

May 10, 1949.

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METHOD OF AND APPARATUS FOR FORMING
STOCKINGS AND THE LIKE
Filed June 1, 1945

2,469,640

Fig. 2.

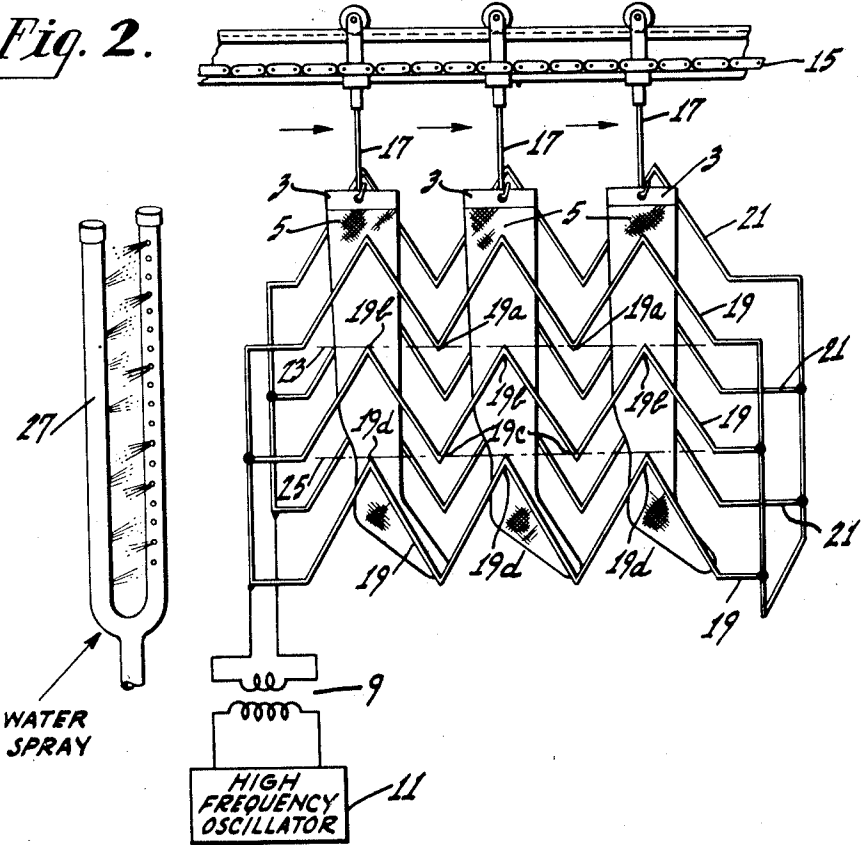
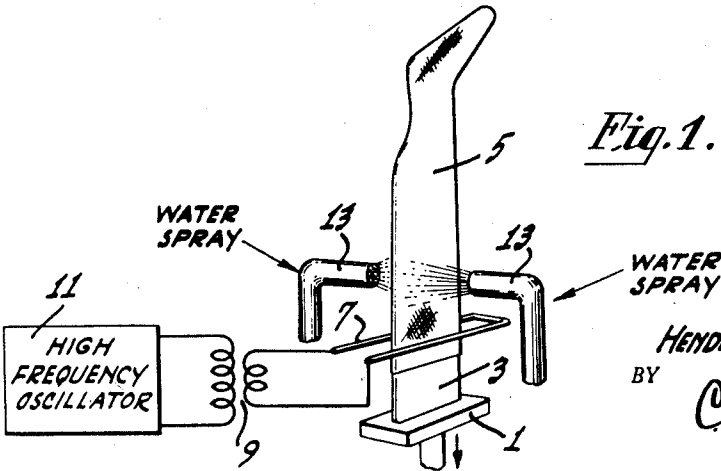


Fig. 1.



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2,469,640

METHOD OF AND APPARATUS FOR FORMING STOCKINGS AND THE LIKE

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Application June 1, 1945, Serial No. 597,024

5 Claims. (Cl. 223—76)

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This invention relates to a method of and apparatus for forming stockings and the like, and more particularly to a method of and apparatus for shaping stockings and other similar hollow articles of dielectric material by placing the same upon a suitable form of the shape which the article is to acquire ultimately and causing the article to shrink thereon under the influence of heat.

Various forms of apparatus of this type have been suggested heretofore. The most common of these is a series of forms upon which the stockings or the like are mounted and which are then placed in steam chambers, such as autoclaves, for heating the stockings in a moist atmosphere to cause them to shrink onto the forms. This process is generally known as preboarding or shaping the stockings. As practiced in the prior art, the process requires batch handling of the stockings because of the necessity of handling steam at high pressure, and this constitutes a definite limitation upon the speed of production.

It has also been proposed, heretofore, to provide electrically heated forms in carrying out the pre-boarding process. However, so far as I am aware, such forms are relatively expensive and rather inefficient.

The primary object of my present invention is to provide an improved method of and apparatus for pre-boarding stockings and other similar, hollow articles, which method and apparatus will not be subject to the aforementioned limitations.

More particularly, it is an object of my present invention to provide an improved method of and apparatus for heating stockings for the purpose of pre-boarding or shaping the same and which will be suitable for conveyor line production methods in place of the steam autoclave methods heretofore employed.

Another object of my present invention is to provide an improved method of pre-boarding stockings as above set forth which can be carried out continuously.

It is also an object of my present invention to provide an improved method and apparatus for the purpose set forth above which will be highly efficient in use and relatively inexpensive in operation.

In accordance with my present invention, the stocking to be treated is placed on a form of electrically conductive material and, while wet and stretched, is passed with the form through or past an inductor coupling device which is connected to a source of high frequency electrical energy and which, therefore, induces high frequency current in the form to heat the same.

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Heat is then transferred by conduction from the form to the stocking to vaporize the water in the form of steam which accomplishes the desired shrinking and forming operation. The temperature is preferably raised beyond the steaming point to about 265° F. By arranging the heating apparatus so that relative motion is produced between each of the electroconductive forms and the inductor coupling device, the latter will scan the forms to heat each of them uniformly, whereby uniform heating of the stockings will be effected.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description of two embodiments thereof when read in connection with the accompanying drawing in which

Figure 1 is a diagrammatic view of one form of apparatus according to my present invention and wherein a single stocking is treated at a time, and

Figure 2 is a similar view of a different form of apparatus according to my present invention arranged for simultaneously treating a plurality of stockings, as in conveyor line production methods.

Referring more particularly to the drawing, wherein similar reference characters designate corresponding parts throughout, there is shown, in Figure 1, a supporting device 1 which carries a metallic or other electroconductive form 3 on which a stocking 5 is mounted for the purpose of being shaped, while moist, under the action of heat, the stocking being made of dielectric material which has the characteristic that it shrinks when subjected to such treatment. The support 1 and its form 3 are arranged for movement in a vertical direction by any suitable means (not shown) to pass the form 3 through an inductor coupling coil 7 which is arranged to surround the form 3 and which is coupled through a transformer 9 to a source of high frequency, electric energy 11, such as a vacuum tube oscillation generator operating at radio frequency. It will be apparent that, as the form 3 passes through the coil 7, the latter will scan the form progressively along successive areas thereof and will induce in the form 3 high frequency current for heating the same practically instantaneously. In turn, the heated form 3 will heat the stocking 5 by conduction.

Above the coil 7 is a suitable spray device 13 arranged to spray onto the stocking 5 a stream or mist of water which serves to moisten the stocking at a point in advance of the coil 7 in the direction of travel of the platform 1 and the form 3, as shown by the appended arrow in Figure 1. Thus, when the stocking is heated, the moisture therein is also heated and transformed into steam, and this causes the stocking 5 to shrink onto the form 3 and acquire the shape thereof.

In Figure 2, I have shown an arrangement for simultaneously treating a plurality of stockings in the manner set forth above. In this modification, there is provided an endless conveyor 15 which carries a plurality of hooks or the like 17 on each of which may be hung an electroconductive form 3. The heating inductor in this modification comprises two groups of inductor heating elements 19 and 21, the elements of each group being connected in parallel relation electrically within the group, and the two groups being connected in series across the secondary winding of the transformer 9. It will be noted that the two groups of elements 19 and 21 are also arranged in physically spaced, parallel relation to each other to permit the conveyor 15 to carry the forms 3 therebetween and in inductive relation to each of the inductor elements 19 and 21.

In order to insure uniform heating of the entire area of each of the conductive forms 3, the elements 19 and 21 are preferably made of wavy form and are so arranged that the proximate peaks of waves of adjacent ones of said elements meet substantially along a common line. Thus, for example, considering the upper and intermediate ones of the inductor coupling elements 19, it will be noted that the lower peaks 19a of the uppermost inductor element terminate approximately at a line 23 at which also terminate the upper peaks 19b of the intermediate element 19. Similarly, the lower peaks 19c of the intermediate inductor coupling elements 19 terminate along a line 25 at which also terminate the upper peaks 19d of the lowermost element 19. The distance between a line passing through the upper peaks of the uppermost element 19 and a line passing through the lower peaks of the lowermost element 19 is sufficient to substantially embrace the entire length of the form 3. The inductor coupling elements 21 are similarly arranged. In the form illustrated in Figure 2, the elements 19 and 21 are zigzag. However, they may be arranged in any other wave form. For example, they may be undulating similarly to a sine wave, they may be in the form of saw teeth, or they may be arranged in any other suitable formation, whether regular or irregular, so long as they embrace substantially the entire length of the forms 3. When the inductor elements 19 and 21 are so shaped, they will each progressively scan successive areas of each form to effect the same result as that obtained with the modification of Figure 1.

In advance of the inductor coupling device 19, 21, there is disposed a substantially U-shaped spray device 27 through which the belt 15 carries each of the forms 3 so that the stockings 5 carried thereon will be suitably moistened. From the spray device 27, the successive forms and the stockings carried thereby are fed between the two banks or groups of inductor coupling elements 19 and 21 where the forms 3 are heated inductively and the stockings 5 are heated conductively by the forms. Thus, the stockings are quickly and

economically shrunk onto the forms 3 to cause them to acquire the desired shape.

Although I have shown and described two modifications of my invention, it will undoubtedly be apparent to those skilled in the art that many other forms thereof, as well as variations in the particular ones described, are possible. Moreover, the method herein described is also susceptible to variations. Thus, for example, the stockings may be moistened prior to being placed on the forms 3, in which case the spray devices 13 and 27 may be dispensed with. Also, instead of moving the forms past the stationary inductor coupling devices 7 or 19 and 21, the forms may be held stationary and the inductors arranged for movement relative thereto in order to effect suitable scanning of the forms. Again, if desired, the inductor coupling elements 19 and 21 may be made linear and arranged to extend horizontally, in which case the conveyor 15 may be arranged to move along a wavy path whereby to cause the forms 3 carried thereby to "bob" up and down relative to the elements 19 and 21 as they are advanced therealong. Other changes of like nature will, no doubt, be apparent. I therefore desire that my invention shall not be limited except insofar as is made necessary by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. The method of pre-boarding stockings with the aid of an electroconductive closed flat form which comprises placing a stocking on and fully in contact with said form to provide uniform heat conduction from the form to the stocking, passing said stocking bearing form successively past a pair of operating stations, moistening said stocking at the first of said stations, uniformly heating said form inductively from opposite sides with high frequency current to a predetermined degree at the second one of said stations, and thereafter causing said heated form to impart heat uniformly to said stocking by conduction through said full contact with the form and thereby to expel the moisture therefrom and cause said stocking to shrink onto said form.

2. The method of pre-boarding stockings set forth in claim 1 wherein successive areas of said form and said stockings are heated progressively.

3. In apparatus for shaping a stocking, the combination of an electro-conductive form having the shape said stocking is to acquire, an inductor coupling device for inducing heating current in an associated piece of work adapted to be connected to a source of high frequency electric energy, said device comprising an elongated conductor of recurrently undulating form, and means for bringing said device and said form into inductively coupled relation and for effecting relative motion between said device and said form in a direction substantially parallel to said device while maintaining said device and said form in inductively coupled relation whereby to cause said device to scan said form and simultaneously induce high frequency heating current in said form to thereby heat said form, said form then being adapted to heat said stocking by conduction to cause said stocking to shrink onto said form.

4. Apparatus according to claim 3 characterized by the addition of means for moistening said stocking at a point in advance of that at which said form and said device are brought into inductive relation with each other.

5. In apparatus for shaping stockings, the combination of an endless conveyor, a plurality of electro-conductive forms carried by said con-

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veyor in spaced relation, said forms each having the shape to be acquired by the stockings, and an inductor coupling device for inducing heating current in an associated piece of work, said device including a pair of spaced inductor elements disposed in parallel relation to each other and between which said conveyor is arranged to feed said forms in succession in inductive relation thereto along a path parallel to each of said elements, said elements each comprising an elongated conductor of recurrently undulating form the undulations of which are disposed in substantially a common plane, said device being adapted for connection to a source of high frequency electric energy whereby to be effective to induce in each of said forms a high frequency current for heating said forms, and said heated forms then being adapted to heat said stockings by conduction to cause said stockings to shrink onto their respective forms.

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