March 16, 1926. 1,577,393

F. B. VOEGELI

APPARATUS FOR AND METHOD OF TREATING TEXTILES

Filed Feb. 9, 1925 2 Sheets-Sheet 1

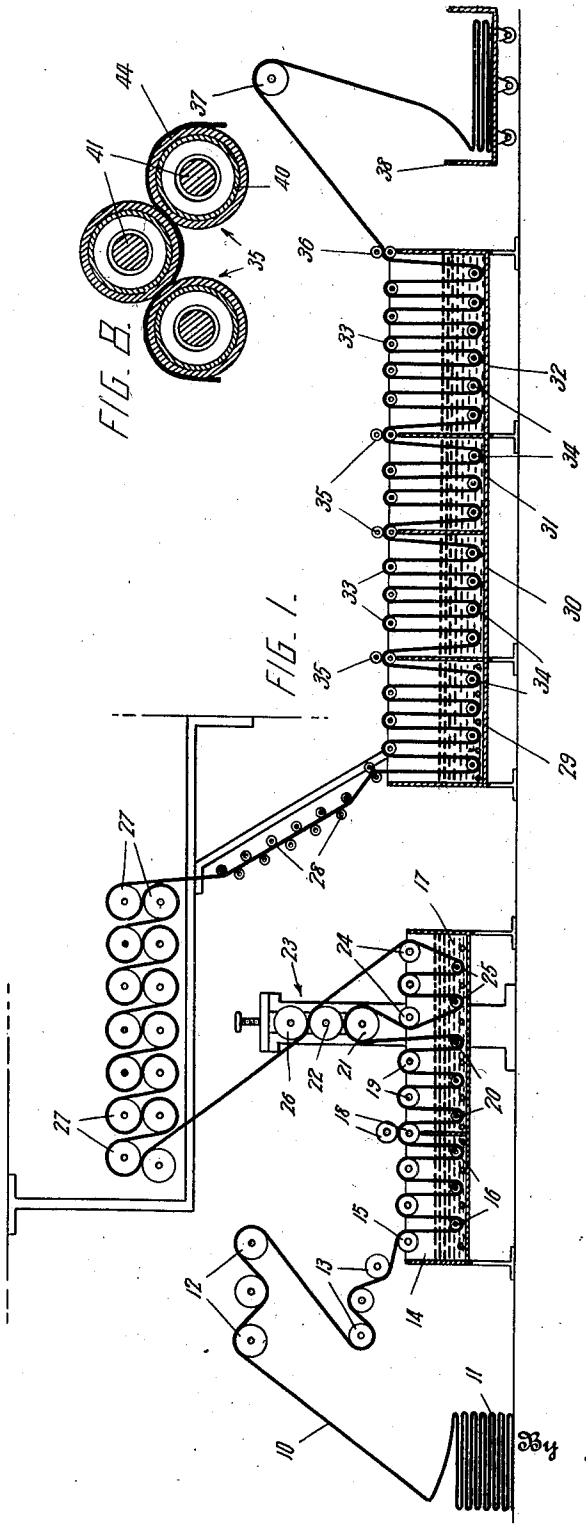


FIG. 1.

FIG. 2.

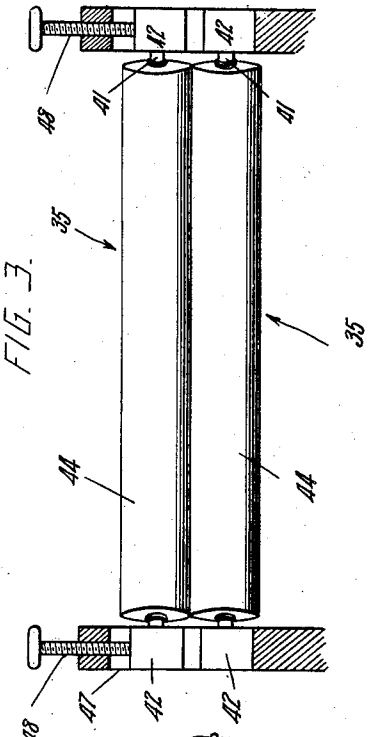


FIG. 3.

Inventor:
F. B. VOEGELI
By Monroe C. Miller
Attorney.

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F. B. VOEGELI

APPARATUS FOR AND METHOD OF TREATING TEXTILES

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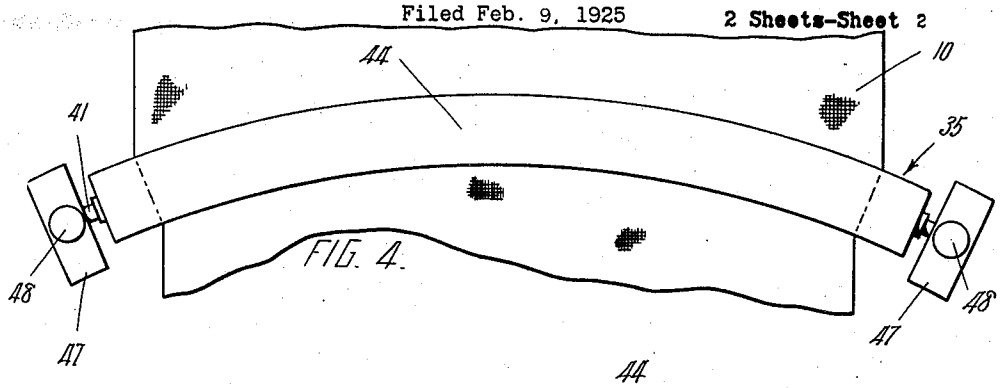


FIG. 4.

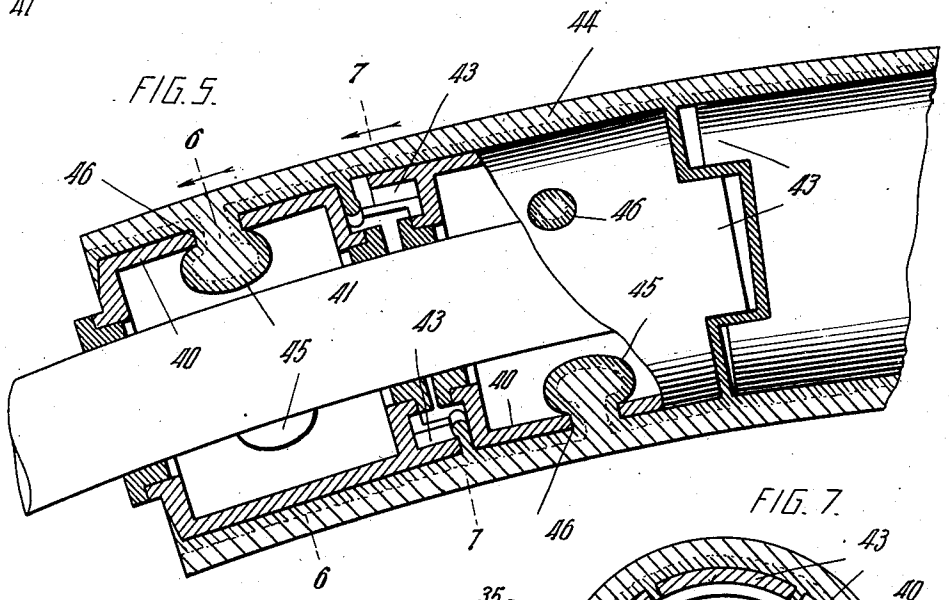


FIG. 5.

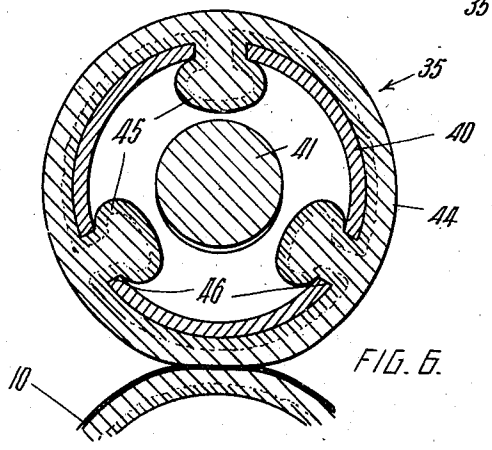


FIG. 6.

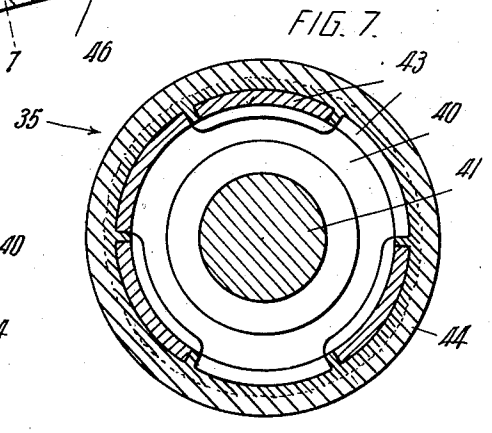


FIG. 7.

Inventor:
F. B. VOEGELI,
By Monroe E. Miller
Attorney.

Patented Mar. 16, 1926. 1,577,393

UNITED STATES PATENT OFFICE.

FREDERICK BENEDICT VOEGELI, OF EASTON, PENNSYLVANIA.

APPARATUS FOR AND METHOD OF TREATING TEXTILES.

Application filed February 9, 1925. Serial No. 7,932.

To all whom it may concern:

Be it known that I, FREDERICK B. VOEGELI, a citizen of the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in an Apparatus for and Method of Treating Textiles, of which the following is a specification, reference being had therein to the accompanying drawing.

The present invention relates to an apparatus for and method of treating textiles, and aims to provide improvements in the apparatus and method for purpose of economy, to save time and expense, and also for the purpose of improving the results obtained.

One object of the invention is the provision of a novel apparatus for and method of mercerizing cotton or similar textiles, by means of which grey goods directly from the loom may be mercerized with the same effect as when the goods are bleached before mercerizing. The bleaching of the goods, according to prevailing practice, before mercerizing, is for the purpose of increasing the absorption properties of the goods, but such previous bleaching is eliminated by the present process and apparatus. In the present process the goods are treated with a hot caustic solution, as contradistinguished from the usual treatment of the goods, after bleaching, by cold caustic soda, which cold process requires the previous bleaching of the goods so that the absorption properties of the goods will reach the maximum point. In using the hot caustic treatment it is possible to treat the goods direct from the loom, without previous bleaching, which contains starch from sizing, lubricating oil, vegetable oil and other numerous substances that impede the power of absorption, and which substances must be removed, by bleaching, when using processes already in vogue. When using the hot caustic solution it is essential that a cooling effect be obtained to produce a shrinkage or contractive effect of the goods, which only occurs at a low temperature, in order that the goods will become mercerized, and the present invention involves provisions in connection or cooperation with the hot caustic treatment to obtain the mercerizing action with good effect. In addition to eliminating the bleaching of the goods, and saving time and expense, the present process and apparatus obtains other advantages as hereinafter more fully set forth. However, the process can also be used for bleached goods, in which case the penetration of the hot caustic solution is obtained more quickly and with greater efficiency.

With the foregoing and other objects in view, which will be apparent as the invention is more fully explained, the invention resides in the features of the apparatus and method as hereinafter pointed out and claimed, it being understood that changes and variations can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal section of the apparatus, shown diagrammatically, and portions being shown in elevation.

Fig. 2 is a detail view, partly in section and partly in elevation, of one of the cooling rolls or drums.

Fig. 3 is an elevation of one pair of squeezing and stretching rollers.

Fig. 4 is a plan view of said pair of rollers.

Fig. 5 is a fragmentary longitudinal section of one of the squeezing and expanding rollers.

Figs. 6 and 7 are cross sections on the respective lines 6—6 and 7—7 of Fig. 5.

Fig. 8 is a cross-section of a set of three squeezing and expanding rollers.

In the embodiment of the invention as illustrated in the drawings and described hereinafter, the apparatus is intended especially for cloth or woven textiles.

In carrying out the process the cloth 10 is taken from the cloth pile 11 and passes across tension rolls 12 and then passes across expanding rolls 13 which expand or stretch the cloth transversely. From the rolls 13 the cloth moves through a tank 14 containing a hot caustic soda or potassium solution, or other alkaline solution, which is heated to a temperature up to 100 degrees Celsius or centigrade. The cloth moves in a zigzag path within the tank 14 downwardly and upwardly repeatedly into and out of the solution, by passing around upper and lower rollers 15 and 16, and after passing through the solution in the tank 14 the cloth passes through a similar solution in a companion tank 17, squeezing rolls 18 being disposed

above the partition between the two tanks between which the cloth passes so as to squeeze the solution from the cloth back into the tank 14. Upper and lower rollers 19 and 20 are mounted in the tank 17 around which the cloth passes in a zig-zag path, and from the last roller 20 the cloth passes upwardly in a loop between the rolls 21 and 22 of a mangle 23, from which the cloth again passes down into the tank 17 around upper and lower rollers 24 and 25. The cloth passes from the last roller 24 between the roll 22 and a third roll 26 of the mangle 23. The treatment of the cloth by the hot caustic or alkaline solution has several advantages. When using caustic soda or potassium at 50 to 60 degrees Twaddle, such as used in processes heretofore the prevailing practice, the solution has a high specific gravity and forms an oil-like substance which is absorbed by the cloth with considerable difficulty. However, in the present process the hot solution has at least 20 to 30 percent lower specific gravity, and on account of the heat plus the lower specific gravity the solution will penetrate any fabric with ease. The caustic soda when dissolved in cold water produces heat and the resulting liquor has to be cooled down before it can be used with the old method of treatment, whereas with the present process the caustic soda liquor can be immediately used and is further heated by steam coils in the tanks 14 and 17, or other source of heat may be employed. Thus, the natural heat of the caustic soda solution is taken advantage of. Furthermore, grey cloth contains starches, which will be converted by hot caustic soda into soluble starches or an easily soluble substance, and such substance is therefore removed to a large extent in the first saturation bath in the tank 14 and by the squeezing rolls 18. Oils and other pectic matter contained in the raw material are also converted into soluble soaps and the fabric is therefore rendered more absorbent. It will be noted that while the cloth is given the hot caustic soda baths, the cloth is squeezed after its initial bath, and passes through the mangle after the second bath, and then after a third bath again passes through the mangle, in order to render the hot caustic soda treatment efficient.

From the roll 26 of the mangle the cloth passes around, in a zig-zag path, a series of cooling rolls or drums 27 which cool the cloth down to the required temperature of between 5 to 10 degrees Celsius. This cooling of the cloth is essential in order to obtain the mercerizing of the cloth, inasmuch as the use of the hot caustic solution will not mercerize the cloth. However, by subjecting the cloth to the cooling effect immediately after the hot caustic bath, the cloth will be mercerized, and the temperature of the rolls 27 is regulated and controlled to produce a uniform cooling of the cloth to the desired low temperature.

From the rolls or drums 27 the cloth passes the expanding rollers 28 and then through the tanks 29, 30, 31 and 32 in succession, upper and lower rollers 33 and 34 being provided in said tanks over which the cloth passes in a zig-zag path downwardly and upwardly into and out of the liquids in said tanks. The cloth is washed in passing through said tanks 29, 30, 31 and 32. The tank 29 contains hot water and the tank 30 contains cold water, while the tank 31 contains an acid or sour liquid. The tank 32 contains cold water. Between the successive baths in the tanks 29, 30, 31 and 32 the cloth receives a combined squeezing and expanding or stretching action above the partitions between the tanks between pairs of squeezing and expanding rollers 35. Such rollers, as hereinafter more fully set forth, subject the cloth, when leaving one tank and before entering the next tank, to a simultaneous squeezing and expanding or stretching action, thereby not only squeezing the liquid from the cloth when leaving a tank but, at the same time, expanding or stretching the cloth before entering the next tank.

From the last tank 32 the cloth passes between squeezing rolls 36 and then over a roll 37 from which the cloth is delivered into a truck 38 or other receptacle, and is then bleached as usual.

The present process obtains an efficient mercerizing of the cloth as well as providing for economy, in the saving of time and expense. By the old or well-known process, forty-eight hours time are normally consumed, including (1) singeing, (2) boiling in kier, (3) souring and bleaching, (4) saturation in cold caustic solution, (5) stretching on expanders, (6) washing, (7) return of goods to kier for second boiling, and (8) final bleaching. With the process disclosed herein, the time consumed is about twenty four hours, or substantially one-half the time required by the old process, the successive steps including (1) singeing, (2) saturation in a hot caustic solution, (3) cooling by the rolls, drums 27 or other means, (4) stretching on expanders, (5) washing, (6) boiling in kier, and (7) final bleaching. By utilizing the hot caustic solution and subsequent cooling of the cloth and solution remaining therein, there is eliminated the preliminary boiling of the cloth in the kier and the souring or bleaching, to effect saving in time and expense, as well as obtaining highly satisfactory results. Inasmuch as grey goods direct from the loom can be used, the preliminary bleaching process can be dispensed with, and only one

boil bleaching is required, since the hot caustic bath has already removed a great part of the impurities. When bleached goods must be used for mercerizing, the width throughout the bleaching has been decreased from 5 to 15 percent, and this width must be recovered in the old mercerizing process or the goods will not be mercerized. Inasmuch as the new process uses goods direct from the loom the width is not impaired and the expanders 28 do not have to perform such strenuous duty as under the old process, thereby lessening the risk or damage to the cloth under the new process. Very heavy fabrics which are difficult to mercerize, can be mercerized with ease by the herein described process, and by using variable speed the lighter fabrics can be mercerized at a much greater speed. The cost of mercerizing is practically reduced to one-half, if all the circumstances connected with the process are considered. Goods can be run into the mercerizing machine direct from the singer, in view of the fact that the heat in the goods from the singer does not effect the mercerization, due to the fact that the goods receive the hot caustic bath. If this were attempted with the old process, the heat of the cloth from the singer would tend to change the caustic soda from a cold bath eventually to a hot bath and would therefore destroy the mercerizing effect.

As shown in Fig. 2, each drum or roll 27 is hollow for the flow of cold water or other refrigerating fluid therethrough, the drum or roll being trunnioned or journaled in bearings 39 and having pipes 40 connected by swivel joints with the opposite ends for the flow of the liquid into and out of the drum. The drums may be cooled by cold water or by brine furnished by a refrigerating machine, and the cloth passing around the drums will be cooled or chilled without the cooling fluid or liquid coming into contact with the cloth. In this way, the remaining caustic solution in the cloth is cooled down to a low temperature without dilution to obtain the mercerizing effect.

The treatment of the cloth is also enhanced by the simultaneous squeezing and expanding of the cloth during the washing baths, when passing from one tank to another. The rollers 35, which are arranged in pairs above the partitions between the tanks 29, 30, 31 and 32 are of the kind disclosed in my copending application Serial No. 751,135, filed Nov. 20, 1924. The rollers are superposed. Each roller of the pair is of curved or arcuate form, and is composed of a series of roller members or sections 40 rotatable on a curved rod 41 that has its terminals secured in blocks or other members 42. The adjacent ends of the members 40 have interengaging clutch teeth or lugs 43 whereby all of said members of each roller rotates as a unit. A tubular cover 44 of rubber or other flexible resilient material is disposed on the roller members 40 of each roller, thereby providing a curved or arcuate roller which rotates around the arcuate rod with the periphery of the roller unbroken from one end thereof to the other, so as to present a continuous curved line of contact with the cloth from one edge of the cloth to the other edge. The cover 44 may be of any suitable thickness and will bend or yield to conform to the curvature of the rod 41 as the roller rotates. The cover 44 is secured on the roller members 40 to prevent the cover from being displaced. Thus, the members 40 are hollow and the cover 44 has headed studs 45 engaging inwardly through apertures 46 in said members, thereby anchoring the cover on said members. As indicated by the cross-hatching in Figs. 5, 6 and 7, the rubber or other material of the cover 44 may be denser or tougher at the inner surface of the cover, with more pliable material at the outer surface of the cover.

The rollers 35 of each pair are parallel and are pressed together so as to squeeze the cloth as it passes between the rollers, and, at the same time, the cloth is given a stretching or expanding action, as the cloth passes from the concaved side to the convexed side of the rollers, as seen in Fig. 4. The blocks or members 42 are disposed in slotted guides 47, and screws 48 or other means may be used for moving the blocks or slides 42 of one roller to cause the rollers to bear together with the desired pressure. The rubber or similar covers 44 of the rollers will frictionally grip the cloth, with a continuous contact from one edge of the cloth to the opposite edge, to prevent the cloth from slipping while being subjected to the expanding or stretching action, and such action will be uniform throughout the width of the cloth.

Fig. 8 shows the use of three rollers 35 for simultaneously squeezing and expanding the cloth, one roller being disposed above and bearing downwardly between two spaced rollers, whereby the cloth is squeezed and expanded along two lines from edge to edge. The intermediate or upper roller thus cooperates with both of the other rollers in substantially the same manner as with a single pair of rollers as hereinbefore described.

Having thus described the invention, what is claimed as new is:—

1. The steps in the method of mercerizing textile goods consisting in subjecting the goods to hot caustic baths and then cooling the goods.

2. The steps in the method of mercerizing textile goods consisting in subjecting the

goods to hot caustic baths, then cooling the goods, and then expanding and washing the goods.

3. The steps in the method of mercerizing textile goods consisting in subjecting the goods to hot caustic baths and then passing the goods across cooling members.

4. The steps in the method of mercerizing textile goods consisting in subjecting the goods to hot caustic baths, then passing the goods across cooling members, and then expanding and washing the goods.

5. The steps in the method of mercerizing textile goods consisting in subjecting the goods to hot caustic baths, squeezing and mangling the goods during such baths, and then cooling and stretching the goods.

6. The steps in the method of mercerizing textile goods consisting in subjecting the goods to hot caustic baths in succession, squeezing the goods between such baths, mangling the goods during the last bath, and then cooling and stretching the goods.

7. An apparatus for mercerizing textile goods comprising means for subjecting the goods to baths, expanding means, and cooling members over which the goods pass between the firstnamed and secondnamed means.

8. An apparatus for mercerizing textile goods comprising means for subjecting the goods to baths, expanding means, and cooling drums over which the goods pass from the firstnamed to the secondnamed means.

In testimony whereof I hereunto affix my signature.

FREDERICK BENEDICT VOEGELI.