April 24, 1951 L. HELDMAIER 2,550,559

TREATMENT OF STOCKINGS AND OTHER KNITTED ARTICLES

Filed Dec. 3, 1946 2 Sheets-Sheet 1

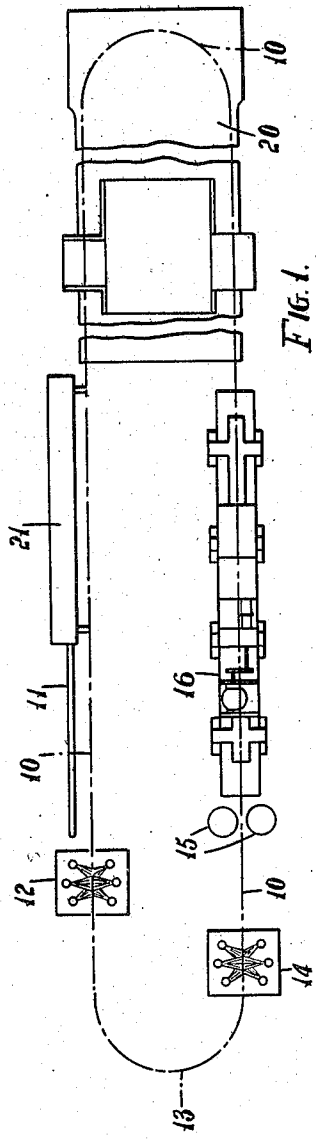


FIG. 1.

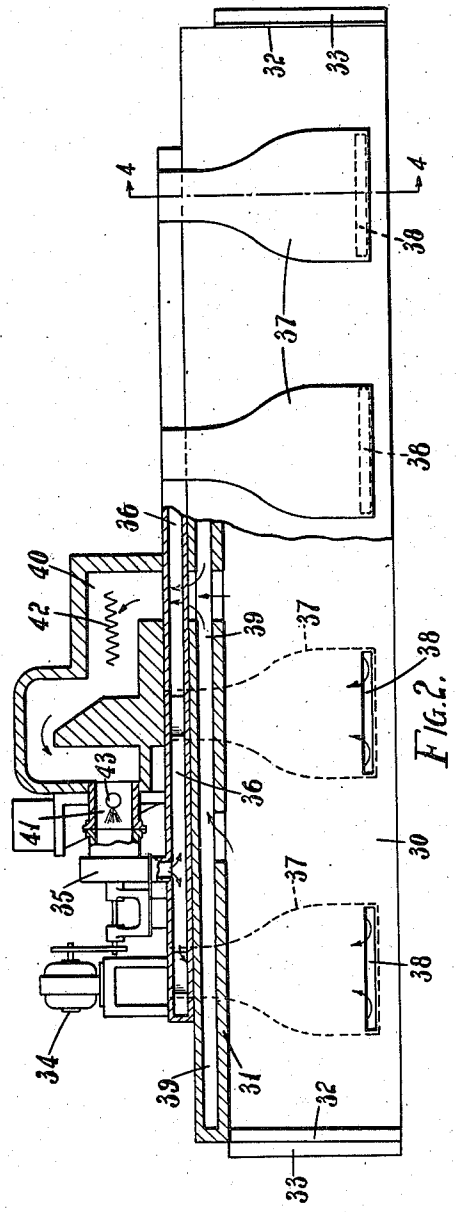


FIG. 2.

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TREATMENT OF STOCKINGS AND OTHER KNITTED ARTICLES

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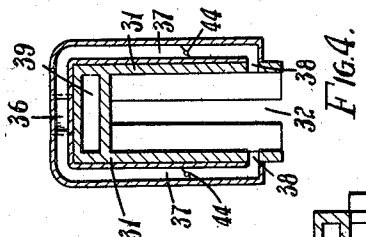


FIG. 4.

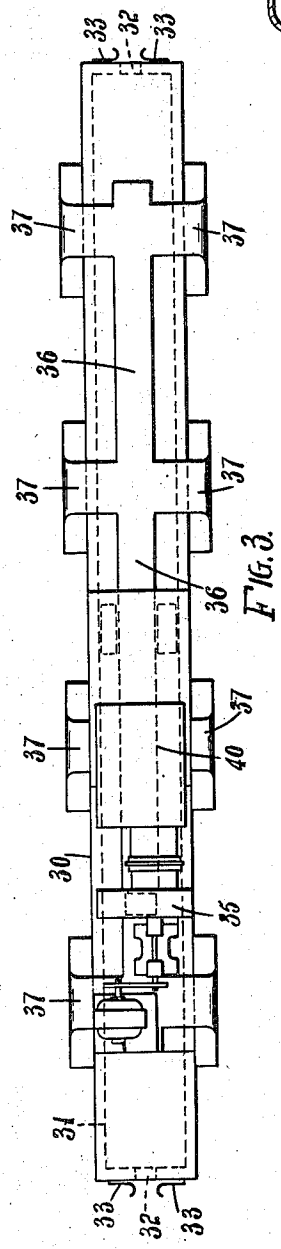


FIG. 3.

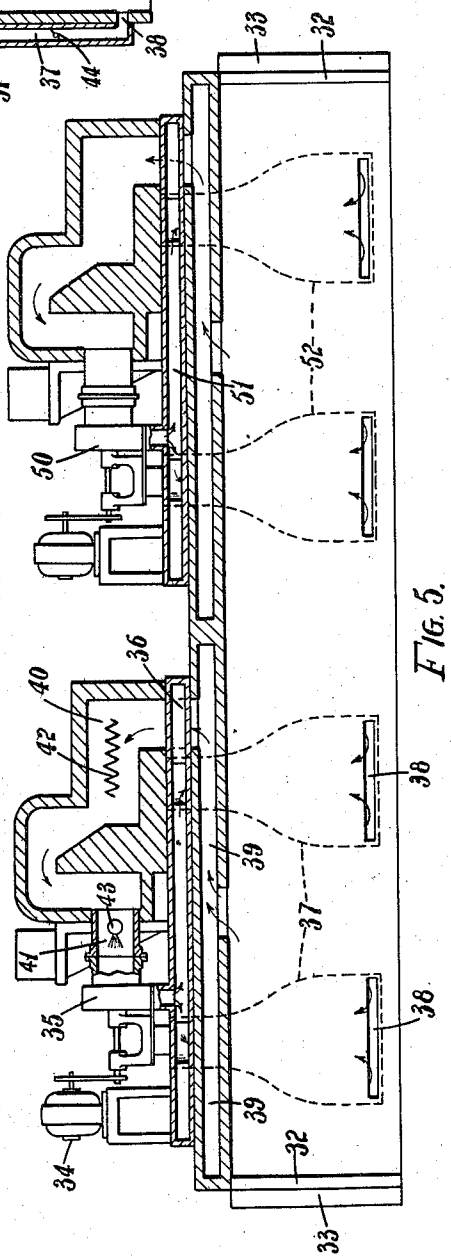


FIG. 5.

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UNITED STATES PATENT OFFICE

2,550,559

TREATMENT OF STOCKINGS AND OTHER KNITTED ARTICLES

Luis Heldmaier, Leicester, England

Application December 3, 1946, Serial No. 713,707
In Great Britain December 20, 1945

10 Claims. (Cl. 223—76)

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This invention relates to improvements in the treatment of stockings and other shaped textile articles, more particularly articles made of nylon or a similar polyamide type of synthetic product, hereinafter referred to, for convenience, as "nylon stockings." The invention is also, however, applicable to the treatment of shaped textile articles made of cellulose acetate or pure silk, as will be explained hereinafter.

It is well recognised that for the satisfactory production of nylon stockings it is necessary to subject the stockings to a combined heat and steam treatment in order to plasticise the material, this treatment being known in the trade as "pre-boarding." In the past, pre-boarding of nylon stockings has been carried out by mounting the stockings on forms and keeping them, whilst still on the forms, in a stationary steam chamber. This, however, is a slow process and it has been proposed in my co-pending patent application No. 622,019, now abandoned, to carry out this pre-boarding treatment as a continuous process, the forms to receive the stockings being carried by an endless conveyor which is adapted to take the stockings on the forms, after suitable preliminary treatment if desired, through a preboarding chamber in which they are subjected to the action of live steam and heat.

The chief object of the present invention is to provide a modification of, or improvement on the process of pre-boarding or plasticising shaped textile articles described in my said co-pending patent application, more particularly in respect of the manner of producing the additional heat required and of easily controlling the same.

The apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings according to one form of the present invention includes an endless conveyor carrying forms for the reception of the shaped textile articles and a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, and is characterised by the provision, firstly, of a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit and, secondly, of one or more electric heaters for heating the circulating air to the desired temperature.

According to a further feature of the present invention, the live steam is injected into the air stream after it leaves the heating means (which may be electrically operated or not as desired), and before it reaches the fan, whereby the steam and hot air are thoroughly mixed before they

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reach the pre-boarding or plasticising chamber.

According to yet a further feature of the present invention, the live steam and hot air are supplied to the pre-boarding chamber at or near the bottom of the same. Preferably the live steam and hot air are supplied to the plasticising chamber at or near the bottom of one or both sides and leave the same at or near the top.

According to another feature of the present invention, the afore-mentioned fan is adapted to circulate live steam and hot air through a part only of the pre-boarding or plasticising chamber, and a further fan is provided for circulating hot or cold air through the remainder of the pre-boarding or plasticising chamber, the arrangement being such that in their passage through the pre-boarding or plasticising chamber the articles on the forms are subjected, firstly, to the action of the live steam and hot air and subsequently to the action of the hot or cold air.

In order that this invention may be the more clearly understood and readily carried into effect, I will proceed to describe the same with reference to the accompanying drawings, which illustrate by way of example certain convenient embodiments of the present invention, and in which—

Figure 1 illustrates diagrammatically the lay out of a complete plant for plasticising and finishing shaped textile articles according to the present invention.

Figure 2 is a longitudinal vertical section through the plasticising chamber, and

Figure 3 is a plan view of the same.

Figure 4 is a section on line 4—4 of Figure 2, and

Figure 5 is a longitudinal vertical section through a modified form of plasticising chamber according to the present invention.

Referring now to Figure 1 of the drawings, the plant is, in general, similar to that used for the continuous finishing of stockings, and comprises an endless conveyor chain 10 carrying at spaced intervals the forms (not shown) over which the stockings or other articles are placed at the loading position 11. The nylon stockings having been placed over the forms (and stretched over the same, if desired) may be first passed through a spray box 12 in which water, hot or cold, is sprayed on to both sides of the stockings or the like, are then allowed to travel for some distance, as indicated at 13, to allow the water to impregnate the stockings or the like thoroughly, and may then be passed through a further spray box 14 in which they are sprayed on both sides with

water. After leaving this spray box the stockings or the like on the forms may be passed between a pair of sponge rubber or similar rollers 15 to equalise the water sprayed on over the whole of the stockings or the like. After emerging from between the rollers, the stockings or the like, still on the forms, are passed into a plasticising chamber 16, the construction and arrangement of which will be described more fully hereinafter.

After emerging from the plasticising chamber 16, the stockings are passed through a drying chamber 20 in which they are finished or conditioned and are returned to the unloading point 21 where the stockings or the like are removed and the forms pass on to the adjacent loading point 11. The stockings or the like may be finished or conditioned in the drying chamber by means of a stream of hot air, by means of electrically or steam heated panels in the walls of the chamber, by means of the apparatus described in British patent specification No. 458,550, or in any other suitable way.

Describing now the plasticising chamber, this comprises an outer metal or like casing 30, which need only be quite narrow, lagged as at 31 with a suitable lagging, for example, silicate cotton, to prevent the escape of heat. A narrow vertical opening 32 is provided at each end for the entrance and exit of the stockings on the forms, gap adjusting plates or rollers 33 being provided on either side of the openings to prevent as far as possible the escape of the steam and hot air from within the plasticising chamber 16.

Mounted on top of the outer casing 30 is an electric motor 34 driving a fan 35 which is adapted to force hot air and steam into a horizontal conduit 36. Branch conduits 37 extend from the conduit 36 (preferably at a number of points as shown) down the sides of the outer casing 30 and feed the hot air and steam to the plasticising chamber at or near the bottom of the same at the sides as at 38. Hot air and steam is extracted from the plasticising chamber through apertures in a conduit 39 extending along the top of the plasticising chamber, this conduit being in communication with a heating chamber 40 which, in turn, is in communication with the fan 35 through the passage 41. The hot air and steam thus circulates through the plasticising chamber in a vertical, transverse, circuit, entering at the bottom and leaving at the top.

In the heating chamber 40 the steam and hot air are heated, in one form of the present invention, by passing over or through one or more electric heaters 42, although in other forms of the present invention gas or any other suitable heating means may be employed. The heating means are, of course, such as to raise the steam and hot air to the desired temperature.

Steam is injected into the steam and hot air circuit at any convenient point by means of one or more suitably disposed sprays. Preferably, however, the steam is injected, by one or more sprays 43, into the passage 41 connecting the heating chamber 40 to the fan 35. Injection of the steam at this point will have the advantage that the steam and hot air will be thoroughly mixed together before they are fed to the plasticising chamber.

With a view to controlling the rate of flow of the hot air and steam through the plasticising chamber dampers 44 may be provided in the branch conduits 37 or elsewhere, as is found suitable.

If desired, the convection heating within the chamber may be supplemented by gas or electric heaters disposed along the bottom of the chamber, or at any other suitable place.

Furthermore, with a view to reducing the time taken to raise the forms to the desired temperature within the chamber, which time is, of course, wasted from the point of view of plasticising the stockings or the like since the forms are travelling continuously through the chamber, the forms may be pre-heated before they enter the chamber in any suitable way.

In the modified form of the present invention shown in Figure 5 of the drawings, the stockings are plasticised and finished or conditioned in one and the same chamber, thus rendering the provision of a separate drying or finishing chamber 20, as shown in Figure 1, unnecessary. In this case, hot air and steam is circulated in the manner described above through only a portion of the chamber as shown. Like references have been used in Figure 5 to indicate the like parts of Figure 2 and further description of the plasticising part of the apparatus shown in Figure 5 is deemed to be unnecessary. The stockings on the forms having been plasticised in, say, the first half of the chamber pass through the second half of the chamber in which they are finished or conditioned. For this purpose a second fan 50 is provided feeding hot or cold air to a horizontal conduit 51 and side branch conduits 52 corresponding to the conduits 36 and 37. The hot or cold air is admitted to the conditioning part of the chamber at or near the bottom of the same and is extracted from the top.

I claim:

1. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating superheated live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, said steam thus coming into contact in said chamber with said shaped textile articles on said forms, and at least one electric heater for heating the circulating air to the desired temperature.

2. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, and means for injecting the steam into the air stream after said steam leaves the heating means and before said steam reaches the fan, whereby the steam and hot air are thoroughly mixed before they reach the pre-boarding or plasticising chamber.

3. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, and means for supplying the live steam and hot air to the pre-

boarding chamber at or near the bottom of the same.

4. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, and means permitting the same to escape at or near the top.

5. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through a part of the pre-boarding or plasticising chamber in a substantially closed circuit, and of a further fan for circulating hot or cold air through the remainder of the pre-boarding or plasticising chamber, whereby the articles on the forms are subjected, firstly, to the action of the live steam and hot air and subsequently to the action of the hot or cold air.

6. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, at least one electric heater for heating the circulating air to the desired temperature, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, and means for permitting the same to escape at or near the top.

7. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, means permitting the same to escape at or near the top, and at least one damper in at least one conduit carrying the live steam and hot air from the fan to the pre-boarding or plasticising chamber for controlling the flow of the live steam and hot air.

8. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a

substantially closed circuit, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, means permitting the same to escape at or near the top, at least one damper in at least one conduit carrying the live steam and hot air from the fan to the pre-boarding or plasticising chamber for controlling the flow of the live steam and hot air, said fan being adapted to circulate the live steam and hot air through a part only of the pre-boarding or plasticising chamber, and a further fan for circulating hot or cold air through the remainder of the pre-boarding or plasticising chamber, the arrangement being such that in their passage through the pre-boarding or plasticising chamber, the articles on the forms are subjected, first, to the action of the live steam and hot air, and subsequently to the action of the hot or cold air.

9. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, means permitting the same to escape at or near the top, at least one damper in at least one conduit carrying the live steam and hot air from the fan to the pre-boarding or plasticising chamber for controlling the flow of the live steam and hot air, said fan being adapted to circulate the live steam and hot air through a part only of the pre-boarding or plasticising chamber, a further fan for circulating hot or cold air through the remainder of the pre-boarding or plasticising chamber, the arrangement being such that in their passage through the pre-boarding or plasticising chamber, the articles on the forms are subjected, first, to the action of the live steam and hot air, and subsequently to the action of the hot or cold air, and electrically operated heaters within the pre-boarding or plasticising chamber to supplement the heat.

10. Apparatus for pre-boarding or plasticising shaped textile articles, more particularly nylon stockings, comprising an endless conveyor carrying forms for the reception of the shaped textile articles, a pre-boarding or plasticising chamber through which the articles on the forms are passed due to movement of the conveyor, a fan for circulating live steam and hot air through the pre-boarding or plasticising chamber in a substantially closed circuit, means for supplying the live steam and hot air to the pre-boarding or plasticising chamber at or near the bottom of one or both sides, means permitting the same to escape at or near the top, at least one damper in at least one conduit carrying the live steam and hot air from the fan to the pre-boarding or plasticising chamber for controlling the flow of the live steam and hot air, said fan being adapted to circulate the live steam and hot air through a part only of the pre-boarding or plasticising chamber, a further fan for circulating hot or cold air through the remainder of the pre-boarding or plasticising chamber, the arrangement being such that in their passage through the pre-boarding or plasticising chamber, the articles on the forms are subjected, first, to the action of the

live steam and hot air, and subsequently to the action of the hot or cold air, electrically operated heaters within the pre-boarding or plasticising chamber to supplement the heat, and means for pre-heating the forms prior to their entry into the pre-boarding or plasticising chamber.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,466,868	Witherell	Sept. 4, 1923
1,623,080	Ziock	Apr. 5, 1927
1,777,705	Stetten	Oct. 7, 1930
1,848,474	Gosch et al.	Mar. 8, 1932
1,926,694	Berger et al.	Sept. 12, 1933
2,243,997	Berger et al.	June 3, 1941
2,316,001	Kitzmiller	Apr. 6, 1943
2,321,452	Berger et al.	June 8, 1943