April 9, 1940. H. C. BORGHETTY 2,196,655

APPARATUS FOR TREATING FABRICS

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Fig. 1.

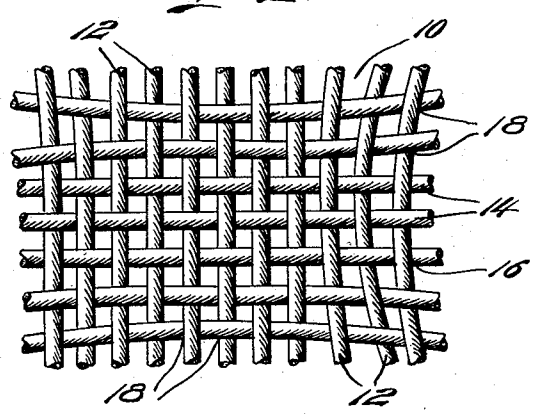


Fig. 2.

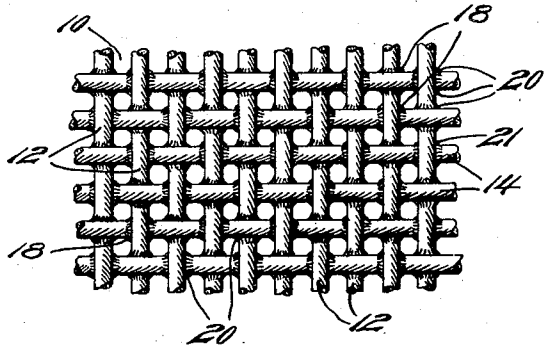


Fig. 3.

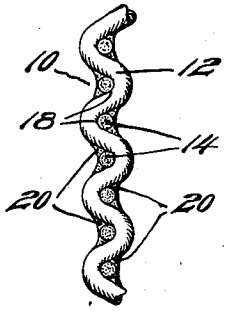
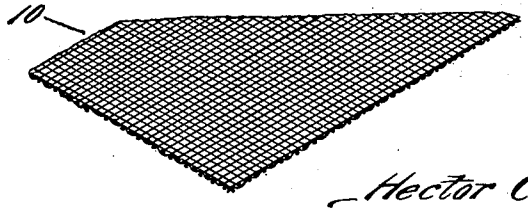


Fig. 4.



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Fig. 5.

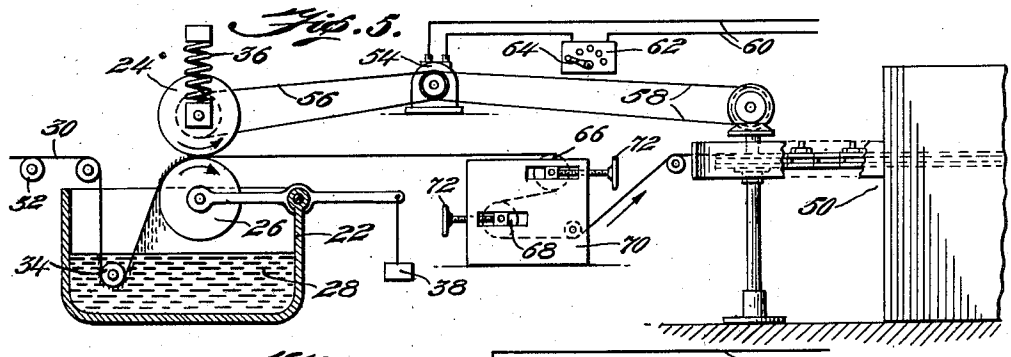


Fig. 6.

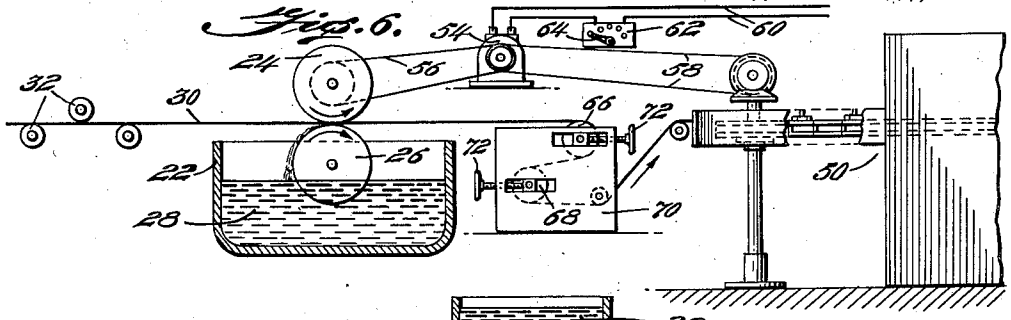


Fig. 7.

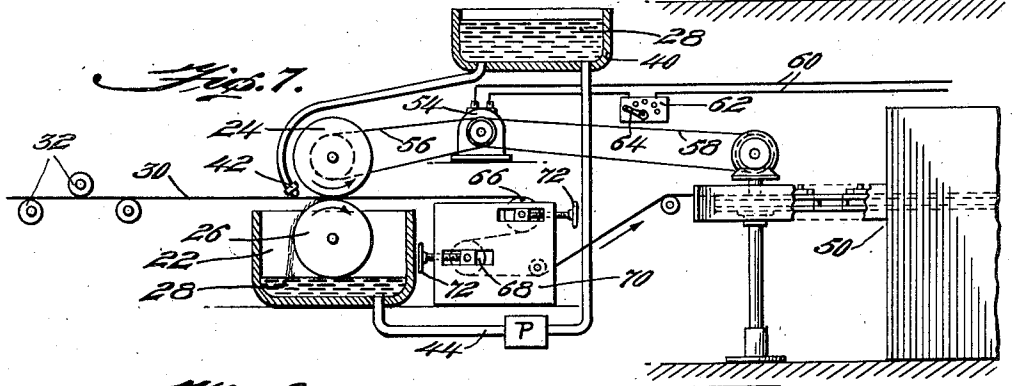
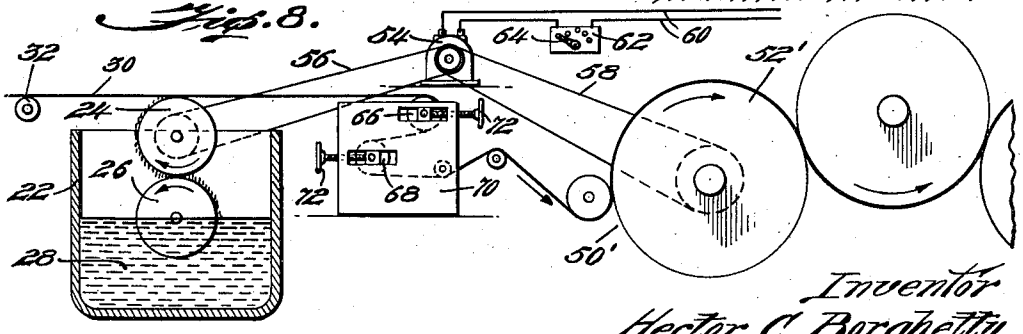


Fig. 8.



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APPARATUS FOR TREATING FABRICS

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Application October 4, 1937, Serial No. 167,097

3 Claims. (Cl. 91—17)

My invention relates to improvements in apparatus for applying coverings to threads, having smooth outer surfaces which may slip relative to other threads when woven up into cloth, including synthetic cellulose threads such as rayons, natural cellulose threads such as cotton or mercerized cottons, other natural or synthetic threads having smooth outer surfaces such as natural silk, or other threads, any of which will be rendered less likely to fray and slip when treated in accordance with my invention, and is particularly adapted for use in providing a stabilized non-slippable fabric, such as described in my Patent No. 2,050,156, patented August 4, 1936, for Stabilized non-slippable fabric and method of its manufacture.

This application is a continuation in part of my application, S. N. 138,215, filed April 21, 1937, for Method of applying coverings to threads from a liquid vehicle.

It is well known that certain threads including those composed wholly or partly of cellulose or cellulose derivative, particularly those of the cotton or artificial silk types, which contain a preponderance of these substances, when subjected to the action of water tend to swell greatly and assume a semi-plastic colloidal condition, which enables them to absorb more than their weight in water. This condition becomes particularly disadvantageous when it is desired to employ water as the vehicle for applying a covering thereto, for the swelling of the fibres in the threads makes them absorb a large amount of the covering material, thus clearly increasing the expense of providing any type of a covering therefor. My invention in its broadest aspects therefore, particularly relates to a novel apparatus for applying a covering whether it be of the insoluble type, or soluble type to a thread of this description, or to a plurality of such threads woven into a fabric to apply such a covering to the surface only of said thread or threads to greatly lessen the amount of covering material hitherto thought necessary for this purpose.

As most covering materials have a tendency when dried or polymerized to become relatively stiff, it is obvious that if they are permitted to permeate within the threads they tend to greatly stiffen the threads, whereas if their application be restricted to the surface with only minute penetration as by employing my improved method, it is apparent that threads will be provided of much less stiffness than hitherto thought possible. While my improved invention may be employed for applying any type of a covering to the exterior of the thread only for any purpose, such as sizing, pigmenting, weighting, applying an insoluble dye, etc., it is particularly adapted for use in the manufacture of such a stabilized non-slippable fabric as described in said patent of less stiffness and hence more nearly having the qualities of the untreated artificial silk or other fabric than hitherto thought possible. It is obvious that when so applied the covering will be applied to the surface of said threads with no appreciable penetration, including their contacting areas of interweave to cause on the drying or curing of said covering a proper bond at said contacting areas of interweave to provide a stabilized and slip-proof fabric.

In addition to the methods, which may be generally referred to as chemical or physico-chemical, for confining the application of the covering material substantially to the surfaces of the threads only, I may alternatively or in conjunction therewith apply the novel types of mechanical methods for confining the application of the covering material substantially to the surface of the threads and their contacting areas of interweave only by means of modification of standard methods of treatment, such as illustrated in the accompanying drawings. I preferably continuously pass the fabric into contact with a liquid vehicle containing the plasticizable transparent covering material to apply said material to the surface of said threads and the contacting areas of interweave thereof and at a predetermined interval of time thereafter continuously apply heat to said fabric to continuously dry said fabric before any substantial penetration of said covering material into the threads has taken place and to plasticize said material substantially on the surface of said threads and at the contacting areas of interweave to bond the threads at said contacting areas of interweave together. I may thus limit the depth of penetration of said covering material to substantially the surface only of said threads by varying the speed of said fabric through the material applying and heat treating steps, the time interval between said material applying and heat treating steps and the strength, nature and manner of application of the liquid vehicle containing the covering material to said fabric.

A further object of my invention, therefore, is to limit the penetration of said covering material to substantially the surface of said threads by regulating the time interval between said material applying and heat treating steps. While the time interval between said steps may vary

for different types of threads and different finishes to be applied, it is apparent that in the application of my invention this time interval is probably lessened as much as possible to prevent any penetration of the liquid vehicle or covering material within the threads to prevent the excessive swelling thereof caused by deep penetration and to reduce the amount of actual covering material required to accomplish the purpose of my invention and prevent the material when treated in accordance with my invention from being too stiff.

A further object of my invention is to limit the depth of penetration of said covering material to substantially the surface only of said threads by varying the speed of said fabric through said material applying and heat treating steps.

A further object of my invention is to limit the depth of penetration of said covering material to substantially the surface only of said threads by varying the strength, nature and manner of application of the liquid vehicle containing the covering material to said fabric to apply a sufficient amount of said material only to said threads to accomplish the purposes of my invention.

A further object of my invention is to provide a novel type of correlation of apparatus for carrying out my improved method.

In order that the application of my invention may be better understood I have illustrated in the drawings a stabilized non-slippable fabric treated in accordance with my improved method and diagrammatic drawings of typical apparatus which may be used to carry out my method.

In the drawings,

Fig. 1 is an enlarged diagrammatic plan view of a woven fabric constructed wholly of artificial silk showing how the smooth cylindrical surfaces thereof tend to slip and fray relative to each other.

Fig. 2 is an enlarged plan view of such an artificial silk fabric shown in Fig. 1 with the contacting areas of interweave of the warp and filling threads bonded together by a transparent covering in accordance with the teachings of my invention to prevent slippage thereof and reduce shrinkage or stretching of the fabric.

Fig. 3 is a sectional view taken along my improved fabric shown in Fig. 2 showing how the binding material bonds the threads together at the contacting areas of interweave.

Fig. 4 is a perspective view of a portion of an artificial silk fabric constructed in accordance with my invention.

Fig. 5 is a diagrammatic longitudinal sectional view of a suitable type of dip pad provided with high pressure squeeze rolls and associated tenter which may be used in carrying out my improved method.

Fig. 6 is a diagrammatic longitudinal sectional view of a nip pad and associated tenter which may be used in carrying out my improved method.

Fig. 7 is a diagrammatic sectional view of a suitable type of alternative type of spray nip pad and associated tenter which may be employed for carrying out my invention.

Fig. 8 is a longitudinal sectional view of a suitable type of back filling pad and associated drying cans which may be employed for carrying out my invention.

In the drawings, **10** generally indicates a fabric constructed wholly or partially of artificial silk or other relatively slippable threads and as shown in enlarged form in Figs. 2–4, constructed in accordance with my invention. Said fabric **10** usually has the warp threads **12** and the filling threads **14**, woven in the usual manner. As stated hitherto, as artificial silk fibres are extruded through the spinnerettes, having smooth metal surfaces in their manufacture, as they become plastic in the solution into which they are extruded, the outer surfaces **16** of many types of synthetic cellulosic filaments from which the threads are made, tend to become very smooth, almost glassy and when woven into the fabric in the usual manner tend to slip relative to each other like natural silk, as shown in Fig. 1. As stated hitherto, a main object of my invention is to render said threads **12** and **14** of said fabric non-slippable, relative to each other, and for this purpose, I preferably bond together said warp and filling threads **12** and **14** at their contacting areas of interweave **18** by the transparent coverings **20**. In order to reduce the shrinking tendencies of a fabric constructed in this manner, the plasticizable transparent covering **20** is preferably bonded or formed around the areas of interweave of said threads preferably while said fabric is in a stretched condition.

The tendency of textile fabrics to slip is noticeable especially in fabrics of low filling and warp counts, for example, rayon taffeta 72 x 48, where the slipping effect causes fraying. Fabrics on the market at present which have this tendency are considered defective particularly in the lining trade.

I therefore cover the fabric as shown in Fig. 1 with a plastic transparent covering by immersing it therein or otherwise, then preferably stretch the fabric to the desired width if a stabilized non-shrinkable fabric be desired and subject said stretched fabric to such a heat for a sufficient period of time as to form a plasticized, insoluble, transparent covering around each contacting area of interweave of said warp and filling threads.

I have found in practice that if the covering for the threads be confined to the surface only of the threads that lesser amounts of materials will be required to provide a suitable covering and that if said covering be confined to the surface only of said threads that its tendency to stiffen the threads will be appreciably lessened and it is essentially to confining this covering to the surface of the threads particularly at their contacting areas of interweave to provide a suitable bond with the other threads that my invention relates, as well as applying said covering to said threads in most instances without causing any undesirable swelling of said threads.

My improved method may be achieved by mechanical or chemical changes over the prior art to confine the application of the covering material to substantially the surface of said threads. In order that the application of my invention may be better understood, I have shown in Figs. 5–8 typical types of pads which may be employed to carry out my invention. In Fig. 5 I have shown a typical type of dip pad comprising the tank **22** for containing the liquid vehicle **28** containing the covering material and the pair of nip rolls **24** and **26**. The cloth **30** is led through tension guide rolls **32** and passed underneath the guide roll **34** below the level of the liquid vehicle **28** in the tank **22** and as the cloth passes under the guide roll **34**, it is immersed in the liquid vehicle **28** and then passes between the nip of the rolls **24** and **26**. If there is no weight or tension applied between the nip rolls **24** and **26**, the cloth generally takes up well over 100% of its weight of liquid vehicle. If the rolls **24** and **26**

are provided with suitable means for providing a high pressure squeeze or nip between them, the amount of liquid vehicle taken up by the cloth can be cut down to within 80% of its weight and for this purpose, as shown in Fig. 5, I employ a positive spring **36** for exerting a downward pressure on the upper nip roll **24** and a suitable pivoted weight **38** for exerting an upward pressure on the lower squeeze roll **26**. Obviously other types of machines with adjustable pressure mechanisms may be used to attain this end. I have shown in Fig. 6 a suitable type of nip pad, wherein the amount of liquid taken up by the cloth can be cut down to approximately 40% of its weight. In this instance the lower nip roll **26** dips into the liquid vehicle **28** which is carried thereby to be applied to the lower surface only of said cloth, the cloth **30** being led through the usual tension rolls **32** directly into the nip between the rolls **24** and **26**.

I have shown in Fig. 7 an alternative type of spray nip pad in which the amount of liquid vehicle taken up by the cloth may be varied over wide limits according to the pressure of the liquid, size of spray openings, speed of machine, pressure of squeeze rolls, etc. In this machine, the amount of liquid taken up by the cloth can be cut down conveniently to within 50% of its weight. In this instance, the liquid vehicle flows by gravity from the tank **40** and is discharged at substantially the nip between the rolls **24** and **26** through a spray nozzle **42** on to the cloth **30** passing thereunder and the excess liquid vehicle may drip downwardly to be collected in the lower tank **22** to be pumped through the pine line **44** to the tank **40** for recirculation.

I have shown in Fig. 8 a suitable type of back filling pad substantially identical to the nip pad shown in Fig. 6 with the exception that the cloth is fed over the upper surface of the upper roll **24** and the liquid is supplied to the surface of said upper roll by peripheral contact of the lower roll **26** therewith, the periphery of the lower roll being immersed below the liquid level **28** of the liquid vehicle. This permits the cloth only to take up between 20–30% of its weight of liquid vehicle.

After the covering material has been applied to the fabric by passing said fabric into contact with the liquid vehicle containing the plasticizable transparent covering material in any of the manners heretofore described or otherwise to apply said material to the surface of said threads and the contacting areas of interweave thereof, to dry the fabric and to plasticize the material to bond the respective warp and filling threads together at their contacting areas of interweave, I preferably apply heat to said fabric and so regulate the time interval between said material applying and heat treating steps that said fabric may be dried before any substantial penetration of said covering material into the threads thereof has taken place with the objectionable results heretofore mentioned of causing swelling of the threads, the use of more covering material than necessary, thus increasing the expense, and the provision of a stiff fabric and to plasticize said material substantially on the surface of said threads and at the contacting areas of interweave to bond said threads at said contacting areas of interweave together whereby the fabric is stabilized against slippage or shrinkage without substantially changing the appearance of the fabric. For this purpose I have provided any suitable type of fabric drying means or heat treating means, whether such means comprises the tenter frame **50** shown in Figs. 5–7 or the drying cans **50'** shown in Fig. 8.

As stated, I limit the depth of the penetration of the covering material to substantially the surface only of said threads, mainly by predetermining the time between the material applying and heat treating steps. This may be done by adjustably or otherwise regulating the distance between the material applying and heat treating units.

In addition, I preferably provide three ways to additionally limit the depth of the penetration of the covering material to substantially the surface only of said threads for different types of fabrics and/or different types of covering materials passing through the same material applying and heat treating units by (1) varying the speed of said fabric through said material applying and heat treating steps, (2) varying the time interval between said material applying and heat treating steps, and (3) varying the strength, nature and manner of application of the liquid vehicle containing the covering of said material to said fabric. This last step may be accomplished in various manners, such as by varying the strength and natures of both the covering material and the liquid vehicle and the manner of application of the liquid vehicle containing the covering material to said fabric may be varied in the manners hitherto described and as shown in the drawings to apply relatively small percentages of said liquid vehicle containing the covering material to said fabric, namely, either by providing spring pressure to the upper roll of a dip pad shown in Fig. 5 or by employing variations of nip pads as shown in Figs. 6–8 which will apply a lesser amount of said vehicle and material than a standard type of pad or jig.

If desired to further limit the penetration by method 1 hitherto described, namely, by varying the speed of the fabric through said material applying and heat treating steps, I provide suitable means for driving said fabric treating means **22** and fabric drying means **50** at substantially synchronized speeds. While any means may be provided for driving each of said means and then synchronizing the speed thereof, as shown in the drawings, I may provide a single motor **54** provided with a belt **56** for driving the rolls of the pad **22** and also with a belt **58** for driving the drying mechanism **50**, either the tenter frame **50** as shown in Figs. 5–7 or the drying cans **50'** as shown in Fig. 8, said motor **54** being driven by a suitable electric circuit **60** containing the adjustable rheostat **62** or other adjustable means having a switch **64** for varying the speed of said driving means of both the fabric treating and fabric drying means.

If it be further desirable to further vary the time interval between the passage of the fabric through said fabric treating means **22** and fabric drying means **50** or **50'**, suitable means may also be provided for this purpose comprising the rolls **66** and **68** horizontally adjustably mounted one above the other in the frame **70** by means of the threadedly mounted turning handles, **72** which will regulate the horizontal distances between said rolls **66** and **68** to increase or diminish the time interval between said material applying and heat treating steps, although it is obvious that any other type of means for varying the time interval between said steps may be employed, whether it involves employing a variable circui-

tous course for the fabric 30 as shown or otherwise.

Thus applying my invention to a fabric to apply the covering 21 to said threads and particularly the covering 20 at their contacting areas of interweave, if my improved covering be initially applied in insoluble form, it is obvious that employing either type of nip pad shown in Figs. 6 and 7 or the back filling pad shown in Fig. 8 will apply said covering to the thread in insoluble form substantially to the surfaces thereof only and without causing any substantial swelling of the threads and if it be desired to employ a soluble covering which can later be cured or set to become insoluble on the threads, they may be cured in any suitable manner such as described in my aforesaid Patent No. 2,050,156. If desired, a suitable water soluble resin, whether it be of the synthetic or natural type, preferably one colorless or odorless may thus be suitably applied to the fabric and then rendered insoluble, set or cured on the fabric so that the stabilized nonslippable and nonshrinkable effect will be lasting and not wash out after laundering. Quite good results, however, may be obtained by employing any type of a resin or other material and merely drying it thereon without further curing, setting, or polymerizing it, particularly if alkaline resin salts be employed.

While I have described my improved apparatus as applied to the manufacture of a stabilized, nonslippable fabric, it is obvious that if desired my improved apparatus may be employed for applying coverings of the type hitherto described to threads in the form of size, or dye pigment, or for weighting or other purposes, ornamental, utilitarian or otherwise.

I employ the word "resin" to include not only synthetic resins, which generally are of a type which may be further polymerized, set or cured, but also natural rosins or resins which may or may not be capable of being further polymerized set or cured. I employ the phrase "applying treating material to said fabric in a liquid vehicle" to cover all contingencies, including when the treating material itself is liquid so that it can apply itself, and whether it is soluble or insoluble in the liquid vehicle.

It is apparent that I have provided a novel apparatus for applying soluble or insoluble coverings to threads for the purposes and with the advantages mentioned above.

It is apparent that the improved mechanical variation of the hitherto employed steps of treating fabrics hitherto described and hereinafter claimed may be employed alone for carrying out the processes of my invention or in association with chemical or physico-chemical methods for limiting the penetration of the liquid vehicle containing the plasticizable transparent covering material to the surfaces and contacting areas of interweave only of said threads.

It is understood that my invention is not limited to the specific apparatus described and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim is:

1. An apparatus for use in treating fabrics, comprising in combination, means for continuously applying treating material to said fabric in a liquid vehicle, means for continuously drying said fabric, means for driving said fabric treating and fabric drying means at substantially synchronized speed, means for varying the speed of said driving means, and means for varying the time interval between the passage of the fabric through said fabric treating and fabric drying means.

2. An apparatus for use in treating fabrics, comprising in combination, a pad for continuously applying a small amount of a treating material to said fabric in the liquid vehicle, a tenter for continuously drying and stretching said fabric, means for driving said pad and tenter at substantially synchronized speed, means for varying the speed of said driving means to vary the speed of fabric passing therethrough and means for varying the time interval between the passage of said fabric through said pad and said tenter.

3. An apparatus for use in treating fabrics, comprising in combination, means for continuously applying treating material to said fabric in a liquid vehicle, means for continuously drying said fabric, means for driving said fabric treating and fabric drying means at substantially synchronized speed, and means for varying the time interval between the passage of the fabric through said fabric treating and fabric drying means.

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