Sept. 12, 1933. E. J. BERGER ET AL 1,926,694

METHOD AND APPARATUS FOR FINISHING TEXTILE PRODUCTS

Filed July 9, 1928 4 Sheets-Sheet 1

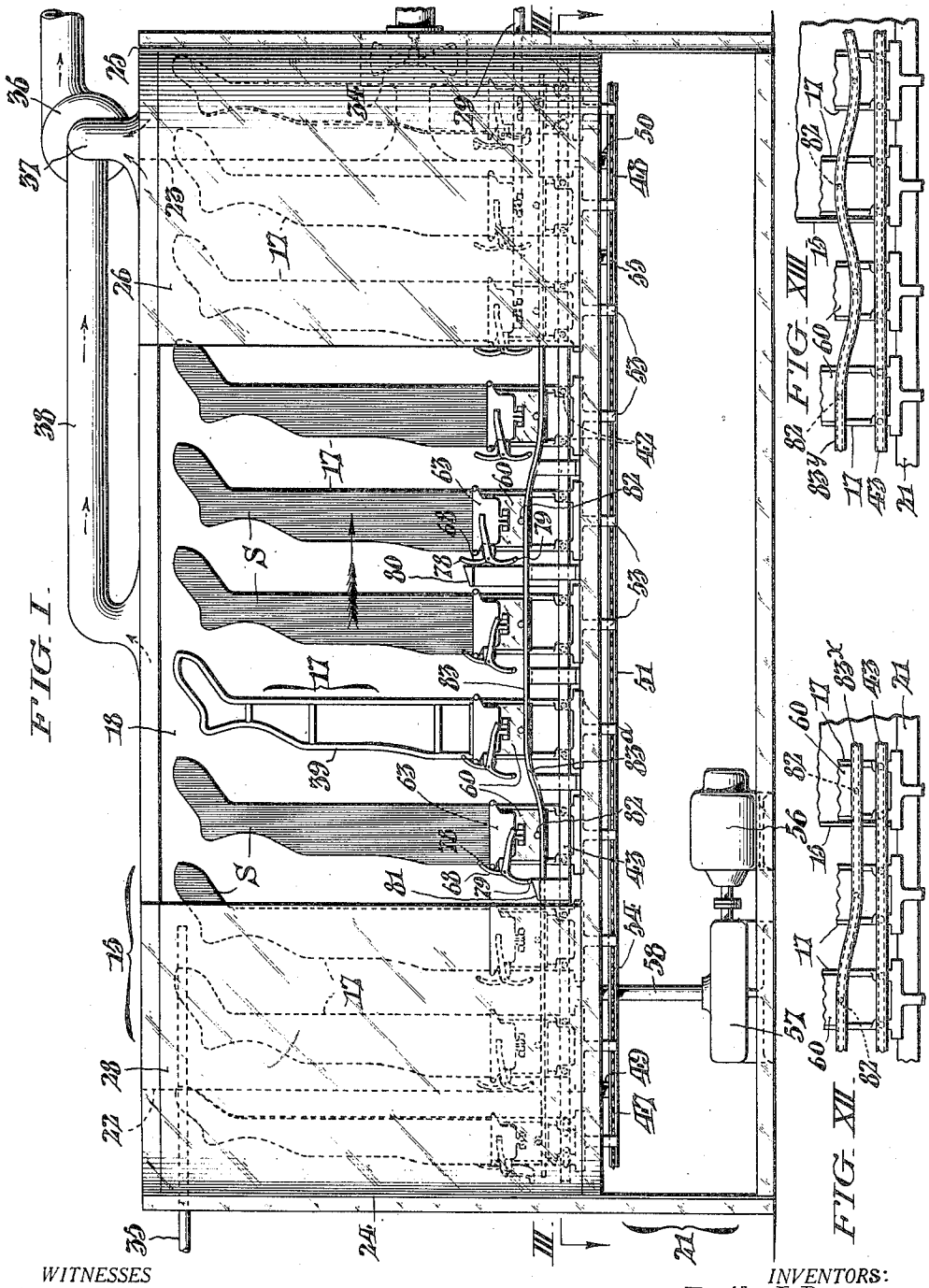


FIG. I.

FIG. XIII

FIG. XII

WITNESSES

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METHOD AND APPARATUS FOR FINISHING TEXTILE PRODUCTS

Filed July 9, 1928 4 Sheets-Sheet 2

FIG. II.

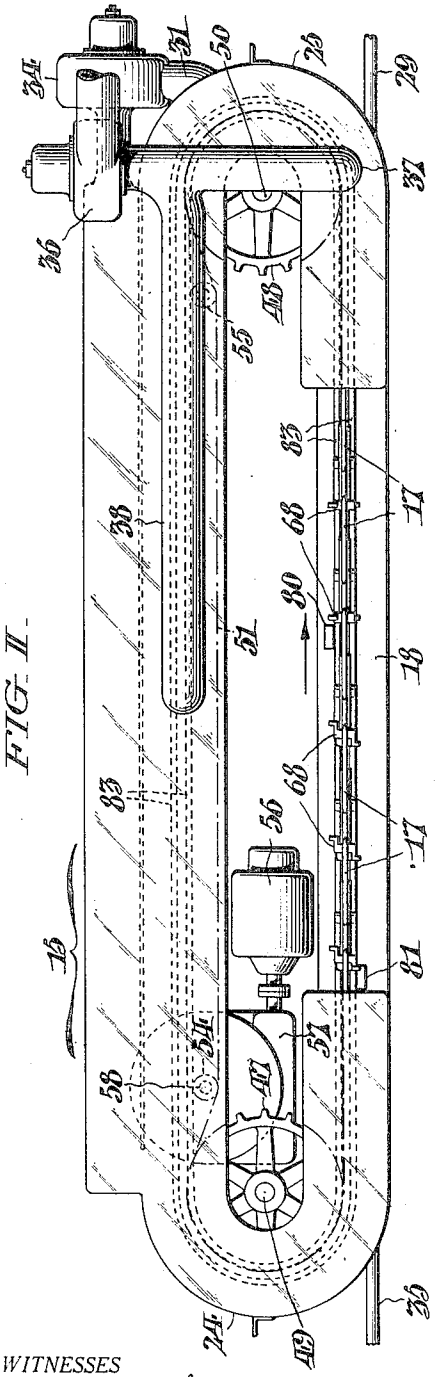
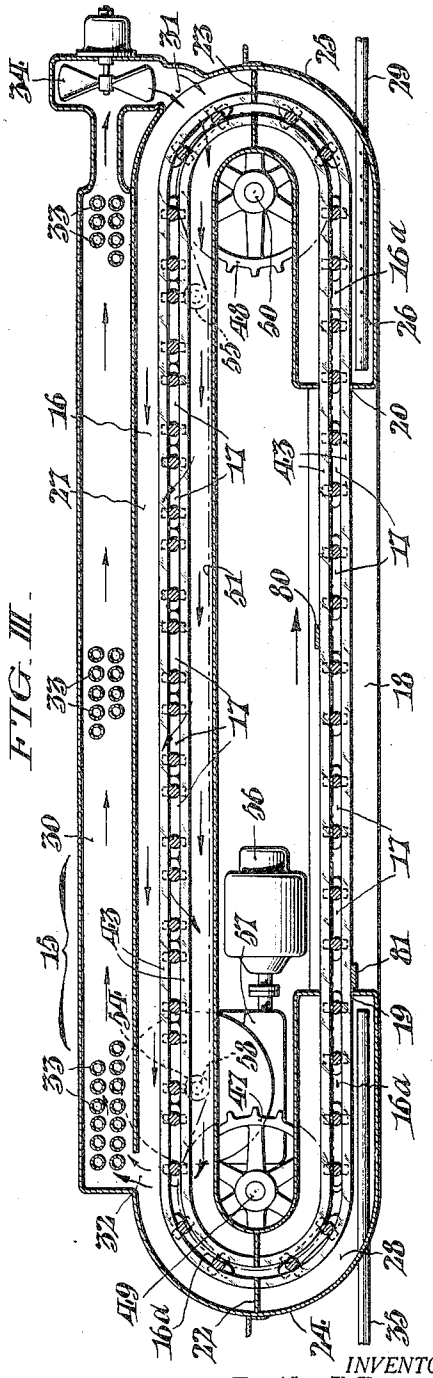


FIG. III.



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METHOD AND APPARATUS FOR FINISHING TEXTILE PRODUCTS

Filed July 9, 1928 4 Sheets-Sheet 3

FIG. V.

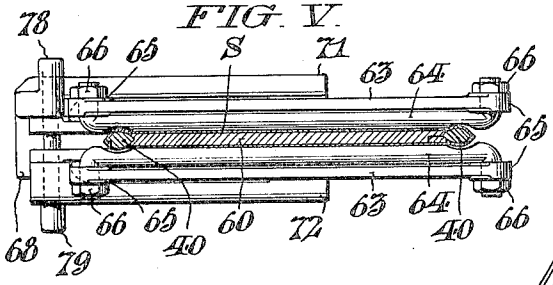


FIG. VI.

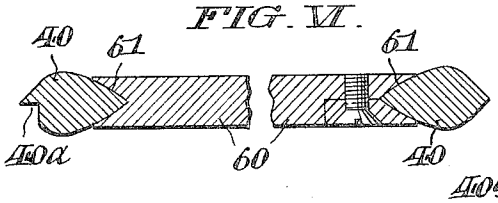


FIG. VII.

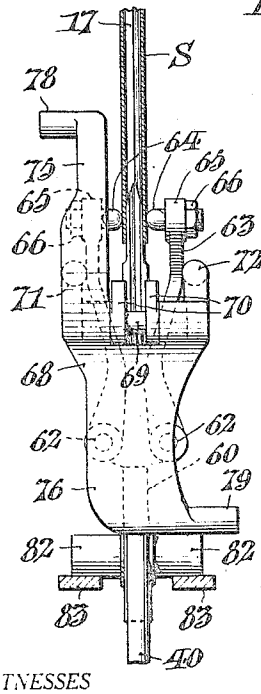


FIG. IV.

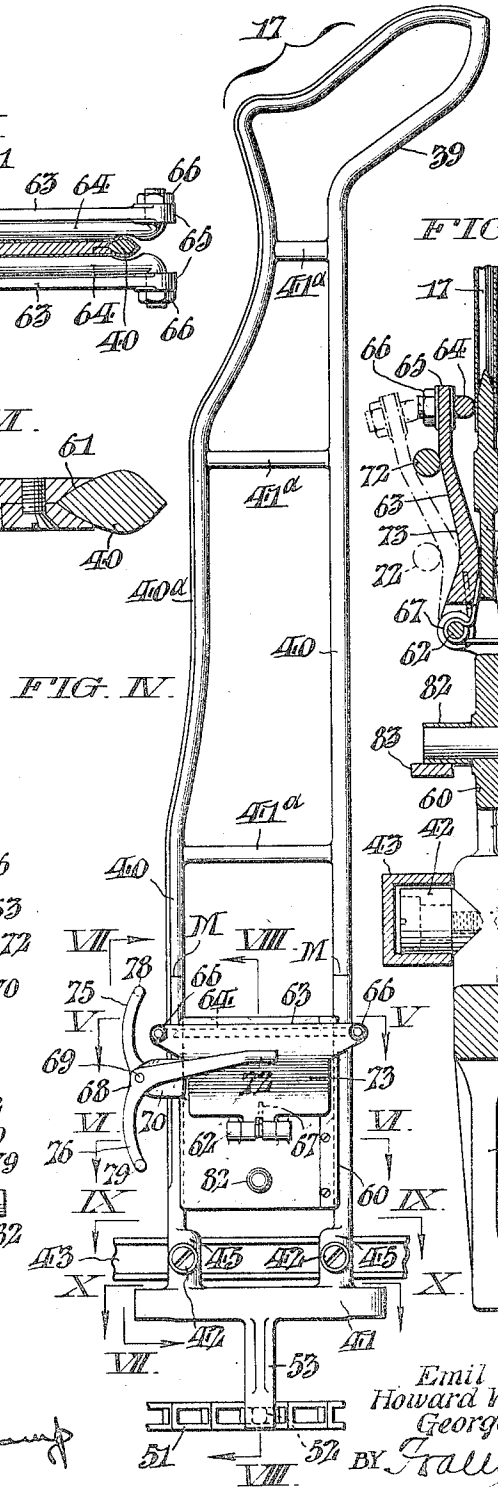
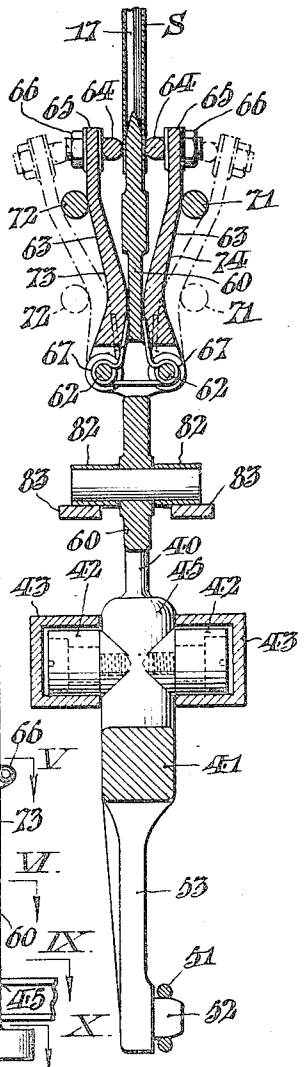


FIG. VIII.



WITNESSES

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METHOD AND APPARATUS FOR FINISHING TEXTILE PRODUCTS

Filed July 9, 1928 4 Sheets-Sheet 4

FIG. IX.

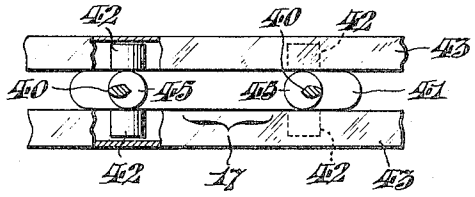


FIG. X.

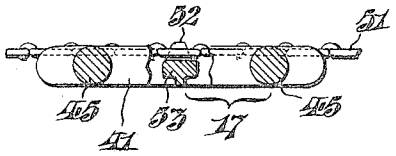
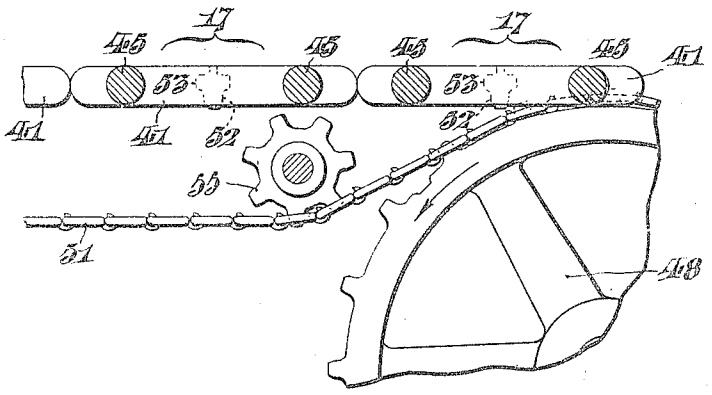


FIG. XI.



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Patented Sept. 12, 1933 1,926,694

UNITED STATES PATENT OFFICE

1,926,694

METHOD AND APPARATUS FOR FINISHING TEXTILE PRODUCTS

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Application July 9, 1928. Serial No. 291,367

19 Claims. (Cl. 223—17)

This invention is concerned with the finishing of articles of textile manufacture, more particularly knitted wares such as hosiery and the like.

In the main our invention is directed toward securing, in textile articles of the specific kind referred to, especially those knit from silk yarn or rayon (artificial silk), an improved high luster finish characterized by absolute evenness of sheen throughout to the end of adding greatly to the appearance and attractiveness of the articles while enhancing their salability to a corresponding degree. The foregoing desiderata we attain by initially subjecting the articles to a vaporous treating medium such as steam at a very high temperature, or a chemical agent like ammonia, (in accordance with the particular kind of material used in fabrication of the articles) while the articles are stretched on shaping forms and all maintained under a controlled degree of lengthwise gravity tension. This initial step we follow by subjecting the articles, while still under the same uniform gravity tension, to the action of a drying medium to permanentize the shape determined by the forms, and in some instances, by still another step by which the natural humidity ("regain" moisture) is restored to the articles in order to properly condition them, i. e. to render the fabric soft to the touch. By our novel method, we effectively obviate the disadvantages of uneven finish and surface blemishes as well as other irregularities which were to a great extent heretofore due to uneven tension or, conversely considered, to unrestrained lengthwise contraction of the articles incidental to the moistening and drying stages of the finishing operation.

Another object of our invention is to afford a treating apparatus suitable to the attainment of the foregoing advantages, which is highly efficient; extremely compact so as to occupy a minimum of floor space; simple and comparatively inexpensive in construction; and, moreover, continuous in operation with provisions for automatically inducing a predetermined degree of uniform lengthwise tension on the articles stretched on the shaping forms in preparation for the finishing treatment, for maintaining them under such uniform tension during passage through the apparatus, and for automatically relieving the tension upon emergence of the articles from the apparatus after the treatment.

Still further objects and attendant advantages will be manifest from the detailed description which follows of the typical embodiment of this invention shown in the accompanying drawings, whereof Fig. I is a side elevation of our novel treating apparatus.

Fig. II is a plan view of the organization.

Fig. III shows a diagrammatic plan section taken, for the most part, as indicated by the arrows III—III in Fig. I.

Fig. IV is a view on a larger scale showing one of the shaping forms and the details associated with it, together with portions of the guiding and progressing means therefor.

Fig. V is a plan section, taken as indicated by the arrows V—V in Fig. IV.

Fig. VI is a view similar to the immediately preceding illustration, but on a larger scale, and taken as indicated by the arrows VI—VI in Fig. IV.

Fig. VII shows an edge view of the lower portion of the hosiery form and associated parts, viewed in the direction of the arrows VII—VII in Fig. IV.

Fig. VIII is a vertical detail sectional view, taken as indicated by the arrows VIII—VIII in Fig. IV.

Figs. IX and X are plan sections, respectively in accordance with the arrows IX—IX and X—X in Fig. IV.

Fig. XI is an illustration showing a detail associated with the means for progressing the shaping forms in the apparatus; while,

Figs. XII and XIII are diagrammatic views showing certain modified details of our invention.

With reference first more particularly to Figs. I, II and III of these illustrations, it will be noted that our improved finishing apparatus comprises a casing or enclosure 15 of sheet metal which affords a narrow corridor or passage 16 having the configuration of an elongated straight-sided ellipse adapted to be traversed, in the direction indicated by the arrows in Figs. II and III, by a continuous succession of open vertical shaping forms 17 intended, in the present instance, for ladies hosiery. The straight frontal portion of the enclosure 15 is interrupted centrally of its length as at 18 to afford a space where the forms 17 are brought to the exterior for clothing and stripping, exit and re-entrance being by way of vertical slits 19 and 20 just wide enough to clear the forms 17. As shown in Fig. I, the enclosure 15 is supported at an elevation by a frame 21, which, for convenience in practice, is built from structural iron. Vertically slitted partitions 22, 23 extending transversely of the rounded end portions 24, 25 of the form traversing passage 16, set apart intercommunicating chambers 26, 27 and 28 in which diversified at-

mospheric conditions are maintained respectively for the purpose of treating, drying and conditioning the articles, the two end (treating and conditioning) chambers 26, 28 being small in linear extent as compared to the intermediate (drying) chamber 27. The function of supplying a vaporous treating medium such as high temperature steam, or a chemical agent like gaseous ammonia to the chamber 26 is relegated to a jet pipe 29 placed in the bottom of said chamber. An auxiliary compartment 30 extending along the rear of the drying chamber 27 and communicating therewith at the ends through ports 31 and 32, accommodates a bank of heating coils 33; and a motor driven rotary fan 34 located in the port 31 maintains a continuous circulation of air between the drying chamber 27 and the heating compartment 30. The stockings S on the open shaping forms 17 are therefore evenly and thoroughly dried as a consequence of diffusion of the agitated preheated air through and about them in the chamber 27. A jet pipe 35 emitting cool water vapor, or other conditioning medium, is located in the upper end of the chamber 28 so that the "regain" moisture necessary to proper softening of the knitted material of the stockings is supplied before emergence of the forms 17 through the exit slit 19. Thus by travel through the apparatus in the direction of the arrows in Figs. II and III, the stockings S carried on the forms 17 are first treated in the sub-division 26, then uniformly dried incidental to passage through the longer subdivision 27, and finally conditioned in the chamber 28. In order to insure continuous atmospheric displacement during the process, the apparatus is equipped with an exhaust system including a rotary suction blower 36 with branch conduits 37, 38 leading into the tops of the treating and drying chambers 26, 27, influx of air taking place by leakage through a central opening 16*a* along the bottom of the passage 16, see Fig. III.

As shown in Figs. IV to VIII, each of the shaping forms 17 comprises a light open profile frame 39 of metal which is preferably cast integral with its verticals 40 joined at the bottom by a sturdy cross bar 41, and at spaced intervals of its height by additional thinner cross bars 41*a* all contributing to the strength and rigidity of the unit as a whole. From Fig. IV it will be observed that the spaced verticals 40 are substantially elliptic in cross section with the major axes of the ellipses lying in the medial plane of the form 17. As shown, the outer periphery of the form 17 is made quite sharp to provide an effective scoring edge; while the rear vertical 40 is recessed along one side as at 40*a* to receive the central seam at the back of the stockings S. Near the bottom and at opposite sides, each form 17 is equipped with rollers 42 which are arranged in horizontally associated pairs for engaging fixed opposing channel rails 43, in the bottom of the enclosure 15. These channel rails 43 are suitably secured to the structural frame-work 21 and lie centrally of the passage 16, thereby defining an endless course of travel for the forms 17 with firm support of the latter in vertical position. At the region of attachment of the rollers 42, the uprights 40 of the forms 17 are thickened and made to circular cross-section as at 45 for snug guidance in the interval between the opposing channel rails 43 and for capacity to easily take the curves at the ends of the structure. The means for progressing the forms 17 includes a pair of sprocket wheels 47, 48 which are located directly beneath the enclosure 15 and rotate on vertical shafts 49, 50. As shown, the shafts 49, 50 are co-axial with the rounded ends 24, 25 of the enclosure 15 and the correspondingly configured opposing guide channels 43, journal support being provided by suitable bearings (not shown) on the frame 21. An endless chain 51 is trained about the sprocket wheels 47, 48 for horizontal travel at a level to be normally engaged by laterally projecting lugs 52 of stems 53 depending centrally from the bottom cross bars 41 of the shaping forms 17 down through the opening 16*a* in the bottom of the enclosure 15, see Figs. I, IV and VIII. To effect temporary detachment as between the forms 17 and the sprocket chain 51 within the drying chamber 27, we employ a pair of sprocket pinions 54, 55 to divert the corresponding run of said chain laterally inward, as shown in Figs. III and XI. As a consequence of detachment from the chain 51 in the manner just described, the forms 17 accumulate within the drying chamber 27, and are progressed therein solely as a consequence of abutment between the contiguous projecting ends of their lower cross bars 41 and under push propulsion of following forms 17 in the series still attached to the chain 51 and rounding the sprocket wheel 48. Currently with such push progression, the leading forms 17 of the detached series within the drying chamber 27 are successively re-presented to the chain 51 at the region of the sprocket wheel 47, i. e. immediately after advance beyond the province of the pinion 54. Now it will be obvious that under this arrangement, the forms 17 are closely grouped during the drying period, thereby permitting use of a very much shorter drying chamber than would otherwise be required. The progressing chain 51 is continuously driven by a motor 56 located in the open interval beneath the enclosure 15, through the medium of a speed reduction device 57 shown as co-ordinated with the shaft 58 of the pinion 54.

For the purpose of maintaining the stockings S all under the same degree of lengthwise or gravity tension during treatment in the apparatus, we equip each shaping form 17 with a weighted tension applying member 60 which is slidable up and down in that part of the opening in said form between the bottom cross bar 41 and the first of the supplemental cross bars 41*a*. The member 60 is of rectangular plate-like configuration and somewhat thinner (Fig. VI) than the frame 40 with avoidance of lateral projection therebeyond. As shown in Figs. V and VI, the opposite side edges of the member 60 are V-grooved, as at 61, in correspondence with the tapered inner edges of the verticals 40 for retainment in the form 17. Pivoted at 62 to opposite faces of the weight 60 are clamping jaws 63 which are fitted at their tops respectively with contact bars 64 to engage the stocking fabric. As shown in Figs. VII and VIII these contact bars 64 are fashioned from stout round wire with laterally turned ends for projection through bosses 65 of clamping jaws 63 and to take securing nuts 66. By virtue of this arrangement, the tension applying member 60 is effectively clamped to the lower end of the stocking S with preclusion of contact over a prohibitive area such as would be likely to mar the appearance of the texture of the finished article. The clamp jaws 63 are actuated in opposition to a spring 67 (which is common to them both and tends to move them to open position) by a lever 68.

This lever 68 is pivoted at 69 to a clevised lug 70 that projects sidewise from the weight member 60, and has parallel fingers 71 and 72 with rounded ends adapted to cooperate with inclined cam surfaces 73, 74 at the out-sides of the clamp jaws 63. The lever 68 also has upwardly and downwardly extending extremities 75, 76 with lateral terminal lugs 78, 79, for cooperation with positionally fixed actuating cams 80, 81 along the course of the forms 17 in the interval 18 at the front of the apparatus in a manner hereinafter more fully disclosed. Projecting from opposite sides of the weight member 60 near its bottom edge are rollers 82, which, incidental to travel of the forms 17 through the enclosure 15, run on a double endless rail 83 which lies along the prescribed course of said forms. Exteriorly of the enclosure 15 along the interval 18, the rail 83 has a cam rise 83*a* by which the tension applying members 60 are temporarily elevated to the position shown in Fig. I.

In the use of our improved finishing apparatus, the forms 17 are clothed successively as they traverse the interval 18 when the tension applying members 60 are held in the elevated position on the cam rise 83*a* of the rail 83 with the clamp jaws 63 in open position, as shown in dot and dash lines in Fig. VIII. In clothing, the stockings S are drawn down over the forms 17 until the edges around their leg openings register at the level of the crossmarks M, M, (Fig. IV), the tension applying members 60 being incidentally overlapped, see Figs. VII and VIII. The clothing operation is further facilitated and proper placement of the stockings S assured through allocation of the stocking seams in the rear edge recesses 40*a* of the forms 17.

When mounted, the stockings S can be readily inspected for imperfections or blemishes by virtue of visibility afforded through the open frames 39. As the clothed forms 17 are advanced to the right in Fig. I, the lugs 78 at the end of the vertical extremities 75 of the levers 68 successively encounter the fixed cam 80, and said levers are thereby swung counter-clockwise. It therefore follows that the parallel fingers 71, 72 of the levers 68 are moved upwardly, and, through engagement with the bevel cam surfaces 73, 74, the clamping jaws 63 are concurrently moved inward in opposition to the springs 67 to clamp opposite sides of the stocking against the weighted tension applying members 60. Upon further advance of the forms 17, i. e., beyond the rise 83*a* of the rail 83, it will be seen that the tension applying members 60 are permitted to descend under their own weight to an extent limited by engagement of the rollers 82 with the lower or normal level of said rail. As a consequence, the stockings S on the forms 17 are all placed under exactly the same degree of lengthwise or gravity tension, the degree of which is determined in each instance through check of the descent of the tension applying member 60 by the rail 83. The function of tensioning the stockings S is thus vested solely in the weight of the members 60 and the parts attached thereto. This does not necessarily result in elongation of the stockings S, but the tension induced is nevertheless uniformly distributed in each. While thus tensioned the stockings S are progressed successively through the humidifying, the drying and the conditioning subdivisions 26, 27, 28, respectively, of the enclosure 15. Immediately upon emerging from the conditioning chamber 28 at the completion of the finishing treatment, the lower extremities 79 of the levers 68 on the forms 17 encounter the upgrade of the fixed cam 81 on the framework 21 to the end that the parallel fingers 71, 72 of said levers are swung downward, thereby permitting the clamping jaws 63 to open automatically under action of the springs 67 with release of the tension applying members 60 in preparation for removal of the stockings S from the forms 17 as they are further progressed along the interval 18.

In some instances of practice it may be desirable to induce lengthwise tension on the articles without relying upon the weight of the tension applying members 60 as above described. In such instances we may resort to the use of opposed grooved rails such as shown at 83*x* in Fig. XII, in lieu of the rails 83 of the first embodiment to cooperate with the rollers 82 on the tension applying members 60. Here it will be noted that uniformly distributed tension is induced through equal elongation of the stockings S.

In still other instances where the intermittent application of tension may be desirable or requisite, we may employ the arrangement shown in Fig. XIII. Here the opposing rails 83*y* which cooperate with the rollers 82 on the tension applying members 60 are given a sinuous configuration along the course of travel of the forms 17 within the enclosure 15. With this modified construction, the tension applying members 60 are moved up and down during the humidifying, drying and conditioning stages of the process with consequent relaxation and tensioning of the articles at recurrent intervals.

Treatment of the articles while under a definite tension in accordance with our improved method, is attended in practice by absolute uniformity as regards finish, and their appearance marked by a very high gloss or luster. The simplicity of our novel apparatus precludes the possibility of easy derangement or failure in any of the several steps of the treatment, while its continuous operation is conducive to dispatch of the treatment and therefore to economic manufacture of stockings and the like.

Having thus described our invention, we claim:

1. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a narrow treating passage adapted to be continuously traversed by a succession of forms to carry the articles, said passage having the configuration of an elongated straight-sided ellipse with an interruption in one side for exposure of the forms at the exterior to facilitate clothing and stripping.

2. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a narrow treating passage adapted to be continuously traversed by a succession of forms to carry the articles, said passage having the configuration of a straight-sided ellipse, a heating compartment along one of the straight sides of the treating passage and communicating therewith at opposite ends, and means for circulating air between the passage and the heating compartment.

3. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a narrow passage adapted to be continuously traversed by a succession of forms to carry the articles, said passage having the configuration of an elongated straight-sided ellipse with an interruption in one side for travel of the forms at the exterior to enable clothing and stripping, transverse partitions setting apart separate chambers in the course of the forms through the enclosure, and

means to maintain different atmospheric conditions in the several chambers for diversified treatment of the articles.

4. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a narrow passage adapted to be continuously traversed by a succession of forms to carry the articles, said passage having the configuration of an elongated straight-sided ellipse with an interruption in one side for travel of the forms at the exterior to facilitate clothing and stripping, transverse partitions in the passage setting apart separate chambers in the course of the forms through the enclosure, means to maintain different atmospheric conditions in the several chambers for diversified treatment of the articles, and an exhaust system with separate connections to the chambers.

5. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a treating chamber, a series of shaping forms to carry the articles, means for progressing the forms through the treating chamber, and means for maintaining the articles on the forms all under a controlled degree of lengthwise gravity-tension incidental to passage through said treating chamber.

6. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a treating chamber with means therein for supplying vaporous treating medium, a communicating drying chamber with means for heating the air therein, a series of shaping forms to carry the articles, means for progressing the forms successively through the treating and drying chambers, and means to maintain the articles all under a controllable degree of lengthwise gravity-tension incidental to passage through said chambers.

7. In apparatus for finishing textile articles, such as hosiery, an enclosure affording a treating chamber with means therein for supplying vaporous treating medium, a drying chamber with means for heating the air therein, a conditioning chamber with means therein for releasing a cooling conditioning medium, a series of shaping forms to carry the articles, means for progressing the forms successively through the treating, drying and conditioning chambers, and means for maintaining the articles all under a controlled degree of lengthwise gravity-tension incidental to passage through said chambers.

8. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of shaping forms to carry the articles, means for progressing the forms through the enclosure, and means to place the articles all under a controlled degree of gravity-tension prior to entry of the forms into the enclosure.

9. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of shaping forms to carry the articles, means for progressing the forms through the enclosure, means to place the articles all under a controlled degree of gravity-tension prior to entry of the forms into the enclosure, and means to relieve the tension on the articles upon emergence of the forms from the enclosure.

10. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of shaping forms with individually associated means for maintaining the articles under a controlled degree of lengthwise gravity-tension, means for progressing the forms through the enclosure, and means for bringing the tension means into action prior to entrance of the forms into the enclosure and for releasing said tension means upon emergence of the forms from said enclosure.

11. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means for progressing the forms through the enclosure, weighted tension applying members with clamps slidable on the forms, and means operative, prior to entrance of the forms into the enclosure, to actuate the clamps for attachment of the tension applying members to the lower ends of the articles, and for freeing said members to apply the tension.

12. In apparatus for finishing textile articles such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means for progressing the forms through the enclosure, weighted tension applying members with clamps slidable on the forms, means operative prior to entry of the forms into the enclosure to actuate the clamps for attachment of the tension applying members to the lower ends of the articles and for freeing said members to apply the tension, and means operative upon emergence of the forms from the enclosure to actuate the clamps for detachment of the tension applying members.

13. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means for progressing the forms through the enclosure, tension applying members with clamps slidable on the forms, means exteriorly of the enclosure to temporarily support the tension applying members in elevated position with the clamps open to permit clothing of the forms, means to close the clamps for attachment of the tension applying members to the lower ends of the articles prior to release by the temporary supporting means aforesaid and entry of the forms into the enclosure, and means to open the clamps for detachment of the members aforesaid, upon emergence of the forms from the enclosure, thereby to enable stripping of the articles.

14. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means for progressing the forms through the enclosure, means to guide the forms over a definite course incidental to progression through the enclosure, tension applying members with clamps slidable on the forms, a rail along the course of travel of the forms, said rail having a rise exteriorly of the enclosure to temporarily hold the tension applying members in elevated position with the clamps open to permit clothing of the forms, means for actuating the clamps to attach the tension applying members to the lower ends of the articles prior to advance of the forms beyond the rise of the rail aforesaid and entry into the enclosure, and means operative upon emergence of the forms from the enclosure to actuate the clamps for detachment of the members aforesaid.

15. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means for progressing the forms through the enclosure, means to guide the forms over a definite course incidental to progression through the enclosure, tension applying members with pivoted clamps slidable on the forms, and cam means along the course of travel of the forms for actuating the clamps to secure the tension applying members to the lower ends of the articles prior to entry of the forms into the enclosure and for actuating the clamps to free the members aforesaid sub-

sequently upon emergence of the forms from the enclosure.

16. In apparatus for finishing textile articles, such as hosiery, an enclosure, a series of vertical shaping forms to carry the articles, means to guide the forms over a definite course of travel in said enclosure, a progressing chain adapted to be engaged by the forms, and means to divert part of the run of the chain away from the forms for compacting of the latter in the enclosure and propulsion by direct contact under push of following forms still engaged with said chain.

17. The method of finishing textile articles, which consists in subjecting them to a definite degree of intermittently-applied lengthwise gravity-tension incident to passage through a vaporous treating atmosphere at high temperature.

18. The method of finishing textile articles, such as hosiery, which consists in subjecting said articles, while stretched on shaping forms under a definite degree of intermittently-applied lengthwise gravity-tension, to passage first through a vaporous treating atmosphere and then through a drying medium.

19. The method of finishing articles, such as hosiery, which consists in subjecting said articles, while stretched on shaping forms under a definite degree of intermittently-applied lengthwise gravity-tension, to progression first through a vaporous-treating medium, then through a drying medium, and finally through a conditioning medium.

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