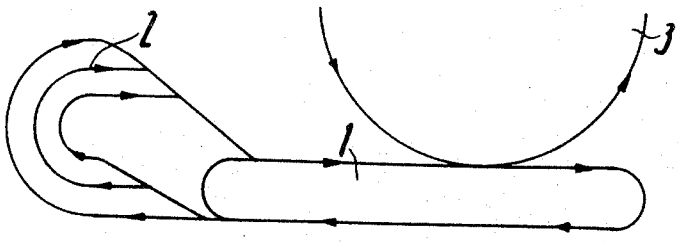


Fig. 2

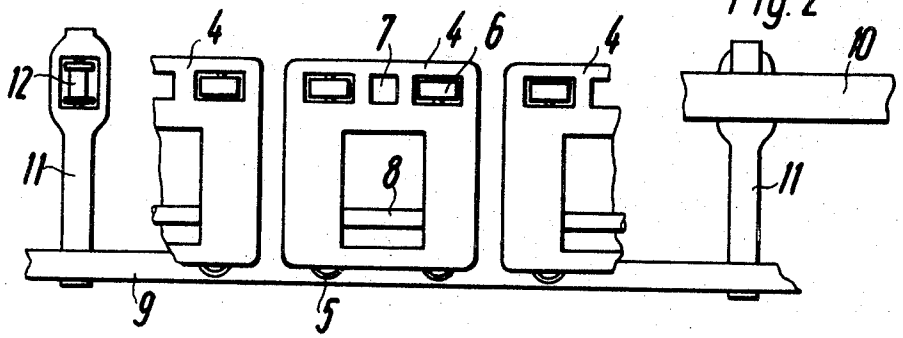


Fig. 3

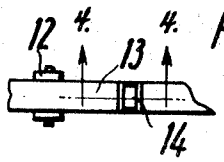


Fig. 4

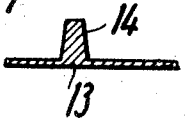


Fig. 5

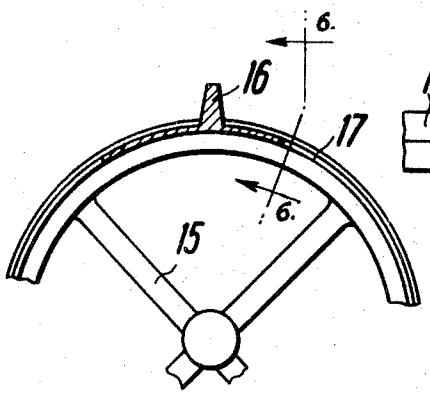
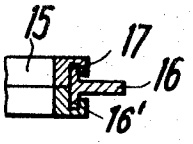
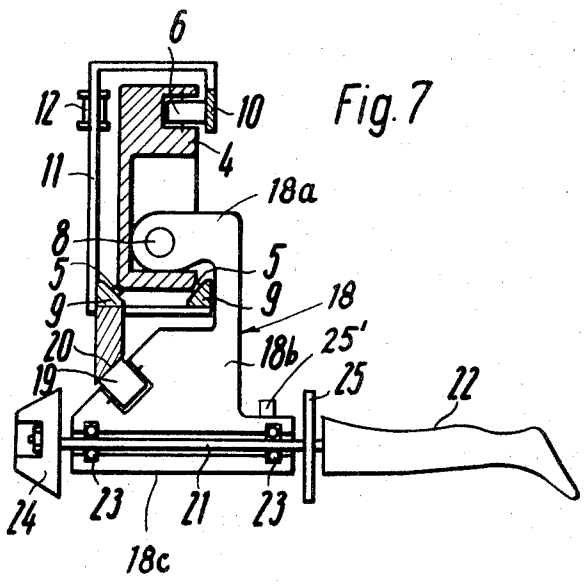


Fig. 6

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18b
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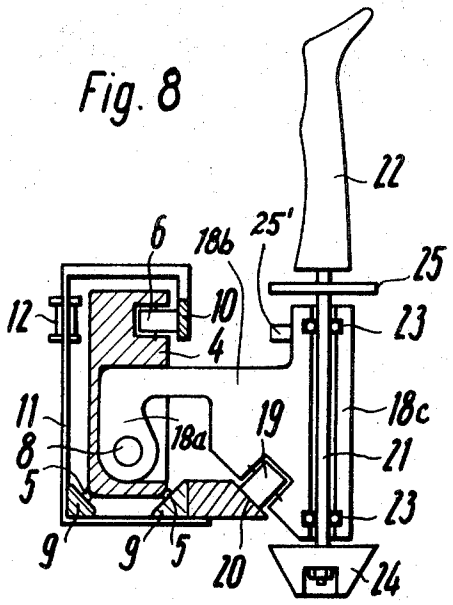
Fig. 7

Fig. 8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METHOD AND APPARATUS FOR TREATING KNIT GOODS, PARTICULARY HOSIERY MADE OF SYNTHETIC MATERIAL

BACKGROUND OF THE INVENTION

The present invention relates to knit goods, and more particularly to a method for treating knit goods, particularly hosiery made of synthetic materials, and to the apparatus for performing the method.

Toward the end of their production sequence goods of the type under consideration are delivered from a storage location over a distributing device toward a further processing location. When the goods reach the further processing location they are drawn over form members which are then transported by means of conveying devices through a treatment installation. In a continuous sequence of processing steps the goods are then treated in a known manner, e.g., washed, dyed, plasticized, rinsed, finished and dried.

An apparatus for treating hosiery as individual pieces in individual chambers is known, for example, from German Pat. No. 969,790. This apparatus comprises a plurality of different treatment chambers with controls and connecting lines required for the continuous performance of the associated process, a treatment channel, and a further processing channel. The chambers are arranged side-by-side or in a circle, and are designed to be either manually or automatically closed independently of one another. The individual chambers can also be heated. They may also be arranged horizontally for the passage there-through of the form members. Also, the form members may pass through the treatment channel in a perpendicular position.

The form members can be passed through the bottoms of the individual chambers, if the further processing channel is disposed below the chambers. Conversely the further processing channel may be disposed above the individual chambers in which case each form member can be dipped into the individual chambers and then pulled up into the treatment channel. During certain treatment stages the form members thus move through the chambers in a horizontal position and during other treatment stages in a vertical position.

An apparatus for shaping and sizing hosiery in which a form member is dipped into a treatment fluid is disclosed in German Pat. No. 657,151. According to this patent a construction is provided which permits tilting of the form member and which is provided with pipelines for the addition of a drying agent into the form member. Treatment of hosiery in a continuous manner is not possible with this apparatus, however.

In contradistinction, an apparatus in which hosiery is pulled onto a series of forms at one processing location and in which the forms are then moved over a table to an adjacent processing location is known from German Pat. No. 622,028. In the subsequent movement on the table the forms pass through a shower device, or into a liquid container in order to wet the hosiery. In the last-mentioned apparatus the wet hosiery can then be smoothed or resized on the forms before the forms reach a drying chamber.

Due to the substantially higher weight of dampened or wet knit goods in this state each piece per se is subjected to different mechanical stresses in the course of treatment. Furthermore, these mechanical stresses differ from piece to piece and also change within a shorter

or longer time. This means that the stitches of the goods are stretched to some degree which may result in extremely undesirable irregularities in some of the treatment stages. This is particularly so when hosiery of synthetic materials is dyed. Especially with hosiery made of texturized yarns, such irregularities result in shading or stripes which are unacceptable for high quality merchandise.

The flat leg profile forms used in the continuously operating treatment systems enhance this varying stretching of the stitches in knit goods so that, for example, on a horizontally moving form with a perpendicularly extending flat surface the stitches of a stocking drawn thereover are heavily stretched along the upper edge while in the area of the lower edge heavy kinking and higher moisture contents occur.

SUMMARY OF THE INVENTION

It is therefore a general object of the present invention to overcome these and other disadvantages of the existing art.

It is a more specific object of the present invention to provide an improved method of treating knit goods by intermittently rotating the form members over which the goods have been drawn while the form members over which the goods have been drawn while the forms are in either a horizontal or vertical position and passing through a treating installation.

It is another specific object of the present invention to provide a transporting unit for knit goods to be treated according to the above method.

It is still another object of the present invention to provide an apparatus for transporting knit goods to be treated according to the above method. The apparatus includes the above transporting unit and a drive for the transporting unit.

These and other objects are achieved according to the present invention by passing the form members through the treating installation and specifically through the varying treatment stages in the installation in a horizontal or vertical position while intermittently rotating the form members about their longitudinal axis.

The vertical position of the form members is utilized, for example, during the placing and removing of the knit goods and possibly also during the plastification, finishing and drying stages. The horizontal position is utilized, for example, during washing, dyeing, rinsing, and spindrying. The rotational movement of the form members about their longitudinal axis is provided in particular for the dyeing process. With a slow speed of rotation it can be assured that no irregular stretching or shortening will occur which could effect irregularities in the dyeing. With a higher speed of rotation there exists the possibility that moisture would be extracted due to the then higher centrifugal forces.

An apparatus for performing the method of the present invention is preferably so constructed that transporting units are provided which each comprise a runner, a supporting arm pivotally fastened to the runner and a form member which is rotatably mounted on the supporting arm. Such transporting units may be moved with the form member in a vertical position in a first part of a treatment system where the transporting units need not be moved in a continuous manner but can be collected in buffer regions, so that the knit goods, e.g., hosiery or parts of pantyhose, can be drawn over the

form members in a simple manner. These transporting units can then be removed from the buffer regions by, for example, circulating means of a rotating conveying device and can be continuously entered into the individual treatment stages where the form members rotate intermittently about their longitudinal axis and either in a vertical or horizontal position. In a centrifuge for hydroextraction the transporting units can rotate, for example, with the form members in a horizontal position and with their tips pointed toward the center of the centrifuge. In addition to the transporting units moving in a circular path within the centrifuge, the form members may also rotate about their longitudinal axes so that the moisture is extracted radially outwardly from the longitudinal axis as well as from the tip of the form member shaft. The goods on the form members are dyed in an apparatus according to the present invention at slower speeds of rotation of the form members about their longitudinal axes in a particularly simple manner so that uniform mechanical stress of the stitches is assured and thus uniformity of shade is attained for the goods which fully meet the desired quality requirements.

According to certain embodiments of the present invention a roller may be supported by the supporting arm. The supporting arm moves on a rail which is displaceable to establish the respective pivot position of the supporting arm. The pivoting movement of the supporting arm or its tilting is thus effected only by the distance of the rail from the pivot point of the supporting arm and its position with respect to the supporting arm during passage of the respective transporting unit through the treatment system.

The pivot point of the support arm about which the pivoting movement takes place is disposed, in particularly advantageous embodiments of the present invention, in the runner of the respective transporting unit. The runner may be provided with a plurality of pairs of rollers mounted thereon and extending from a bottom surface thereof and with a plurality of supporting rollers in the upper region of the runner on the side of the runner facing the supporting arm. The pairs of rollers extending from the bottom surface are engageable with and move on rails, for example, which may extend to different levels. Such level differences are advantageous, for example, in a continuous treatment system when the transporting units pass from a linear rail portion into a centrifuge and then back into a linear rail portion. In such cases the rails for the pairs of rollers extending from the bottom surface are directed upwardly and outwardly toward the edge of the centrifuge with an increasing radius of curvature. Thus the transporting units are decoupled from their drive means as well as braked by the ascending rails. In the subsequent path these rails may continue at their higher level, or they may be lowered to a lower level. For example, in the area where the goods are removed from the form members, after having completed their treatment, and the empty transporting units are moved to buffer paths, the rails may be at a lower level.

Sprockets may be provided for driving the transporting units. The sprockets are fastened to rotating belts or wheels and engage the runners by extending into an opening in the runners. With linear rails such belts may be guided along the rear of the runners. When entering into a centrifuge the transporting units move away from such a belt and are then gripped by the sprockets which are guided for example, by a sprocket wheel. The sprockets can be spring biased on the wheel or in frictional engagement within a peripheral groove of the sprocket wheel. Upon leaving the centrifuge the transporting units move - as mentioned above - away from the sprocket wheel so that this drive is decoupled. The units then move onto an upper level so that the following transporting units may file into the centrifuge below this upper level and in a horizontal position.

The advantages of the present invention are particularly obvious in embodiments of the present invention where the form members follow the natural shape of a leg in all dimensions. With such a form member, irregular stresses on the stitches of the knit goods, when in the dampened state are substantially eliminated during the rotation of a form member about its longitudinal axis. Such form members may also be made transparent so that, for example, visual final checking of the goods on the form member is not only substantially facilitated but can also be effected by automatic monitoring devices.

The rotational movement of the form members, which is the significant feature of the present invention, can be produced very easily in accordance with the various embodiments of the present invention by providing a driving wheel supported at one end of a shaft, the other end of which supports the form member. The drive wheel may either rotate on a fixed support during movement of the transporting unit, or it may cooperate with a movable drive device if a variable speed of rotation is desired. The movable drive may include toothed wheels and rods as well as friction gears. Preferred embodiments of the present invention are provided with a drive wheel in the form of a conical friction wheel in which the speed of rotation can be controlled by displacing the point of contact between the movable drive device and the wheel along the surface of the cone. The form member is so arranged that its center of gravity lies in the axis of rotation.

A further advantageous feature of the present invention resides in the provision of a protective plate mounted on the form member shaft between the form member and a bearing which mounts the shaft within the supporting arm. The plate is provided particularly to keep moisture away from the respective parts of the transporting unit.

An electromagnet may also be disposed at the supporting arm which together with magnetizable particles in the protective plate acts as a magnetic brake and which is operated at a low voltage of 24 volt, for example, or less so that it presents no danger for the personnel working in the installation. The electromagnet and plate thus brake the form member in its rotational movement and holds it in a desired position.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a path diagram illustrating the path through a treatment installation according to the present invention.

FIG. 2 is a side elevational view illustrating the runner of the transporting units according to the present invention.

FIG. 3 is a plan view illustrating a transporting belt according to the present invention.

FIG. 4 is a cross-sectional view taken along the line 4 — 4 in FIG. 3.

FIG. 5 illustrates a portion of a centrifuge wheel according to the present invention with a portion removed for clarity.

FIG. 6 is a cross-sectional view taken along the line 6 — 6 in FIG. 5 with the removed portion in assembly.

FIG. 7 illustrates a transporting unit according to the present invention with the form member in the horizontal position.

FIG. 8 illustrates a transporting unit according to the present invention with the form member in the vertical position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

At the outset it would be advisable to initially consider a generalized discussion of the present invention by reference to FIG. 1. According to FIG. 1 the treating of knit goods, e.g., hosiery or parts of pantyhose made of synthetic materials, takes place in a treatment installation identified by the reference numeral 1. Adjacent to the treatment installation 1 there is an area of buffer paths 2. In the area of the buffer paths 2 the goods are drawn over form members provided therefor and are then brought by a conveying device from the buffer paths 2 to the installation 1 for continuous treatment therein. If so desired, a centrifuge 3 may be placed in the area of the treatment installation 1. The transporting units move along a linear path into the centrifuge 3. The drive moving the transporting units along the path outside of the centifuge 3 is uncoupled and the drive of the centrifuge is coupled to the units to move them into the centrifuge. During entry into the centrifuge 3, the form members of the transporting units have already been moved into a horizontal position so that the tips of the form members are directed toward the center of the centrifuge. The speed of rotation of the transporting units in the centrifuge may be substantially higher than the speed thereof in the other treatment stages. When the transporting units leave the centrifuge, the centrifuge drive is uncoupled. This is accomplished by extending the path with an increasing radius of curvature. Thereafter, the path for the transporting units is directed upwardly so that the units are braked and the next transporting units, which enter into the centrifuge 3, pass below this upwardly directed path. In the subsequent treatment stages the height now attained by the units can be maintained while the path may be directed downwardly in that area where the completely treated goods are removed from the form members and the empty transporting units again enter the buffer paths 2.

An upwardly directed path may also be provided for the entrance of the transporting units into a drying system so that the warm air in this treatment stage does not escape or escapes only to an insignificant extent. When the transporting units leave the drying system, the rails are accordingly lowered so that here, too, the warm air will not escape or only to an insignificant extent.

Referring now to FIG. 2, the runners 4 of the transporting units used in the present invention are shown to be provided with pairs of rollers 5 extending from a bottom surface thereof (see also FIGS. 7 and 8) and with supporting rollers 6 extending from a side surface thereof. Two parallel extending rails 9 are provided on which the bottom rollers 5 move. The entire transporting unit is supported vertically by the engagement of the rollers 5 with the rails 9 and laterally by the engagement of the rollers 6 with a sliding surface 10. The sliding surface 10 is fastened to a frame 11 as are the rails 9. The frame 11 also includes guide rollers 12. These rollers are situated on the frame 11 along a path defined thereby to be linear. The rollers 12 guide a transporting belt 13 (FIGS. 3 and 4).

The transporting units are driven outside the centrifuge 3 by the engagement of the sprockets 14 (FIGS. 3–4) of the transporting belt 13 with the openings 7 in the runners 4, and in the centrifuge 3 by the engagement of the sprockets 16 of the sprocket wheel 15 (FIGS. 5–6) with the openings 7. The openings 7 extend into the runners 4 from a side surface thereof. This manner of fastening is selected so that the transporting units entering the centrifuge 3 are not suddenly accelerated to their final speed. For this purpose the sprocket wheel 15 is provided with a groove 17 in which a flange 16′ of the sprocket 16 is guided. The flange 16′ frictionally engages the walls of the groove 17 and slides relative thereto. The friction generated by the relative sliding movement is such that the transporting units can be driven by the sprocket wheel 15 without a sudden acceleration and with the sprocket wheel rotating at a constant speed. An alternative device in which the sprockets 16 engage within the openings 7 of the runners 4 operates in the same manner except that the sprockets are not frictionally guided but are arranged in assembly with springs which are able to expand in the peripheral direction of the sprocket wheel 15.

Turning now to a consideration of the form member assembly, FIGS. 7 and 8 show a supporting arm 18 which includes a pivot arm portion 18*a*, a roller mounting portion 18*b* and a form member supporting portion 18*c*. The arm 18 is pivotal in each case about a shaft 8 which in turn is mounted on the runner 4. The arm 18 has a roller 19 mounted on the portion 18*b*. The roller 19 engages a rail 20 which effectively serves as a pivot stop for the arm 18. In the position shown in FIG. 7, the rail 20 forms an engaging unit with the rear rail 9 on which the rear bottom rollers 5 move, and in the position shown in FIG. 8 it forms an engaging unit with the front rail 9 for the front bottom rollers 5. The rail 20 is guided in the area between the illustrated positions of the supporting arms 18 in such a manner that the rail itself effects the pivoting of the supporting arm 18. That is the rail 20 is directed in its length from the position shown in FIG. 7 to the position shown in FIG. 8. The rail 20 curves to therefore effect a camming action in pivoting the arm 18.

A shaft 21 is mounted in ball bearings 23 within the portion 18c of the arm 18. A form member 22 and a drive wheel 24 are fastened to the two ends of shaft 21. The rotational movement of the form member 22, which is a significant feature of the present invention, is effected intermittently during the movement of the transporting units in the treatment installation 1. For this purpose a member (not shown) is permanently connected to that portion of the frame 11 within the treatment installation 1, so that the rotational movement of the wheel 24 and therefore the form member 22 is effected only by the movement of the transporting unit during its passage through the treatment installation 1. If higher or lower rotational speeds of the form member 22 are desired, a movable drive member (not

shown) is provided which cooperates with the drive wheel **24**. The movable drive member can be moved into position to engage the wheel **24** as desired. In the illustrated embodiment, the drive wheel **24** is a conical friction wheel in which a change in the rotational speed within certain limits is possible by axial displacement of the line of contact between the wheel and the movable drive member.

A protective plate **25** is fastened on the shaft **21** between the form member **22** and the adjacent ball bearing **23** in the supporting arm portion **18***c*. With the form member **22** in the vertical position (FIG. **8**), the protective plate **25** catches, for example, excess or dripping liquids. In the horizontal position of the form member **22** (FIG. **7**), the protective plate **25** prevents, for example, soiling or other adverse influences on the adjacent bearing **23** of shaft **21** when the transporting unit passes through the centrifuge **3** and generally also when solid or liquid particles are directed toward the supporting arm **18.**

The form member **22** can be fixed in the supporting arm **18** in a known manner by mechanical means (not shown) so that rotation or axial movement thereof is prevented. Alternatively, an electromagnet **25'** may also be fastened to the supporting arm **18.** The electromagnet may form along with magnetizable particles in the protective plate **25,** a magnetic brake. This brake has an advantage over a mechanical brake in that the form member **22** can be rotated by small angular amounts since the force of the magnet can be appropriately dimensioned without difficulty.

The connection of such an electromagnet to a voltage source can be effected by slip contacts which are disposed at the runner or at the supporting arm of each transporting unit. It is here possible to provide insulating layers on the slip paths in the current inputs to disconnect the magnet in the individual stages of the treatment installation or to interrupt the current-conducting slip paths in any other desired manner.

According to the various embodiments of the present invention, the form member **22** is advantageously adapted in all its dimensions to the natural shape of a leg. This adaptation may, however, also be applied with less perfection so that the form member **22** then has an almost rectangular cross section with rounded edges or is oval. Even if the form member **22** is provided in the form of a flat leg profile, the rotation of the form member still has a sufficient effect on a uniform stretching of the stitches which otherwise could not be obtained, particularly for texturized yarns.

According to one embodiment of the invention, the form member **22** may be made of transparent material.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. Apparatus for transporting knit goods through the different stages of a treating installation, comprising in combination:

a frame;

a runner;

means for movably mounting said runner on said frame;

a form member over which the knit goods are drawn;

a supporting arm;

means for rotatably mounting said form member to said supporting arm;

means for pivotally fastening said arm to said runner;

drive means for displacing said runner along said frame in a continuous manner; and

means for intermittently rotating said form member as said runner is being displaced along said frame by said drive means.

2. Apparatus as defined in claim **1** wherein said means for pivotally fastening said arm fastens said arm to said runner so that said form member is selectively movable between a horizontal and a vertical position.

3. Apparatus as defined in claim **2** further comprising means for selectively pivoting said form member to a desired position between a horizontal and a vertical position.

4. Apparatus as defined in claim **3** wherein said means for selectively pivoting comprises: a roller mounted on said supporting arm, and a rail mounted on said frame, said roller engaging said rail for movement therealong, said rail being guided to correspond to the desired respective pivotal position of said supporting arm.

5. Apparatus as defined in claim **1** wherein said means for movably mounting said runner includes a pair of rails on said frame and a plurality of pairs of rollers mounted on said runner and extending from the bottom surface thereof, said plurality of pairs of rollers engaging said pair of rails; and wherein said runner includes a further plurality of rollers extending from the surface of said runner which faces said supporting arm, and said frame includes a further rail against which said further plurality of rollers bear to provide lateral support for said runner.

6. Apparatus as defined in claim **1,** wherein said form member is adapted in all its dimensions to the natural shape of a leg.

7. Apparatus as defined in claim **6,** wherein the form member is transparent.

8. Apparatus as defined in claim **1,** wherein: said form member mounting means includes a shaft rotatably mounted on said supporting arm, said form member being mounted at one end of said shaft; and said intermittently rotating means includes a drive wheel mounted on the other end of said shaft, and means mounted on said frame for intermittently engaging said drive wheel for imparting rotational movement to said form member through said shaft.

9. Apparatus as defined in claim **8,** wherein said drive wheel is a conical friction wheel.

10. Apparatus as defined in claim **9,** further comprising: a protective plate fastened on said shaft between said form member and said supporting arm.

11. Apparatus as defined in claim **8** wherein said form member is adapted in all its dimensions to the natural shape of a leg and said form member is mounted on said shaft so that said form member is rotatable about its longitudinal axis.

12. Apparatus as defined in claim **1** wherein:

said runner includes drive engaging means; and

said drive means includes a plurality of sprockets and means mounted on said frame for supporting said

sprockets for engagement with said drive engaging means.

13. Apparatus as defined in claim 12, wherein said drive engaging means is formed as an opening extending within said runner.

14. Apparatus as defined in claim 12, wherein said means for supporting said sprockets is a belt.

15. Apparatus as defined in claim 12, wherein said means for supporting said sprockets is a wheel.

16. Apparatus as defined in claim 15, wherein said wheel includes a peripheral groove, and wherein said sprockets are mounted to a flange which is in frictional engagement with said wheel in said groove.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,842,973 Dated October 22nd, 1974

Inventor(s) Horst Rothert

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent, line 7, change "Roheleitungsbau" to --Rohrleitungsbau--.

In the Abstract, line 5, change "form" to --floor--.

Column 1, line 32, change "there-through" to --therethrough--.

Column 2, line 25, delete "form mem-"; line 26, delete in its entirety.

Signed and sealed this 31st day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.