

Dec. 24, 1957

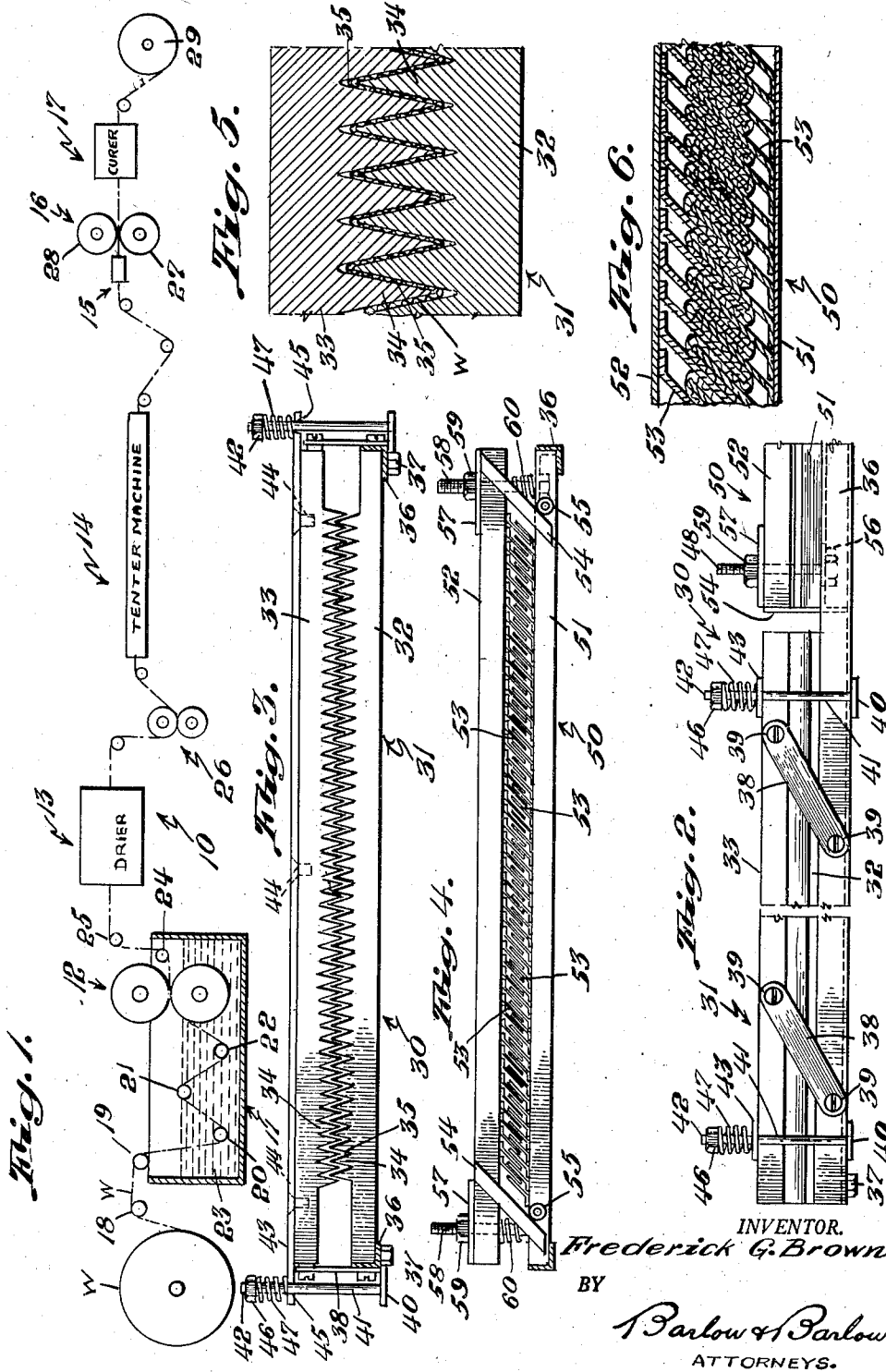
F. G. BROWN

2,817,468

METHOD OF MAKING A PLEATED FINISH IN TEXTILE FABRIC

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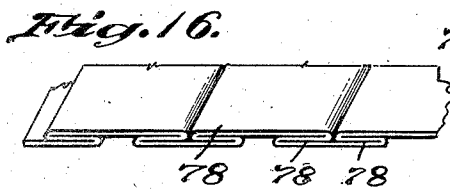
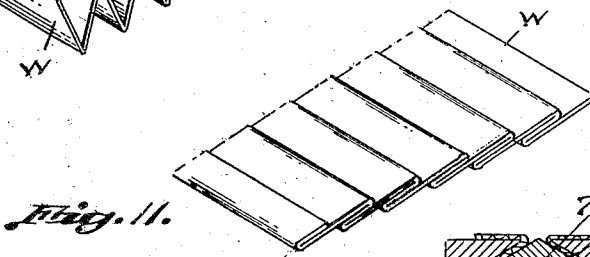
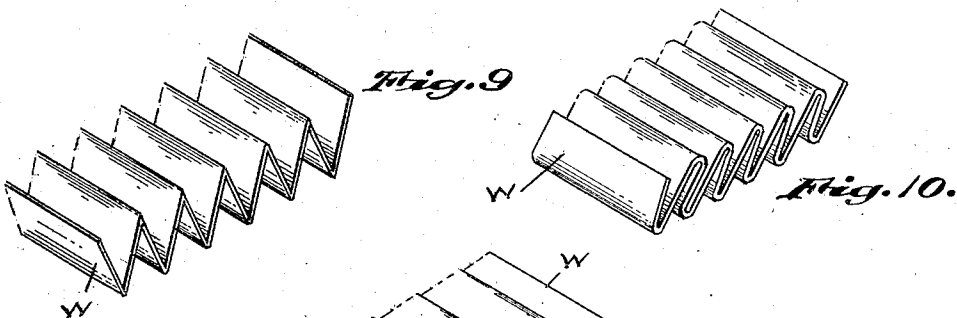
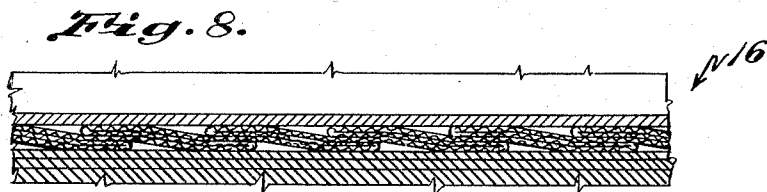
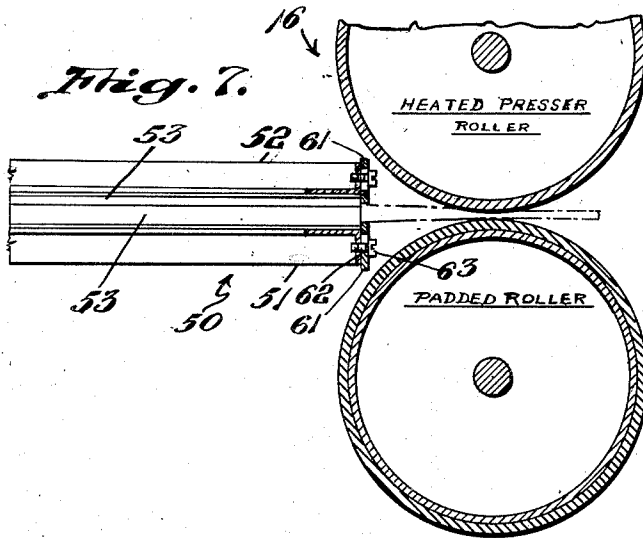
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Fig. 12.

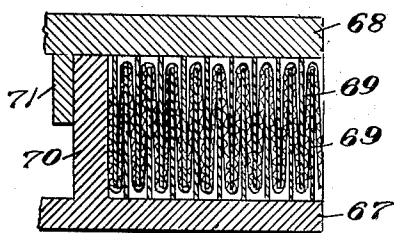
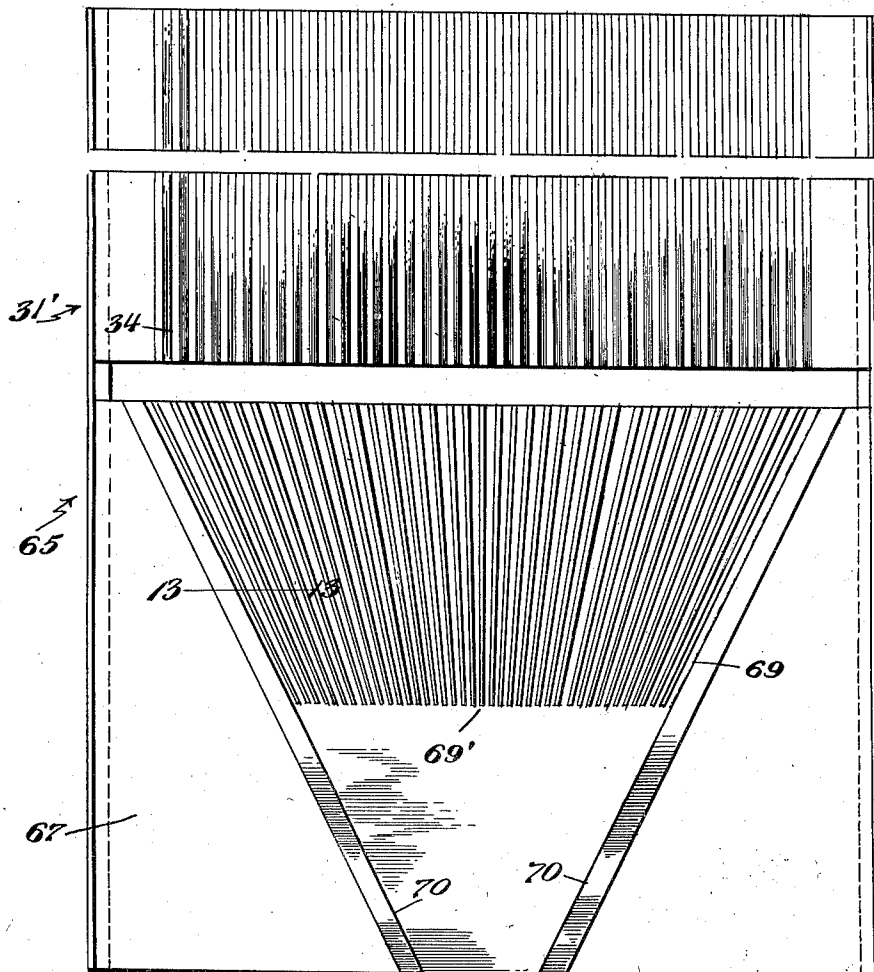
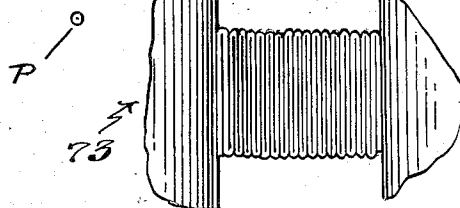


Fig. 13.

Fig. 14.



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METHOD OF MAKING A PLEATED FINISH IN TEXTILE FABRIC

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5 Claims. (Cl. 223—30)

This invention relates to a method for finishing textile fabrics with pleats therein and to apparatus utilized in performing the method.

Heretofore it has been the usual practice to make pleats in wearing apparel, drapery, and other articles made of textile fabric subsequent to the cutting of the material in the various shaped pieces required for the particular article to be made. The making of such pleats, particularly a full pleated article, even with mechanical aids required skilled labor and consequently was expensive.

An object of the invention is to provide a pleated textile fabric finish in which the pleats will extend continuously warpwise of the fabric.

Another object is to provide a pleated textile fabric finish in which the creases of the pleats will be retained and resist the formation of other creases.

Another object is to provide a pleated textile fabric finish in which the pleats will extend continuously warpwise of the fabric and widthwise from selvage to selvage.

A more specific object is to provide a method of continuously pleating textile fabrics in which the folds of the pleats are continuously developed lengthwise of the direction of travel of the fabric and creased by a pressing action thereon.

Another object is to provide a method of continuously pleating textile fabrics in which the folds of the pleats are continuously developed lengthwise of the direction of travel of the fabric and in which the advancing folds will be traveled diagonally of their advance to be passed through pressing rollers to crease the folds.

Another object is to provide a method of continuously pleating textile fabrics in which the fabric will be first treated with a crease-retaining agent.

Another object is to provide textile finishing apparatus for treating textile fabric for making continuous pleats therein in which the folds of the pleats will be continuously developed lengthwise of the direction of travel of the fabric and creased under pressure.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a schematic view of apparatus embodying my invention;

Figure 2 is a side elevational view of a pleater forming part of the apparatus shown in Figure 1;

Figure 3 is a front edge view of one of the matrices of the pleater shown in Figure 2;

Figure 4 is a front edge view of another portion of the pleater shown in Figure 2;

Figure 5 is a sectional view of a fragmental portion of the matrix shown in Figure 3 on an enlarged scale and showing the fabric as folded thereby;

Figure 6 is a sectional view of a fragmental portion of the matrix shown in Figure 4 on an enlarged scale and showing an advanced stage of the fabric folds shown in Figure 5;

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Figure 7 is a side view partly in section on an enlarged scale of a fragmental portion of the pleater and presser rollers of the apparatus;

Figure 8 is a sectional view showing the folded fabric between the bite of the presser rollers shown in Figure 7 on an enlarged scale;

Figure 9 is a perspective view of the fabric showing the preliminary folds as made by passing through the matrix shown in Figure 3;

Figure 10 is a perspective view of the fabric showing the advanced stage of the fabric folds as made by passing through the matrix shown in Figure 4;

Figure 11 is a perspective view of the fabric with the folds shown in Figure 10 creased to form knife-edge pleats;

Figure 12 is a plan view of a modified form showing a portion of a pleater for making so-called accordion pleats in the fabric;

Figure 13 is a sectional view taken substantially along line 13 of Fig. 12 on an enlarged scale and showing the upper portion of the pleater in interfitting relations with the lower portion shown in Figure 12;

Figure 14 is a view of a fragmental portion of the presser rollers between the bite of which the fabric folds are passed to crease the same into the accordion pleats;

Figure 15 is a section view of a fragmentary portion of a pleater of modified form for making a box pleat; and

Figure 16 is a perspective view of the fabric folded in box pleats.

In accordance with the invention the fabric or cloth to be pleated is first treated with a crease setting or holding liquid such as a resin. Preferably, the cloth in a continuous web of indefinite length is passed through the liquid, at a rate of travel sufficient for the liquid to impregnate the cloth. The surplus of the solution may be removed and the cloth next dried to an approximate 8 percent to 15 percent moisture content. The cloth may now be passed through a particular pleating apparatus so as to make the folds of the pleats in the cloth lengthwise thereof. The cloth with the said pleats therein is now passed through a pressing apparatus to crease the pleats and thereafter the pleats may be substantially permanently set by subjecting the cloth to the necessary treatment so as to cure the agent impregnated into the cloth.

Referring to the drawings, the apparatus designated generally 10 for carrying out the invention comprises essentially a padder 11 in which the fabric is treated with a resin in a soluble form, a mangle 12 for squeezing excess resin, drying apparatus such as a heated drying box 13, and a drying tenter 14 for drying the fabric to the proper moisture content for subsequent treatment, a pleater fixture 15 for folding the fabric to make the pleats, heated presser rollers 16 for creasing the folds into pleats, and a curing chamber 17 wherein the resins are cured to permanently set the crease of the pleats.

The web W from the roll of fabric is led over guide rollers 18, 19, thence into the padder 11 to be submerged and guided by rollers 20, 21, and 22 through the resin solution 23. The solution 23 may be resins in a water soluble or prepolymerized state as used for treating fabrics for crease resistance, embossing, and glazing. The solution may be a 10 percent urea formaldehyde precondensate having a molecular ratio 1 urea to 1.6 formaldehyde and a catalyst in a quantity of 3 percent on the basis of the dry resin solid which may be diammonium phosphate. Another solution found satisfactory consists of 12 pounds (dry) unmethylated melamine formaldehyde precondensate resin solids to 30 gallons of water, the catalyst being the same as above. A third example of a suitable resin may consist of 15 pounds methylated melamine resin to 30 gallons of water with the same catalyst as above. The web W is passed through the solution 23 at a rate

to absorb approximately 75 percent of its weight of the solution and passes through the squeeze rollers of the mangle 12, which operate under pressure of many tons so as to remove all excess of the solution from the fabric. The web W is led from the squeeze rollers 12 over guide rollers 24, 25 to pass through the heated dryer box 13 to partially dry the web and thence is guided to the nip of feed rollers 26, which advances the web to the dryer tenter 14 of the usual construction and which operates at a temperature not in excess of 200° F. whereby the web is partially dried at a predetermined width to an approximate 6 percent to 15 percent moisture content depending upon the weight of the fabric, the light weight fabrics being partially dried to the lesser percentage moisture content of the above range.

After the web W has been dried on the tenter 14 to the required moisture content, it is guided to the folder 15 to be hereinafter more fully described, which folds the web lengthwise as being advanced therethrough. The web so folded is passed through presser rollers 16 which crease the folds into pleats. The presser rollers 16 may be the usual paper-covered backing roller 27 and the upper steel roller 28 gas heated to approximately 230 degrees to 500 degrees F. depending upon the weight and kind of fabric and the speed of travel of the fabric. The fabric web is then passed into the curing chamber 17 wherein the resin is cured at 260–400° F. with the web traveling through the chamber 17 at a rate to remain therein three to ten minutes; for example, with the chamber heated to 310° F. the web is made to travel at a rate to remain in the chamber eight minutes. The web upon leaving the chamber 16 may be batched in roll form 29.

The various operations on the fabric have been described and shown in Figure 1 as being continuous from the advancing of the web of fabric into the solution in the padder 11 to the batching of the web upon leaving the curing chamber 16, and it is pointed out that this is merely illustrative, since the rate of travel of the web through the various apparatuses would not be the same. In actual practice of the invention, the web W upon passing through the tenter 14 is batched preferably in roll form for transferring to the folder 15 and presser rollers 16 which are preferably combined in a single apparatus and which may be at a location remote from the tenter 14. The web after being pressed in pleats is again batched for transferring to the curing chamber wherein the web W is traveled at the speed to effect proper curing of the resins contained in the fabric.

In Figures 2 to 6 I have shown a pleater fixture designated generally 30 comprising a first matrix 31 having a lower and upper plate 32, 33, respectively, which are substantially similar to each other and each having a plurality of longitudinally extending vertical V-shape projections 34 forming V-shape grooves 35 therebetween in which nest the projections 34 of the opposite of the said plates. The lower plate 32 is supported at opposite longitudinal edges on angle irons 35 and secured thereto as by bolts 37. With a view of securing the said plates in a manner to effect yieldable parallel separation between the plates, the same are secured to each other by parallelly disposed connecting links 38 (see Figure 2) which are attached to the longitudinal opposite edges of the plates as by screws 39. Brackets 40 (see also Figure 3) project outwardly from the lower side of the angle iron 35 and each of which has attached thereto a vertical lug or pin 41 having a threaded upper end 42. A strap 43 extends laterally across the upper side of the plate 33 and is secured in place by screws 44. The end portions of the straps extend beyond the plate to be opposite the brackets 40 and have slots 45 therethrough extending inwardly from a side edge thereof. Each pin 41 extends through a slot 45 and adjustably receives a nut 46 which forms an abutment for one end of a compression spring 47, the other end of which engages against the strap 43 to resili-

ently bias the upper plate 33 for movement towards the lower plate 32.

The second portion of the pleater 30 comprises a matrix 50 (see Figures 2 and 4) which is attached to the angle irons 36 to extend in continuation of the matrix 31 and has lower and upper plates 51, 52, respectively (see Figure 6) which are substantially similar to each other and each having a plurality of longitudinally extending webs 53 extending on a slant at approximately 42 degrees from the horizontal and with the webs 53 of one of the said plates inclined in a direction and spaced to interfit centrally in the space between the webs 53 of the opposite plate and be parallel thereto. With a view of effecting adjustment as to the relative depth of the webs of one plate in the space between the webs of the other plate at the same time maintaining equal spacing between the webs, guides 54 are secured to the upper plate 52 at the lateral edges thereof and these depend from the plate at an angle equal to and in the same direction as the webs carried by said plate 52. There is a pair of guides 54, as shown in Figure 4, at the opposite lateral edges of the plate 52. A roller or the like abutment 55, there being one for each guide 54, is secured to the lower plate 51 to be engaged by a slanted edge of the adjacent guide 54. Elongated openings 56 (see Figure 2) are provided in the lower plate 51 in the opposite longitudinal marginal sides thereof adjacent to the outer ends of said sides. A strap 57 is secured in an appropriate manner on the upper side of the plate 52 at each end portion thereof at a location to be opposite to the said openings. A bolt 58 extends through each opening 56 and through the said strap to adjustably receive a nut 59 to move the upper plate towards the lower plate against the bias of a compression spring 60 which encircles the said bolt between the said plates tending to separate the plates. The assembly of the above matrix is secured in position on the supporting structure of the presser rollers in any suitable manner with the inner end of the pleater positioned closely adjacent to the bite of the said presser rollers which provides the feed for advancing the web W through the said pleater.

In threading the web W through the pleater above described, the upper plate 33 is separated from the lower plate 32 by raising the same against the bias of springs 47. The web of predetermined width is passed over the projection 35 of the lower plate 32. The upper plate 33 may now be lowered into engagement with the web W to push the same into the grooves 34 (see Figure 5). As the web is pulled in matrix 31 the folds will be continuously developed lengthwise of the fabric in the fashion somewhat similar to the folds of an accordion (see Figure 9). The plates of the matrix 50 are separated and the preliminary folds made in the web W by the matrix 31 are threaded into the webs 53 of the lower plate 51, which webs 53 are in substantial register with the projections 34. The upper plate 52 is now lowered for its webs 53 to engage the fold in the fabric between the webs 53 of the lower plate 51 (see Figure 6). Thus, the folds in the fabric are completed and positioned at an angle to assure passing between the bite of the presser rollers all in the same direction (see Figure 10). In order to assure the folds remaining in proper relation as the web W passes outwardly of matrix 50 of the presser rollers, guide bars 61 (see Figure 7) are provided at the delivery end of the matrix 50 and between which bars the fabric passes onto the bite of the presser rollers 16. The bars are secured in adjusted position as by means of elongated openings 62 through which the screw fastenings 63 pass. Thus, the spacing between the bars may be chosen relative to the depth of the pleat folds made in the fabric.

The folds in passing through the presser rollers 16 are laid flat in overlapping relation in the usual manner (see Figure 8) and are creased to a knife edge and thus form a so-called knife edge pleat as shown in Figure

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11, which pleats extend lengthwise throughout the entire length of the fabric. In Figure 11, the pleats are shown in non-overlapping relation. However, the pleats may readily be made to overlap each other to an extent desired by lengthening the folds, or the pleats may be made to overlap to a smaller extent than that shown by a choice of pleater.

In Figures 12 to 14, I have shown a pleater designated generally 65 for making so-called accordion pleats and comprises a first matrix 31' which may be similar in structure to the matrix 31. The second portion or matrix 66 comprises a lower and upper plate 67, 68, respectively, each substantially similar having a plurality of webs 69 in register with the projection 34 of matrix 66 at the adjacent ends thereof. The webs 69 extend radially in spaced relation from a reference point *p* at a location forwardly of the pleater. The webs 69 of each plate interfit centrally the spaces between the webs 69 of the other plate (see Figure 13). The webs 69 are of a length so as to provide sufficient spacings between the said webs 69 equal at least to two thicknesses of the fabric plus the thickness of the interfitting web 69 at the terminal of the webs 69 as at 69'. The lower plate 67 is provided with a guide 70 (see Figure 13) on each side of the webs 69. Each guide 70 extends radially from the said point *p* and form therebetween a restricted delivery opening 72. These guides are of a height slightly greater than that of the webs 69 and against which the upper plate 68 rests. The upper plate 68 is provided with sides 71 (see Fig. 13) which are adapted to engage the guides 70 to locate the proper interfitting of said webs 69.

The fabric is threaded through the latter pleater in a manner similar to that previously described for threading the former described pleater. In pulling the fabric through the webs 69, the edge folds will engage the guides 70 and move the folds towards each other to pass through the opening 72 with the said folds held tightly against each other to be led to presser rollers 73 which may rotate about vertical axes. It may, however, be desirable in some instances to pass the folded fabric through the usual horizontally extending presser rollers. To this end the folded fabric may be readily turned through 90 degrees by suitably positioned guides (not shown) so as to travel the fabric with the folds extending in a horizontal direction.

In Figure 15, I have shown a pleater for making a so-called box pleat. It comprises a lower member 75 having dovetail like grooves 76 in which are received second members 77 which are triangular in cross section. These second members are suitably supported on a frame (not shown) and are moved into and out of the grooves 76 as a unit. The fabric which may be first or initially folded by the apparatus of Fig. 3 is threaded through the groove 76 and the members 77 thereafter placed in position whereupon the folds 78 are placed in the fabric as the latter is drawn through the pleater.

I claim:

1. The method of making a pleated finish in textile fabric comprising first treating the fabric with a solution of resins in a prepolymerized state, partially drying

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the fabric to a 6 percent to 15 percent moisture content, and then traveling said fabric and while so traveling to continuously develop folds in the fabric, pressing said folds under heat to crease said folds into pleats and thereafter curing the resin content in the fabric.

2. In apparatus for treating textile fabric web to produce a pleated finish in the web comprising a container for a crease retaining agent through which the web is passed for impregnating the same with said agent, a pair of squeeze rollers for removing excess of said agent from the web, a first dryer through which the web passes for partially drying the web, a partially drying of tenter for continuing the partially drying the web while traveled thereby, a pleater to continuously develop folds of pleats in the direction of travel of the web, a pair of presser rolls between which the folds pass to be creased into pleats and a curing chamber through which the fabric with the pleats therein passes to cure said retaining agent contained in the fabric.

3. The method of pleating a web of textile fabric comprising traveling the web lengthwise and while so traveling treating the web with a crease retaining agent, then expanding the web widthwise and then gathering the web widthwise to develop folds therein extending lengthwise of the web and generally perpendicular to the plane thereof and then twisting the folds to incline them to the said plane and then pressing the inclined folds between rolls the axes of which are substantially parallel to the said plane.

4. The method of pleating a web of textile fabric comprising traveling the web lengthwise and while so traveling treating the web with a crease retaining agent, then expanding the web widthwise and then gathering the web widthwise to develop folds therein extending lengthwise of the web and generally perpendicular to the plane thereof and then twisting the folds to incline them to the said plane and then pressing the inclined folds between rolls the axes of which are substantially parallel to the said plane and then raising the temperature of the web to cure the agent picked up thereby.

5. The method of making a pleated finish in textile fabric comprising first treating the fabric with a solution of resins in a prepolymerized state, partially drying the fabric, and then traveling said fabric and while so traveling to continuously develop folds in the fabric, pressing said folds under heat to crease said folds into pleats and thereafter curing the resin content in the fabric.

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