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LIGHTWEIGHT DRYER FELT SEAMS

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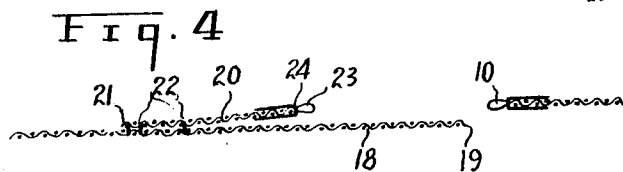
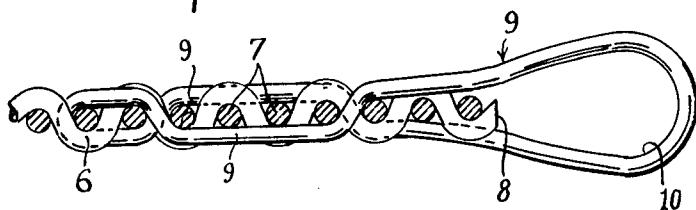
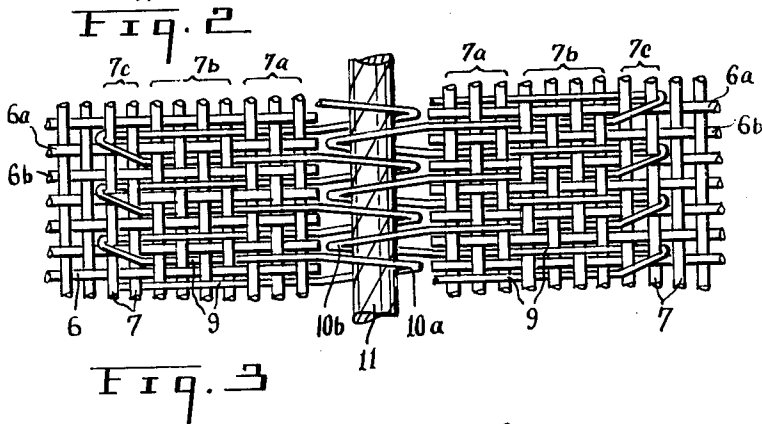
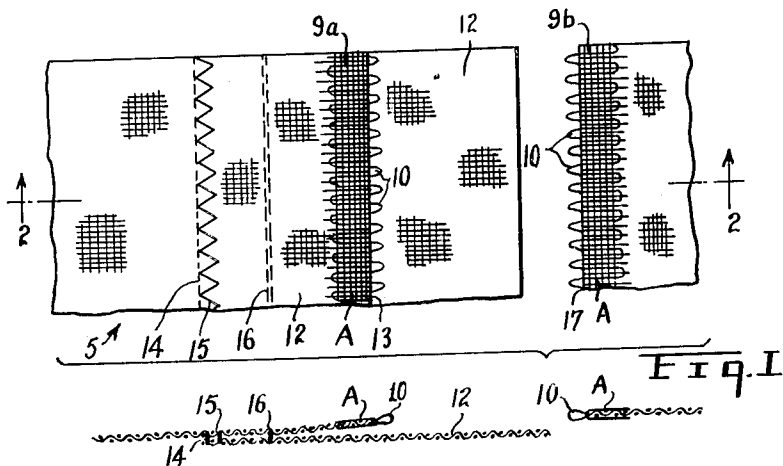


Fig. 5

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LIGHTWEIGHT DRYER FELT SEAMS

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10 Claims. (Cl. 198—193)

This invention relates to dryer felts for paper machines and particularly to a method of joining the ends of a lightweight open weave fabric by weaving the joining structure into the ends of the fabric.

In the conventional paper machine the web of paper is dried by passing around a series of steam heated dryer drums. A "dryer felt" is used in conjunction with these drums to ensure intimate contact. The conventional felt is a dense impermeable fabric about 1/8" thick, and is joined on the paper machine by means of some form of seam to make it endless. Early joints were made by sewing or rivetting in situ. Latterly the common method has been a "clipper seam" consisting of a series of steel hooked loops which are clenched into the fabric. The opposing loops at the joint are brought together and the seam completed by the insertion of a pin. Because of the likelihood of sheet marking, the clipper seam is normally covered with a flap.

Recently a new concept in dryer fabrics has been introduced involving the use of an open-weave, relatively thin fabric which will permit evaporating water vapour to escape more readily.

Because of the thinner construction of the fabric the conventional clipper can only be used by some such adaptation as applying the clips to a thick tape and sewing this to the ends of the fabric. Alternatively several layers may be folded over to provide the necessary bulk to accommodate the clips.

These methods are unsatisfactory due to a tendency to mark the sheet, and also, when exposed to heat, the bulkier seam area tends to react differently from the body of the fabric, leading to wrinkling problems. Also, even minor misalignment of the clippers results in highly localized stress points which are conducive to wrinkling.

The present invention provides a novel method of joining these lightweight fabrics and overcoming the above objections.

The object of the invention is to provide a joint structure for lightweight dryer felt fabric which will not materially increase the joint thickness over that of the fabric.

A further object of the invention is to provide a joint structure for lightweight dryer felt fabrics in which the joint structure is woven into the ends of the fabric.

A further object of the invention is to provide a joint structure and protective flap for a lightweight dryer felt.

A further object of the invention is to provide a joint structure for lightweight dryer felts in which the joining structure is formed from a woven strand similar in nature to that of the strands forming the weave of the fabric.

These and other objects will be apparent from the following detailed specification and the accompanying drawings, in which:

FIG. 1 is an underneath plan view of the two ends of the lightweight dryer felt fabric according to the present invention, before being joined together.

FIG. 2 is a longitudinal cross section on the line 2—2 of FIG. 1.

FIG. 3 is a plan view to a larger scale of the two ends of the fabric joined together.

FIG. 4 is a still further enlarged longitudinal section of one end of the fabric showing the joining strand looped and interwoven into the fabric.

FIG. 5 is a view similar to FIG. 2 but showing the flap as an extension of the main body of the fabric.

Referring to the drawings, the dryer felt fabric 5 is formed of a thin open weave in contrast to the thick dense felt normally used in the manufacture of dryer felts. The thin open weave fabric consists of warp strands 6 and weft strands 7. The opposing ends 8 of the warp strands 6 are cut to provide a uniformly straight line transversely of the fabric, as seen in FIGS. 3 and 4.

A monofilament 9 is woven in a longitudinal direction into each of the opposing ends of the fabric, starting at one edge of the fabric and progressing transversely towards the opposite edge of the fabric. The monofilament 9 is preferably woven in the longitudinal direction by weaving over and under groups of weft strands 7 and between a pair of warp strands 6 to a count of approximately eight weft strands, the monofilament is then crossed over an adjacent warp strand and is then woven back over groups of weft strands to the end of the fabric where an extended open loop 10 is formed before proceeding to weave the monofilament in a similar manner over and under groups of weft strands, until the interweave of the monofilament with the fabric is complete transversely across the full width of the fabric. By this means a whole series of extended loops 10 are formed at the opposing ends of the fabric with each loop being aligned in a longitudinal direction with one warp strand 6.

One particular detail of interweave of the monofilament 9 is shown in FIGS. 3 and 4. In this interweave the monofilament 9 is directed between a pair of warp strands 6 under the first three weft strands 7a, over the next four weft strands 7b and under the next two weft strands 7c; the monofilament is then crossed over an adjacent warp strand 6a and over the two weft strands 7c, under the four weft strands 7b and over the three weft strands 7a. The extended loop 10 is then formed and the monofilament is then directed between next adjacent warp strand 6b and the interweaving is continued across the whole width of the fabric.

The interweaving of the monofilament 9 in the opposing ends of the fabric is such that the extended loops 10a and 10b are interleaved with each other as shown in FIG. 3.

A pin or cable 11 of wire or plastic is threaded through the extended loops 10a and 10b and is secured in place at each end in any suitable manner to prevent it from being withdrawn from the loops. By this means the two opposing ends of the fabric are securely joined together.

The loops 10 stand in a substantially vertical plane relative to the plane of the fabric 5 and so can be readily interleaved with each other and the insertion of the pin 11 through the loops can be accomplished with ease.

It will be appreciated that the monofilament 9 could be interwoven with the warp and weft strands in a weave other than that described above, for instance the interweave may extend longitudinally of the fabric for less than or more than eight weft strands and may be woven over and under the weft strands in groups other than as shown at 7a, 7b and 7c.

It is normal practice to cover the joint in a dryer felt with a flap. In FIGS. 1 and 2 there is shown a flap arrangement which is particularly suitable for covering the type of joint above described. In this arrangement a strip 12 of the same material as the fabric is secured, along its edge 14, to the upper face of the fabric by the stitching 15 and 16 at a distance back from the end 13 of the fabric. The opposing end 17 of the fabric has the monofilament 9b interwoven along its edge in the same manner as shown in FIG. 3. When the two ends 13 and 18 are brought together and joined by passing a pin 11 through the loops 10 the strip 12 will act as a flap over the joint

and so protect the paper carried on the fabric as it passes through the dryers.

In FIG. 5 a modified flap arrangement is shown. In this arrangement the flap 18 is formed as an extension of one end of the main body of the woven fabric without a monofilament being interwoven along its transverse edge 19. A separate strip of material 20 similar to that of the main body of the woven fabric is secured along its transverse edge 21 to the flap 18 at a distance inwardly of the transverse edge 19, by the stitching 22, and a monofilament 23 is interwoven along the transverse edge 24 in the manner above described. The looped monofilaments 10 and 23 are joined together in the manner shown in FIG. 3 and the area of the joint is protected by the flap 18.

The area of the fabric A incorporating the interwoven monofilament can be coated with a suitable plastic. This plastic coating will fill the interstices between the monofilament and the warp and weft strands and so reduce wear which might tend to cut the monofilament.

With a joint formed as above described the monofilament 9 as it is interwoven with the warp and weft strands is kept within the top and bottom surface planes of the fabric as defined by the knuckles of the warp strands 6 and therefore presents no thickening of the joint as is the case where clips and other such devices have been used.

The joint by reason of the interweaving of the monofilament with the warp and weft strands is highly resistant to longitudinal pull and greatly reinforces the weave of the fabric without materially blocking the otherwise open weave which is an important factor in lightweight dryer felts.

What we claim is:

1. A lightweight endless belt formed from a length of fabric having an open weave of warp and weft strands, the said length of fabric having its ends joined together to form the endless belt, the said joint comprising a pair of monofilaments interwoven with a series of weft strands one at each end of the fabric, the interweave of the monofilaments extending transversely across the full width of the fabric and forming a series of loops extending beyond the ends of the fabric, the said loops at one end of the fabric adapted to interleave with the loops at the other end of the fabric when the ends of the fabric are brought together, and a pin projecting through the interleaved loops holds the ends of the fabric in an endless belt.

2. A lightweight endless belt as set forth in claim 1 in which the said monofilaments are interwoven with the weft strands between one pair of warp strands in a direction away from the end of the fabric, each monofilament is then crossed over an adjacent warp strand and interwoven with the weft strands in the direction of the end of the fabric, the reversing interweave with the weft strands being continued between each of the warp strands across the full width of the fabric.

3. A lightweight endless belt as set forth in claim 1 in which the interweave of each monofilament with the fabric is sealed with a plastic compound.

4. A lightweight endless belt as set forth in claim 1 in which the said monofilaments in their interweave with the weft strands of the fabric lies within the top and bot-

tom surface planes of the fabric as defined by the tops of the knuckles of the warp strands.

5. A lightweight endless belt as set forth in claim 1 in which the joint formed by the looped monofilaments is protected by a flap formed by a strip of fabric secured transversely to one end of the belt fabric at a spaced distance from the said end of the belt fabric and extends a distance beyond the joined ends of the belt.

6. A lightweight endless belt as set forth in claim 1 in which one monofilament is interwoven with one end of the fabric and a second monofilament is interwoven to a strip of fabric, the said strip being secured transversely to the fabric adjacent the end thereof opposite from said first mentioned interwoven monofilament.

7. A lightweight endless belt as set forth in claim 6 in which the said strip of fabric is spaced longitudinally from the end of the fabric to which it is attached, the portion of the fabric extending beyond the strip forming a flap over the joint formed by the interleaved loops of the monofilaments.

8. A lightweight endless belt as set forth in claim 6 in which the said strip of fabric is spaced longitudinally from the end of the fabric to which it is attached, the said strip having its monofilament loops projecting in the direction of the end of the fabric and being stitched to the fabric along its transverse edge remote from the end of the fabric.

9. A lightweight endless belt formed from a length of fabric having an open weave of warp and weft strands, the said length of fabric having its end joined to form the endless belt, the said joint comprising a pair of monofilaments interwoven with a series of weft strands at each end of the fabric, the said monofilaments being directed in a longitudinal direction between a first pair of warp strands adjacent one longitudinal edge of the fabric and over and under the desired number of weft strands, each monofilament then crossing over one of the said warp strands and being directed in a reverse longitudinal direction over and under the weft strands and forming a loop extending beyond the end of the fabric, the said interweaving of the monofilament being repeated across the entire width of the fabric, the said loops at one end of the fabric adapted to interleave with the loops at the other end of the fabric when the ends of the fabric are brought together, and a pin projecting through the interleaved loops holds the ends of the fabric in an endless belt.

10. A lightweight endless belt as set forth in claim 9 in which the monofilaments are first passed under three weft strands over four weft strands and under two weft strands and directed in a reverse direction over one warp strand and over the above mentioned two weft strands, under four weft strands and over three weft strands and extended to form a loop beyond the end of the fabric before repeating the pattern of interweaving with the weft strands.

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