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Worcester, Jr. et al.

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[54] **PREFORMED CROSS-LAID FABRIC**

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[52] **U.S. Cl.** **161/82**, 139/383, 161/85, 161/86, 161/91

[51] **Int. Cl.** **B32b 3/02**

[58] **Field of Search** 161/85, 86, 88, 89, 161/91, 92, 149, 78, 79, 82, 84; 139/383

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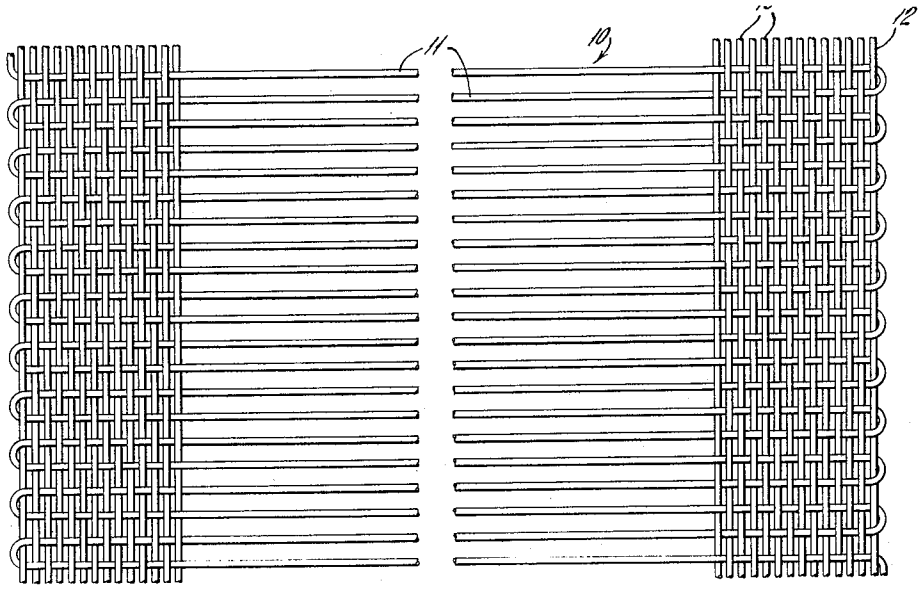
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[57] **ABSTRACT**

A fabric comprising from about two to eight yarns per inch running in the transverse or cross direction of the fabric and a selvage along each longitudinal edge of the fabric. Each selvage comprises from about 10 to 30 warp yarns and has a width of from 1 inch to 3 inches. The warp yarns in the selvage being woven with the cross yarns and the warp yarns having a denier of from about 70 to 300. The fabric is made by drawing a plurality of selvage warp yarns through each side of a loom while maintaining the yarns under tension. As the warp yarns are drawn through the loom the cross yarns are woven with the warp yarns to form the selvage. As each cross yarn is woven the selvage is held in place. The selvage is released and the fabric moved forward and regripped and the next cross yarn woven, and so forth. After the cross yarns are woven to form the selvages, tension is applied to the fabric in the crosswise direction and the fabric rolled on a driven roll.

14 Claims, 3 Drawing Figures



Patented Nov. 20, 1973 3,773,606

2 Sheets-Sheet 1

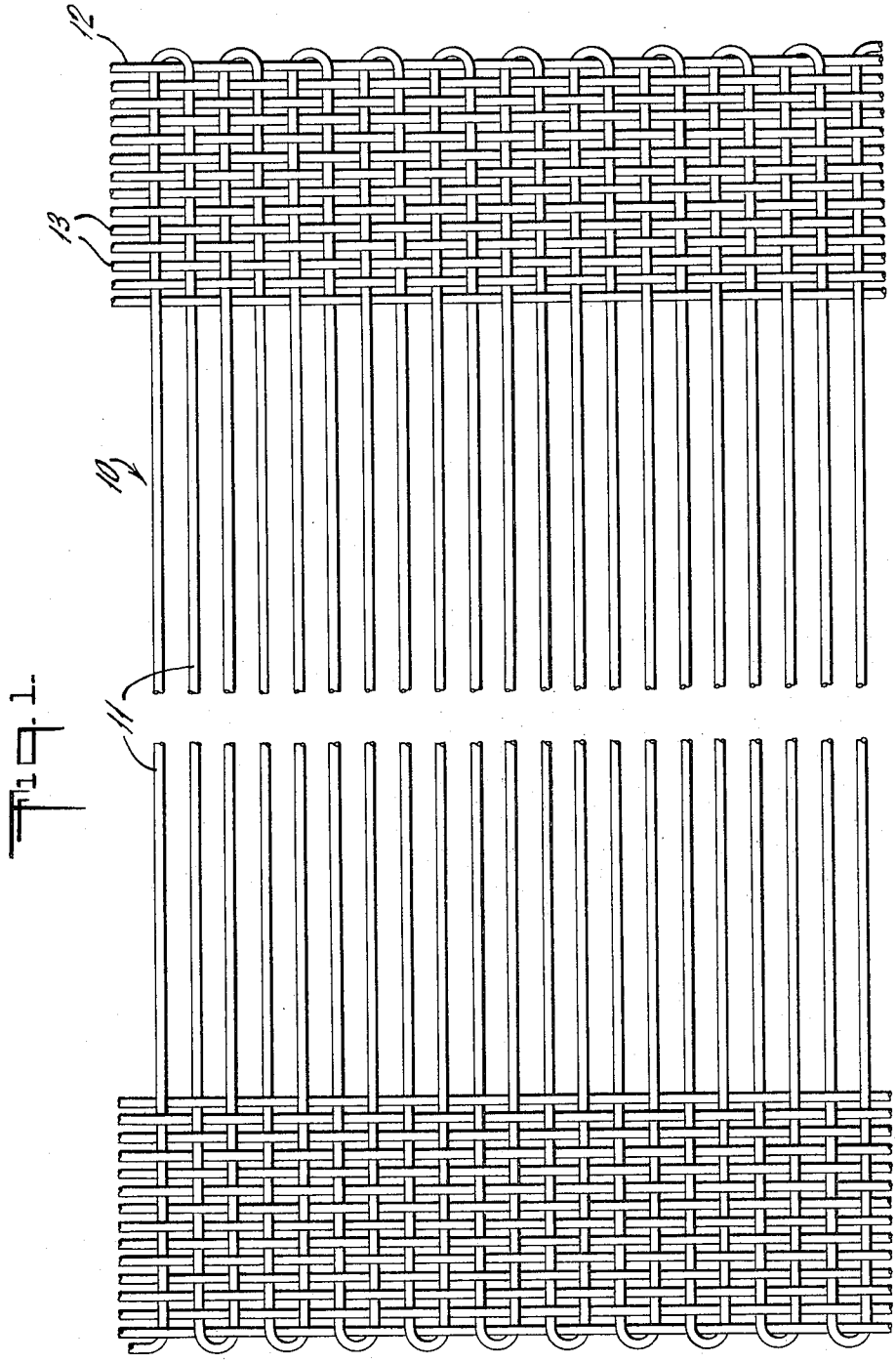


FIG. 1

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Patented Nov. 20, 1973 3,773,606

2 Sheets-Sheet 2

Fig. 2.

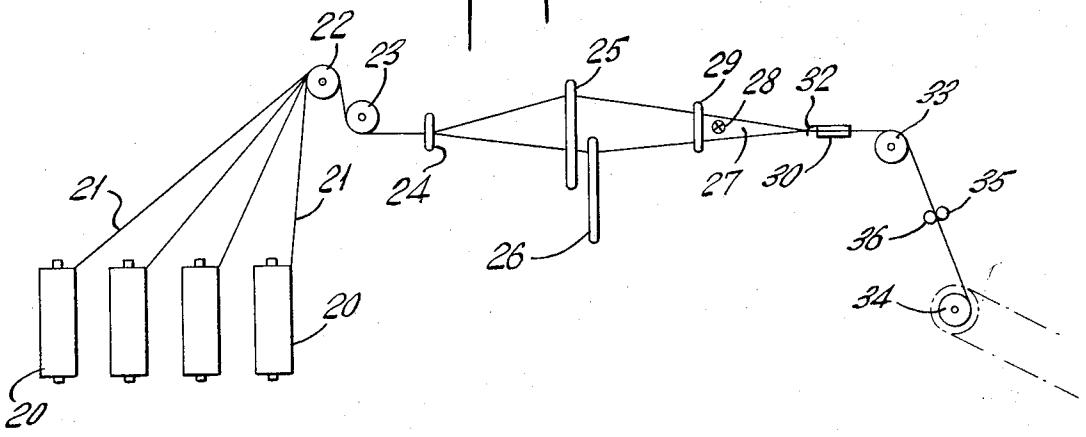
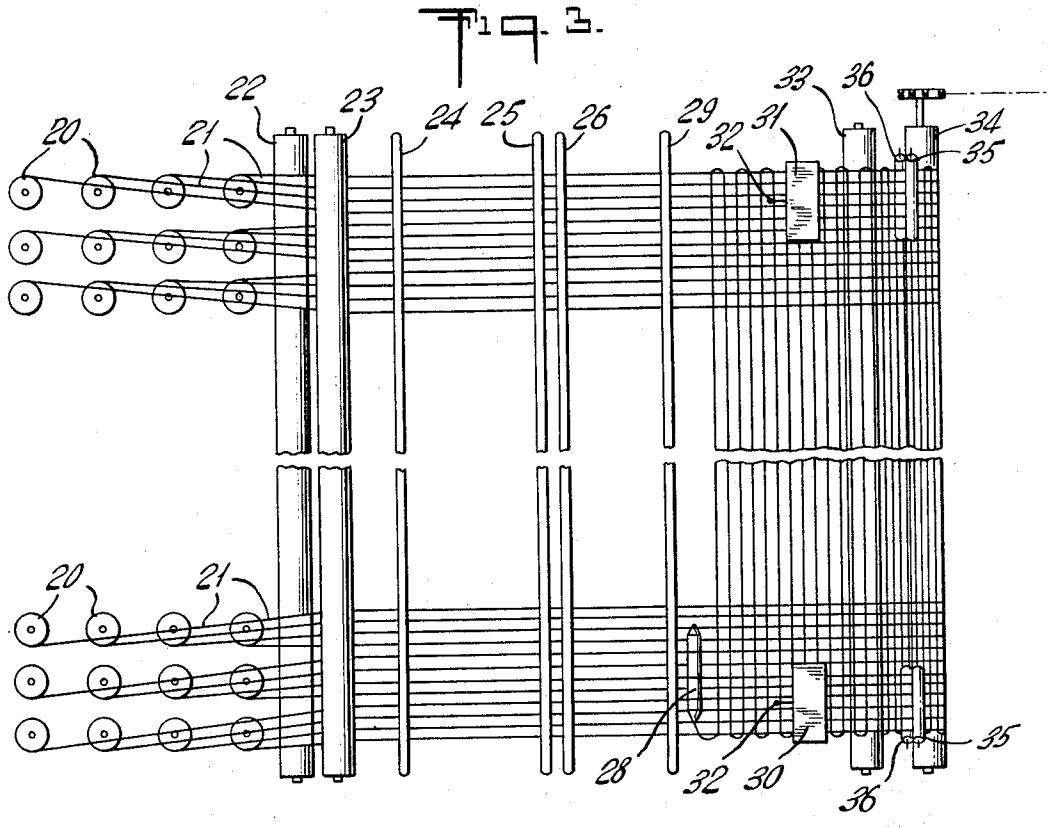


Fig. 3.



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PREFORMED CROSS-LAID FABRIC

This invention relates to a new type of cross reinforcing material and more particularly, to a preformed cross reinforcing material which may be utilized in its formed state.

BACKGROUND OF THE INVENTION

In the manufacture of many fabrics such as paper and nonwoven materials it is often desirable to reinforce these fabrics in their cross or transverse direction. The cross reinforcement is required because of the usually greater longitudinal strength of these fabrics as compared to their cross strength.

In many products the reinforcement may be in the form of a woven gauze, such as 8 × 8 woven fabric, or in the form of an unwoven scrim; that is, cross yarns and longitudinal yarns disposed at right angles to one another and adhered together by adhesive or other means. In many products the cross reinforcement is only cross yarns which are laid on a base fabric that acts as a carrier for the yarns. Longitudinal yarns may or may not be used with such cross yarns as desired. A cover fabric is placed on top of the reinforcement to form the final laminate.

Hence, in these prior art material stability is given to the cross reinforcing means by the longitudinal yarns which are either woven or adhered to the cross yarns or by forming the cross yarns on the base material or carrier which is to be reinforced.

SUMMARY OF THE INVENTION

We have discovered a preformed cross reinforcing fabric which does not require longitudinal yarns to give the cross reinforcing fabric stability. Further, our cross reinforcing fabric need not be directly formed on the material it is to reinforce but is performed. This allows my new fabric to be rolled up, transported and utilized in the same manner as conventional woven or other stable fabrics.

In accordance with the present invention our new preformed cross reinforcing fabric comprises from about two to eight yarns per inch running in the transverse direction of the fabric. The fabric has a selvage along each longitudinal edge and each selvage comprises from about 10 to 30 warp yarns. Each selvage has a width of from 1 inch to 3 inches and the selvage yarns are woven with the transverse yarns. The selvage warp yarns have a denier of from about 70 to 300 and are preferably substantially uniformly disposed throughout the selvage.

Our new fabric is made by drawing through a loom, along each side of the loom, from about 10 to 30 warp yarns with the yarns maintained under tension as they are being drawn through the loom. Cross yarns are woven with the warp yarns at each selvage and as each yarn is woven the immediately previously woven yarns are held in place to prevent breakage and distortion of the selvage yarns during the weaving operation. Tension is applied in the crosswise direction of the fabric and the fabric is wound on a driven roll.

FURTHER DESCRIPTION OF THE INVENTION

Fabrics of the present invention may be produced on any of the standard looms either shuttleless or not.

The preformed cross reinforcing fabrics of the present invention must contain from about two to eight yarns per inch in the crosswise or transverse direction and preferably from about three to six yarns per inch. If less than two yarns per inch are used, the fabric does not have sufficient strength to make a suitable reinforcing media, while if more than eight yarns per inch are used, the cross yarns will tend to overlap and intertwine and the resulting fabric cannot be adequately handled.

The cross yarns may be any of the standard type yarns such as spun yarns, multi-filament yarns, and mono-filament yarns made from any of the natural, artificial or synthetic fibers.

The size of the cross yarns will depend on the desired end use of the material formed.

Each selvage in the preformed cross-laid fabric contains from about 10 to 30 warp yarns and preferably 12 to 30 warp yarns. If less than 10 warp yarns are used the selvage will not have sufficient strength to allow for the continuous production of the fabric. If more than 30 warp yarns are used they serve no purpose and are uneconomical, so they merely increase the amount of yarns removed from the fabric when it is laminated to paper or nonwovens or similar materials. The selvage has a width of from about 1 to 3 inches and is preferably about 2 inches wide. If less than about an inch width is used the fabric cannot be rolled upon itself in a controlled and uniform manner, whereas if more than 3 inches is used, it is uneconomical, as considerable waste is produced.

The selvage yarns have a size of from about 70 to 300 denier and preferably about 175 denier. These deniers correspond in cotton yarns to sizes of from about 75's as the finest yarn and 20's as the coarsest yarns. The prefered 175 denier is approximately equivalent to a 30's cotton yarn. If larger than 300 denier yarns are used the selvage in the fabric will build up too fast and the fabric cannot be wound on economically sized rolls.

If too fine a yarn is used the yarns do not have sufficient strength to withstand the weaving operation and the more yarns required to produce a suitable fabric.

Any type of warp yarn may be used in the selvage; that is, spun yarn, multi-filament yarn or mono-filament yarn and the cost of the yarns will control to a great extent the type of yarn used and the size of yarn used.

An advantage of utilizing the preformed cross-laid fabric of the present invention in reinforced laminates, is that our preformed fabrics may be laminated to paper or nonwovens or other materials at virtually any speed. Once our new fabric is formed it only has to be unwound from the roll which may be done at any speed during the lamination process. This is not true with other cross reinforcing materials. With most cross reinforcing materials, such as cross-laid yarns, there are limitations in speeds at which the yarns are cross-laid which, in turn, control the speed of the final lamination.

In manufacturing the fabric of the present invention, the warp yarns used to form the selvage are delivered from suitable packages placed at the rear of a standard loom. The warp yarns are passed about a pair of rolls to place tension on the yarns as they pass through the loom. A standard shuttle weaves the cross yarns with the warp yarns to form the selvage. As a cross yarn is woven the immediately previously woven portion of the selvage is held in place to prevent breakage and distortion of the selvage. After the fabric is woven the selvage are diverged slightly to place the cross yarns under ten-

sion and stretch the fabric in its crosswise direction. The stretched fabric is wound on a driven wind-up roll.

It is common in the textile industry to drive the woven fabric itself on the wind-up roll rather than drive the wind-up roll. It is extremely important in our new method that the fabric not be driven, but that the wind-up roll be driven.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more fully described in conjunction with the accompanying drawings wherein:

FIG. 1 is an enlarged schematic view of one embodiment of the preformed, cross-laid fabric of the present invention;

FIG. 2 is a schematic side view depicting the method of producing the new fabrics of the present invention; and

FIG. 3 is a schematic top view of the method depicted in FIG. 2.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. 1 of the drawings, there is depicted a fabric **10** of the present invention. The fabric comprises cross yarns **11** and warp yarns **12.** The cross yarns and warp yarns are woven together at each edge of the fabric to form a selvage **13.**

Referring to FIGS. 2 and 3 there is schematically shown a method for producing the fabrics of the present invention. A supply of warp yarns **21** are delivered from suitable packages **20** to a standard loom. The yarns **21** pass over a rubber covered tension roll **22** and beneath a second rubber covered tension roll **23.**

It should be noted that in the figures the various framing drive means etc. used with standard looms have been omitted for the sake of clarity, and just the major operative parts of the loom are shown.

In some instances when manufacturing our new fabrics it may be desirable to pass each yarn through a tension eye to aid in the proper positioning of the yarn during the weaving operation.

The yarns **21** pass from the tension rolls **22** and **23** to a spacer member **24.** From the spacer the yarns are passed through a loom which has two heddles **25** and **26** which alternate up and down to form a shed **27.** A shuttle **28** weaves the cross yarns in the shed. After each weave a reed **29** battens each cross yarn against the portion of the fabric already formed. Each selvage edge of the fabric passes through a conventional temple **30** as is well known in the weaving art. The temples have crow hooks **32** which grip the selvage and holds it in place while the cross yarn is being inserted to maintain the selvage stable and prevent breakage. After the cross yarn is inserted, and battened, the crow hook is removed from the selvage, the temple releases the selvage and the fabric moved forwardly. The crow hook is reinserted and the selvage gripped by the temple while the next cross yarn is inserted.

The preformed cross-laid fabric passes about guide roll **33** down to wind-up roll **34.** The wind-up roll must be driven and the wind-up roll pulls the selvage warp yarns through the loom during the weaving operation. As the preformed fabric passes down to the wind-up roll each selvage edge passes through a pair of canted rolls **35** and **36.** These canted rolls diverge the selvages slightly and straighten the cross yarns by placing the cross yarns under tension immediately before they are wound on the wind-up roll.

The invention will be further illustrated in greater detail by the following example:

EXAMPLE

Using a standard loom set up as depicted in FIGS. **2** and **3,** 24 selvage yarn packages are mounted on spindles for easy rotation at the rear of the loom. The selvage yarns are cotton yarns having a 30's yarn size and 12 yarns are used to form each selvage. The yarns are tensioned by a pair of rubber covered rolls and pass through a spacing member. The yarns are threaded through a pair of heddles which are moved alternately up and down to form a shed.

The filling yarn used is a spun polyester yarn equivalent to a 40's cotton count and it is woven in the crosswise direction at five yarns to the inch. The fabric after being woven passes over a guide roll, through a pair of canted rolls to apply tension in the crosswise direction and wound on a driven wind-up roll.

The resulting fabric is a 0 × 5 fabric having a pair of selvages each approximately 1 ½ inches wide. The fabric is suitable for reinforcing paper or nonwoven fabrics or similar materials.

Although a specific example of the inventive concept has been described for purposes of illustration, the invention should not be construed as limited thereby nor to the specific features mentioned therein except as the same may be included in the claims appended hereto. It is understood that changes, modifications and variations may be made in the method and product herein described without departing from the spirit and scope of the claimed invention.

We claim:

1. A fabric consisting of from about two to eight yarns per inch running in the transverse direction of the fabric and a selvage portion at each longitudinal edge of the fabric, each selvage portion having from about 10 to 30 warp yarns and a width of from 1 to 3 inches, said warp yarns being woven with said transverse yarns in the selvage portion and said warp yarns having a denier of from about 70 to 300.

2. The fabric of claim **1** wherein the warp yarns are uniformly spaced in said selvage portion.

3. The fabric according to claim **1** having from about three to six yarns per inch running in the transverse direction of the fabric.

4. The fabric according to claim **1** wherein the yarns running in the transverse direction of the fabric are spun yarns.

5. The fabric according to claim **1** wherein the warp yarns are mono-filament yarns.

6. The fabric according to claim **1** having from about 12 to 20 warp yarns in each selvage portion.

7. The fabric according to claim **1** wherein the warp yarns have a denier of from about 125 to 175.

8. The fabric according to claim **1** having from about three to six yarns per inch running in the transverse direction and about 12 to 20 warp yarns in each selvage portion, said warp yarns having a denier of from about 125 to 175.

9. The fabric according to claim **1** having from about three to six spun yarns per inch running in the transverse direction of the fabric and about 12 to 20 warp yarns in each selvage portion, said warp yarns having a denier of from about 125 to 175 and said warp yarns being uniformly spaced in the selvage portions of the fabric.

10. The fabric of claim 1 having a layer of sheet material adhered to one surface.

11. The fabric of claim 1 having a layer of longitudinal yarns adhered to one surface.

12. The fabric of claim 1 having a layer of sheet material adhered to each surface.

13. The fabric of claim 1 having a layer of sheet material adhered to one surface and a layer of longitudinal yarns adhered to the other surface.

14. The fabric of claim 1 having a plurality of plies of paper adhered to each surface.

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