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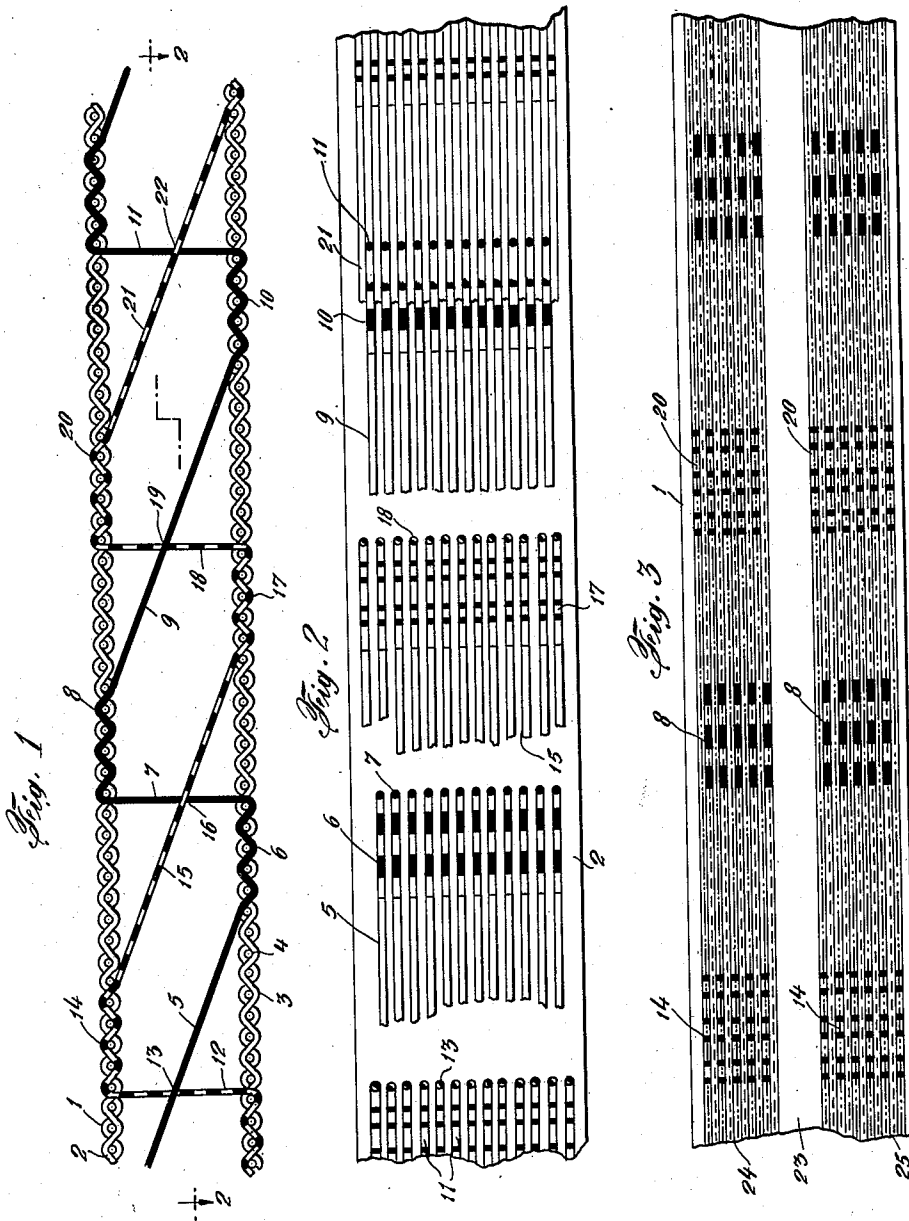
G. F. FRENCH

2,238,465

LADDER WEB

Filed May 10, 1939

2 Sheets-Sheet 1



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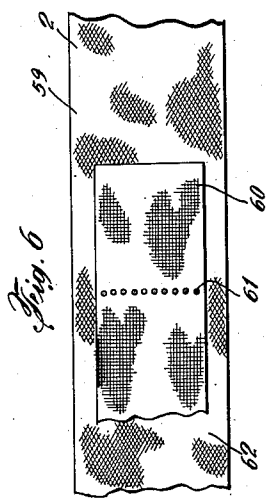
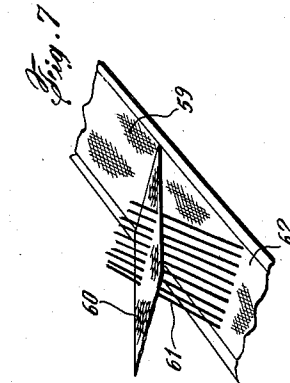
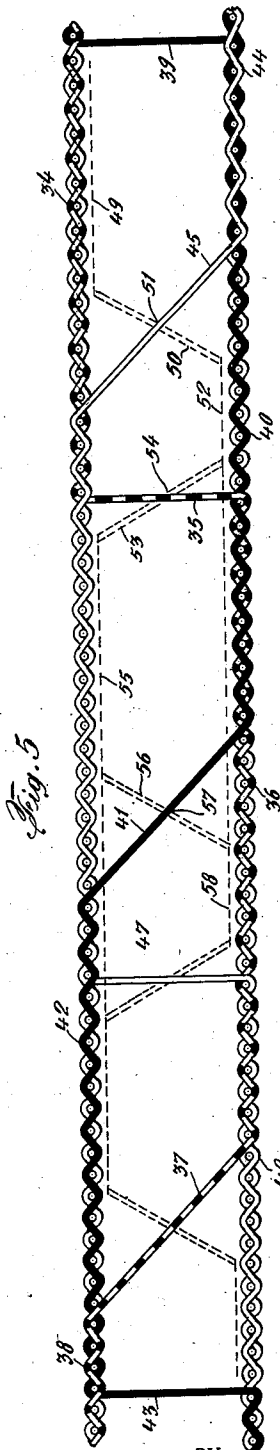
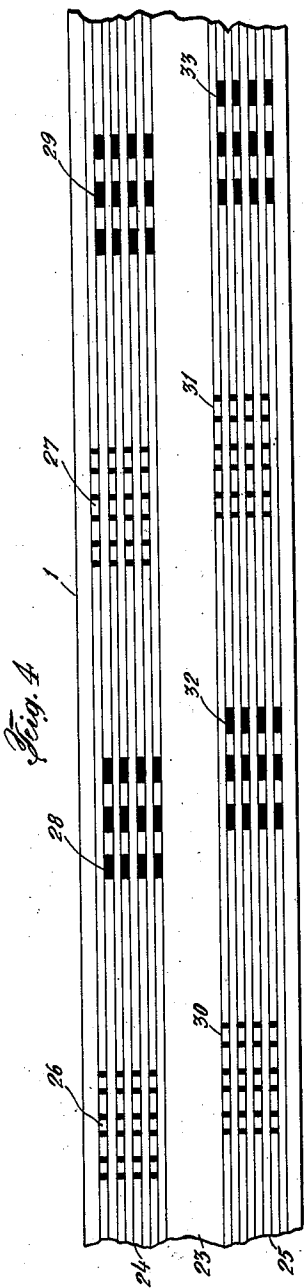
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LADDER WEB

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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LADDER WEB

George Frederick French, Manchester, England

Application May 10, 1939, Serial No. 272,763
In Great Britain March 17, 1938

11 Claims. (Cl. 139—384)

This invention relates to Venetian blind ladder webbing, more particularly to a new and improved construction thereof. The present invention is a continuation-in-part of my co-pending application Serial No. 203,584, filed April 24, 1938, entitled "Multiple warp ladder web."

Venetian blind ladder web consists of two outer or body bands or webs in between which are interwoven two generally narrower cross tapes which interweave for a distance with one body web forming a binding-in area, then for a space as separate tape between the two body webs, then interweave for a similar distance with the second body web and fourthly cross back to the first body web by means of short free weftless warp threads or ends which require to be cut or snipped before the body webs can be separated and opened up to make the cross tapes or straps accessible for the slats or laths. In order that the laths may overlap it is necessary that there should be two sets of cross tapes (though maybe consisting of several sections each) woven in staggered relationship to each other, one towards each side of the body webs, with a slight space between them. Occasionally they have met in the centre but they have never actually more than touched each other.

This design of ladder webbing has never been altered since the inception of ladder web and it can be safely assumed that this staggering or forming one row of straps on each side of the outer bands was to enable each row of cross-straps to bind into one of the outer bands, then weave a certain length of separate cross-strap for the lath to rest on, then binding into the other outer band and then for the strap warps to cross (without weft) back again to the first outer band completing the cycle without interference from the other strap warps and to give overlapping of the laths.

If one places blind laths on a single row of straps so made it will be seen that there would be a gap between the edge of one lath and the commencement of the next and for the purpose of excluding light or shutting out the view from the outside into a room such a construction of blind would be valueless. The designer of Venetian blinds therefore built up the ladder web by adding another row of cross-straps, placing one row on one side and the other row on the opposite side, leaving a space between the two for the operating cord to lie between. The binding or weaving-in of these cross-straps to the outer bands was done in staggered formation, that is, the binding of one row of straps would be near

the edge of the outer band and about 2" further on (according to the width of the lath employed) on the other side of the band would be a binding-in of the other row of straps and in this way the designer was not only enabled to get the overlap of the laths required but there was a space between the rows of straps in which the operating blind cord could work and be kept in its place by the staggered cross-straps. No other way of construction of a Venetian blind ladder web has ever been thought possible and consequently this design of ladder web has been universally used for about 100 years not only when loom woven, but also when made by the earlier hand methods.

The main object of the present invention is to produce ladder webbing in which the required blind lath overlap is obtained, whilst formed with only a single consolidated or composite row of cross-straps, the usual two rows being merged into one width. A further object is to provide such a webbing in which the cross-straps may extend across or substantially across the full width of the webbing, and if desired with the usual central space in each full-width strap for the operating cord, thereby increasing the strength and utility of the webbing. Alternatively, another object is to provide a webbing which, with only a single row of narrow consolidated cross-straps, may be narrower, and thus cheaper to produce than the ordinary webbing, especially when made with weftless cross-straps.

According to the present invention, however, whilst there remain two sets of cross tapes woven in the same staggered relationship, their positioning in respect to each other and the body webs is less restricted. They may in whole or in part intermingle (overlap, merge, compound, superimpose, fuse) with each other, one above the other as it were. Preferably they will both be centrally spaced across the width of the body webs, or they may be located slightly to one side of their respective body webs, overlapping in the centre. In order that this whole or part overlapping may take place it is necessary that the aforesaid free cross-over warp threads of one set pass right through the cross-strap portions of the other set though of course after the usual cutting above described the composite ladder web separates in the usual way.

Application of this new principle of weaving will clearly permit either of narrower ladder web or wider cross tapes than has hitherto been possible—including the variety without weft in which a slight space is left in the centre of the

cross-strap warps so as to permit of the cords being passed between the two halves.

Actually, weaving a cross-strap is commenced before completing the preceding one, and in this way a very simple, useful and cheap construction of ladder webbing is provided; and when the lath straps are made in the full width of the outer webbing (with a short gap for the cords to operate) a web of double strength for the lath to rest on is produced and in the case of the weftless or part weftless straps the lath can be threaded half under and half over the weftless strap threads to keep the laths from moving out of position. In the case of weftless straps two pieces of ladder webbing can be produced in one space of a multiple loom with 4-tier rows of shuttles.

According to the invention, the outer bands of the webbing are each formed as usual, but instead of forming two rows of cross-straps spaced apart in staggered formation as heretofore, they form one composite row, and each set is applied in succession, that is to say, first one set of warps is connected with one outer band for a distance (usually similar to the binding-in of the prior cross-straps), they then cross over to the other outer band to form a cross-strap (with or without weft), and are then bound into such other outer band for a like distance, after which they cross directly back to the first named band in the form of short free cross over warps for a repeat of the first binding-in. The other set of warps is applied in the same way, and in the same line or path, starting with a short binding-in with the first-named outer band, then crossing over to the other outer band to form the next cross-strap, then being bound into such other outer band, and finally passing directly back to the first-named outer band as short free cross-over warps. The relationship between the two sets of warps is such that whilst one set is in the middle of formation of a cross-strap, the other set is crossing over, through the first set as the short free cross over warps. That is to say, where each set of warp threads crosses over from one outer band to the other to form a cross-strap, the short, free warps of the next set of warps pass through them, and in such way it is rendered possible for all the cross-straps to lie in the one row.

The bindings-in of each set of warps are spaced at a uniform distance apart, and thus each alternate cross-strap lies centrally between and overlaps the next preceding and next succeeding cross-straps formed by the other set of warps, said overlapping giving the necessary overlap for the blind laths.

The cross-strap warp connections with the outer bands may vary in length and may be relatively short as in the original practice, or may be longer as set forth in my earlier applications Ser. Nos. 143,557 and 67,809, and the connections will be effected by interweaving the strap warps with the outer bands by means of the weft of the bands, which will not be affected by the interchange of the strap and band warps.

On removal of the webbing from the loom, the short free weftless cross-over warp threads are cut away as usual. To reduce the cost of such cutting away to a minimum the said free cross-over warps are made as short as possible, as for instance in my earlier application Ser. No. 67,809, so that one snip of the scissors will suffice. However, the invention may be applied to ladder web having relatively long free cross-over warps.

In the accompanying drawings, constituting a part hereof and in which like reference characters indicate like parts,

Fig. 1 is a longitudinal, cross-sectional view taken through a piece of ladder web made in accordance with the present invention, the spacing of the outer bands being exaggerated for clearness;

Fig. 2 is a horizontal, cross-sectional view taken along the line 2-2 of Fig. 1;

Fig. 3 is a top plan view of a modified form of ladder web;

Fig. 4 is a view similar to Fig. 3 showing a slight further modified form;

Fig. 5 is a longitudinal, cross-sectional view of still another modification of the present invention;

Fig. 6 is a fragmentary horizontal cross-sectional view similar to Fig. 2 of a modified form of the invention, wherein the cross-straps are formed with weft; and

Fig. 7 is a diagrammatic perspective view of the modification shown in Fig. 6, the length of the free warps being greatly exaggerated for clearness.

An outer band 1 is woven with weft 2 and opposite and parallel thereto is a similar outer band 3 woven with weft 4. A cross-strap 5 consisting of warp threads only is held in outer band 3 at the binding-in area 6, the threads crossing over as shown at 7 to form a binding-in area 8 in outer band 1. A cross-strap 9 then passes to the outer band 3 and the warps are woven into the same as shown at 10 to form a binding-in area and the warps continue as free cross-over threads 11, and the cycle is repeated.

In alignment therewith, a series of warp threads 12 form a cross-over from 3 to band 1 and are bound in as shown at 14. In crossing over, the warps 12 pass between the warps 5 at 13 whereby there is an interlacing of the two sets of warp threads. From the binding-in 14 there extends a cross-strap 15 which interlaces with the free warps 7 at 16. The opposite end of cross-strap 15 forms the binding-in 17 on outer band 3. Free warps 18 pass through cross-strap 9 at 19 and enter the outer band 1, forming a binding-in area 20. Extending therefrom is cross-strap 21, which interlaces with cross-over threads 11 at 22, and the cycle is repeated.

Usually, the distance between outer bands 1 and 3 is extremely short and preferably they are woven in a contiguous manner so that the cross-over from warps 12, 7, 18 and 11 is extremely short. In order to open up the ladder web, it is merely necessary to snip through these cross-over warps. No trimming operations are ordinarily required.

In Figures 1 and 2 the several cross-straps were shown as extending practically across the entire width of the outer bands. Fig. 3 shows a slight modification thereof in which there are no cross-strap elements at the central portion 23 of the outer bands, leaving in effect two identical sections of consolidated cross-straps at the sides 24 and 25 of said outer bands. The space 23 is intended for the reception of a cord constituting a part of a Venetian blind.

In Fig. 4 there is shown a still further modification of the structure of Fig. 3, wherein the pairs of cross-straps lie in the same planes. In Fig. 4 there is a slight shifting of one of each of the pairs of cross-straps. The binding-in 26 on side 24 of the upper outer band is equivalent to the binding-in 14 of Figs. 1 to 3 inclusive. From side

binding-in 26 a cross-strap passes to the opposite outer band, then forming a binding-in and a cross-over of free weft to the outer band 1 and then a binding-in 27, repeating the cycle. The second set of cross-straps on side 14 of outer band 1 is similarly formed, the bindings-in 28 and 29 being equivalent to those shown in Fig. 3.

However, on the side 25 of outer band 1 the binding-in 30 is not in alignment with binding-in 26 but is slightly displaced. Then follows the cross-strap to the opposite outer band, the binding-in thereon, the cross-over of free warps back to outer band 1, and the binding-in 31. The bindings-in 32 and 33 on outer band 1 are equivalent to similar elements on Fig. 3.

By reason of this construction, the two parts of each cross-strap are not in alignment, but are relatively displaced by a small amount. This enables a lath to be threaded between the two parts of the cross-strap without any distortion of the threads. The amount of displacement will generally be equivalent to the thickness of the lath.

In Fig. 5 there is shown a modification in which the binding-in areas are of substantially greater extent than shown in Fig. 1 for example. Cross-strap warp threads 34 pass from outer band 1, forming the free cross-over warps 35, entering the lower band 2 and extending along the same as shown at 36, leaving said band at 37 to form a cross-strap, and then a binding-in area 38 on outer band 1. A second set of cross-strap warp threads is provided having a cross-over 39 to outer band 2 and a long binding-in 40, then a cross-strap 41 and a long binding-in 42 in outer band 1, after which is a cross-over 43 to outer band 2. Still a third set of cross-strap warp threads 44 in outer band 2 forms the cross-strap 45, a long binding-in 46 in band 1, a cross-over 47, and a long binding-in 48 in band 2. All this is in accordance with my co-pending application above referred to.

In addition, there is provided a second series of cross-straps which interlace with the first series in a manner similar to the description in connection with Figs. 1 and 2. However, in order to avoid confusion, the second series of cross-straps have been indicated only diagrammatically in Fig. 5. There is, for example, shown a binding-in 49 on outer band 1, a cross-over 50, the threads interlacing with those of cross-strap 45, and then a binding-in 52 on band 2. A cross-strap 54 interlaces at 55 with cross-over threads 35 and is bound into band 1 at 56. A cross-over 56 therefrom interlaces at 57 with cross-strap 41 and forms a binding-in 58 on band 2. This diagrammatic showing indicates long binding-in areas of the cross-straps in both sets. However, the bindings-in may be short in accordance with previously known practice.

In the above description of Figs. 1 to 5 inclusive, the cross-straps were of the weftless type. However, it is possible to form such cross-straps with weft, even though the cross-over warps pass through the cross-strap warps. In Figs. 6 and 7 there is shown an arrangement of this character illustrating the outer band 2 with the cross-strap warps forming a binding-in 59 thereon and a cross-strap 60 extending therefrom to the upper outer band 1 (not shown). Through the woven cross-strap 60 extend a series of free cross-over warps 61 from the other set of cross-strap warp threads, they being bound in at 62 on outer band 2. In Fig. 7 these free warps have been shown as greatly exaggerated in length in order to clearly illustrate the con-

struction. In actual practice, such free warps are extremely short. After the completion of the weaving, they are snipped through in order to allow the ladder web to open up.

With the two rows of cross-straps consolidated, i. e. brought into line, they give the advantages in one row of the two separate and staggered rows of cross-straps as regards overlap. Furthermore, they allow of the outer bands being made to narrower widths, which for narrow and light laths is a desideratum.

The invention is, of course, applicable to wide webbing, and in such connection, the cross-straps may also be wide, and when weftless the central warps may be omitted and leave a space for the operating cord. In each case (narrow or wide webbing), the cross-straps may extend across or substantially across the full width of the webbing, or, in the case of a row with the central space 2 one half width may extend to one selvedge of the webbing and the other half width extend to the other selvedge of the webbing.

When the composite row of cross-straps is divided, the laths may be threaded between the two portions of each strap to prevent accidental displacement, say by wind. Although preferring that the cross-straps in each row shall completely overlies each other transversely, the cross-straps formed by one set of warps may only partly overlies the cross-straps formed by the other set of warps.

It should now be seen that the main feature of the invention is the merging of the two sets of cross-straps into one row, which is made possible by the short, free portions of one of the sets of warps passing through the cross-straps or of the other set of warps, said short, free portions being afterwards cut away.

By this invention the webbing can, if desired, be made to proportions in width which is not possible with the ordinary webbing with the cross-straps in two rows and staggered. By virtue of the cross-straps being further away from the selvages of the webbing when in one row and central to the outer bands, they will (especially when weftless) be less visible than they would be in the known ordinary webbing. Although the cross-straps will preferably be weftless or partly weftless, they may be composed wholly of warp and weft and the short free, cross-over warps pass through them (even though woven) and be afterwards cut away. Such strap weft, after forming or partly forming a cross-strap, may be bound to the band, or pass directly to the next cross-strap.

When the cross-straps are entirely weftless, two complete webbings may be produced simultaneously in a single loom slot, (using four tiers of shuttles), thus increasing production and also reducing the cost of production.

In place of warps, a series of lengths of cord, braid, narrow tape or the like may be used, in which case the short, cross-over parts will merely pass alongside and not through the cross-straps.

Although I have described my invention, setting forth several specific embodiments thereof, the invention is not limited to the details here shown and described. By the various modifications described herein it was intended to show the many forms which the present invention may take, it being essential for the present purposes that the free warps for one set of cross-straps pass through the cross-straps for the

other set. Therefore, my invention is to be broadly construed and to be limited only by the claims appended hereto.

What I claim is:

1. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the distance between adjacent cross-straps being less than the length of said cross-straps.
2. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, the distance between adjacent cross-straps being less than the length of said cross-straps.
3. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, said cross-over being snipped through, the distance between adjacent cross-straps being less than the length of said cross-straps.
4. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, each of said cross-straps being woven with weft at least in part, the distance between adjacent cross-straps being less than the length of said cross-straps.
5. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, the length of binding-in being at least equal to the distance between successive cross-straps, the distance between adjacent cross-straps being less than the length of said cross-straps.
6. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, each cross-strap being divided centrally to provide a space for an operating cord, the distance between adjacent cross-straps being less than the length of said cross-straps.
7. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, and each cross-strap being divided centrally to provide a space for an operating cord, the distance between adjacent cross-straps being less than the length of said cross-straps.
8. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, each cross-strap being divided centrally and the binding-in of one-half width of each strap being in advance of the binding-in of the other half width of such cross-strap, the distance between adjacent cross-straps being less than the length of said cross-straps.
9. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises two sets of cross-strap warp threads, each set forming successively a binding-in on one outer band, a cross-strap, a binding-in on the opposite outer band and a free warp cross-over, each set passing through the other at intervals, the two sets of cross-straps so formed being in alignment, each cross-strap being divided centrally and the binding-in of one-half width of each strap being in advance of the binding-in of the other half width of such cross-strap to an extent equal to the thickness of a lath, the distance between adjacent cross-straps being less than the length of said cross-straps.
10. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads forming two alternating sets of cross-straps, both of said sets of cross-straps being in substantial alignment, the distance between adjacent cross-straps being less than the length of said cross-straps.
11. In ladder web including two outer bands and a series of cross-straps therebetween at spaced intervals, the improvement which comprises at least two sets of cross-strap warp threads forming two alternating sets of cross-straps, both of said sets of cross-straps overlapping at least in part, the distance between adjacent cross-straps being less than the length of said cross-straps.

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