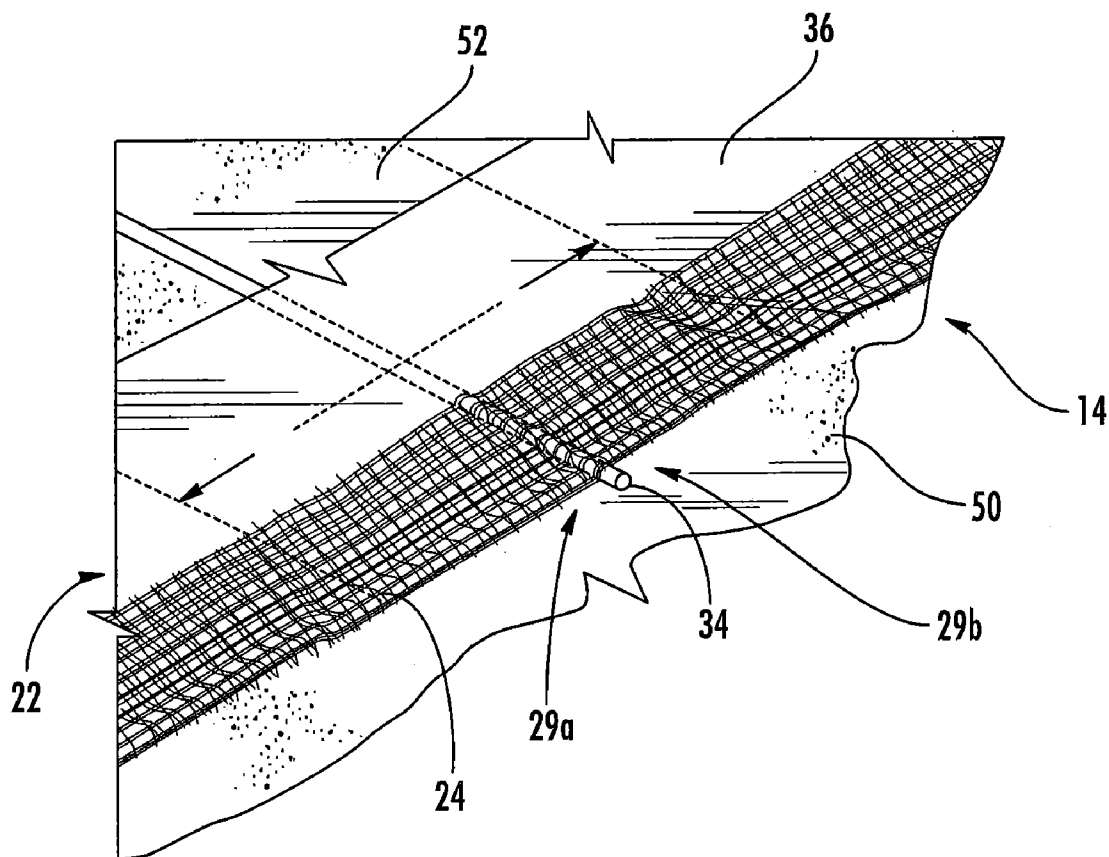




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**Goglick et al.**(10) **Pub. No.: US 2015/0308045 A1**(43) **Pub. Date: Oct. 29, 2015**(54) **SEAMED PAPERMAKER'S PRESS FELT  
WITH REINFORCED BATT LAYER****Publication Classification**(71) Applicant: **Huyck Licensco, Inc.**, Youngsville, NC  
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(US)(52) **U.S. Cl.**  
CPC ..... **D21F 7/08** (2013.01)(21) Appl. No.: **14/660,372**(22) Filed: **Mar. 17, 2015****Related U.S. Application Data**(60) Provisional application No. 61/984,596, filed on Apr.  
25, 2014.(57) **ABSTRACT**

A papermaker's felt includes: a base fabric having a seam; and at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam. The batt layer comprises multiple batt sublayers and at least one scrim layer, the scrim layer comprising a polyamide elastomer or a polyolefin elastomer.



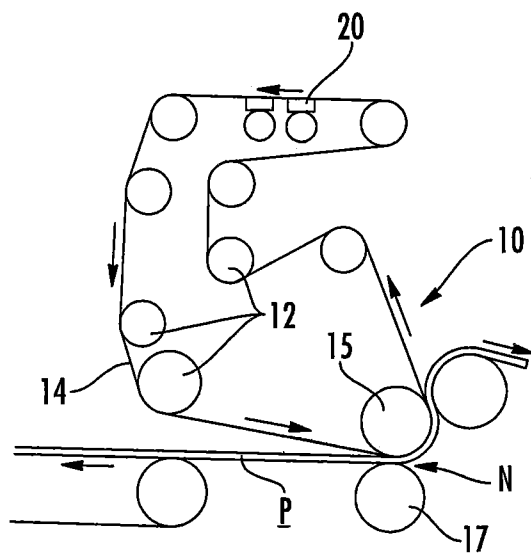


FIG. 1

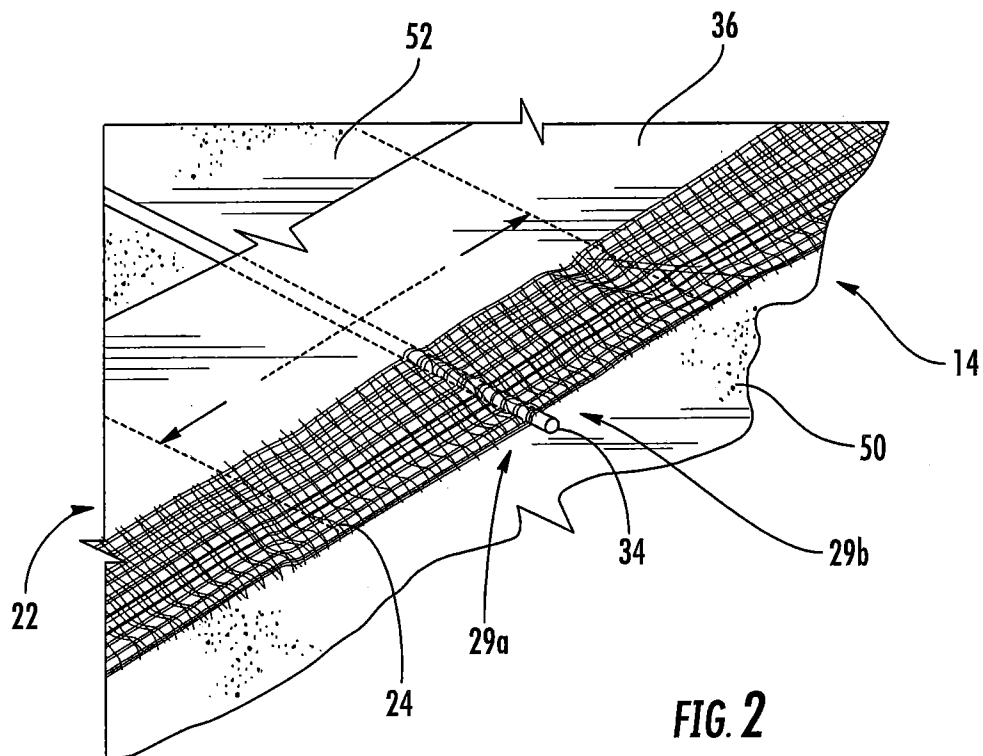


FIG. 2

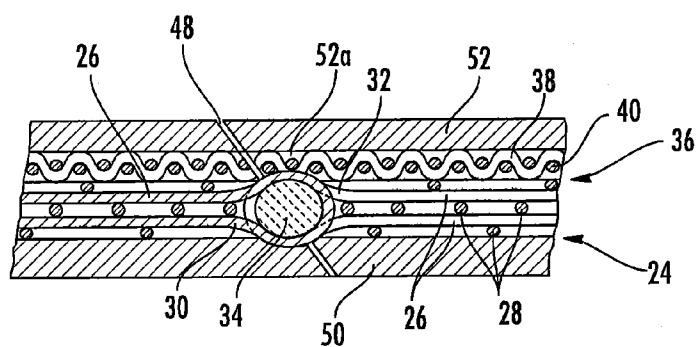


FIG. 3

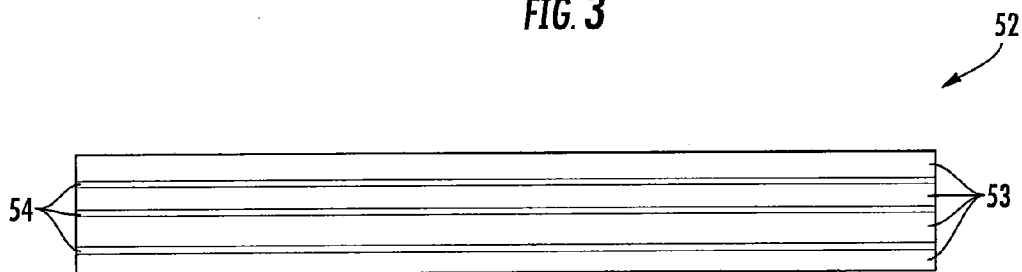
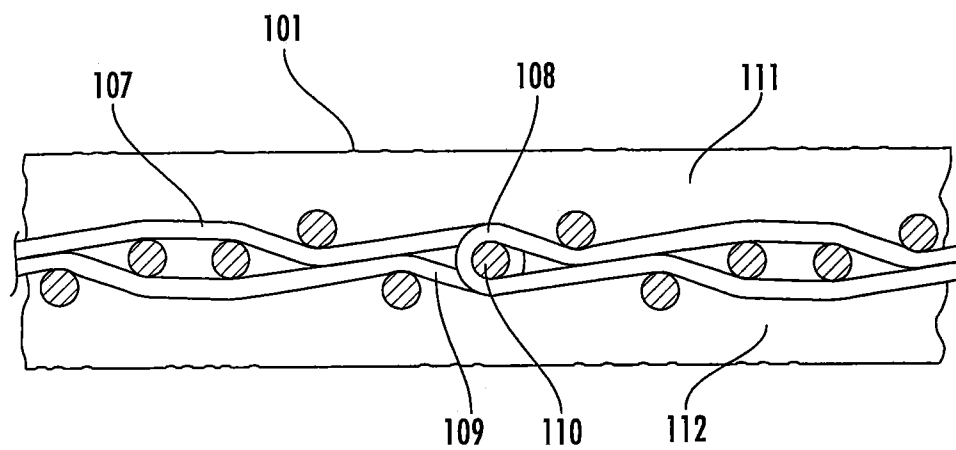
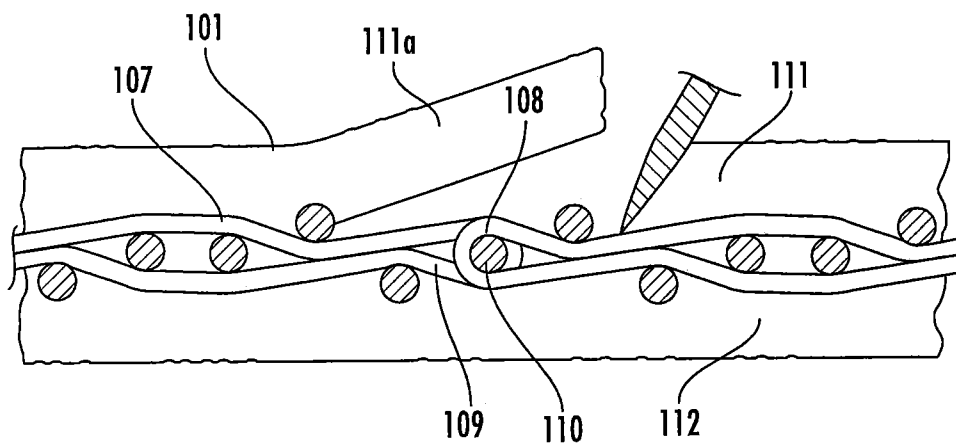


FIG. 4



**FIG. 5**



**FIG. 6**

## SEAMED PAPERMAKER'S PRESS FELT WITH REINFORCED BATT LAYER

### RELATED APPLICATION

**[0001]** The present application claims the benefit of and priority from U.S. Provisional Patent Application Ser. No. 61/984,596, filed Apr. 25, 2014, the disclosure of which is hereby incorporated herein in its entirety.

### FIELD OF THE INVENTION

**[0002]** The present invention relates generally to papermaking, and more particularly to fabrics used in papermaking.

### BACKGROUND OF THE INVENTION

**[0003]** In the conventional fourdrinier papermaking process, a water slurry, or suspension, of cellulosic fibers (known as the paper “stock”) is fed onto the top of the upper run of an endless belt of woven wire and/or synthetic material that travels between two or more rollers. The belt, often referred to as a “forming fabric,” provides a papermaking surface on the upper surface of its upper run which operates as a filter to separate the cellulosic fibers of the paper stock from the aqueous medium, thereby forming a wet paper web. The aqueous medium drains through mesh openings of the forming fabric, known as drainage holes, by gravity alone or with assistance from one or more suction boxes located on the lower surface (i.e., the “machine side”) of the upper run of the fabric.

**[0004]** After leaving the forming section, the paper web is transferred to a press section of the paper machine, in which it is passed through the nips of one or more pairs of pressure rollers covered with another fabric, typically referred to as a “press felt.” Pressure from the rollers removes additional moisture from the web; the moisture removal is often enhanced by the presence of a “batt” layer on the press felt. The paper is then conveyed to a dryer section for further moisture removal. After drying, the paper is ready for secondary processing and packaging.

**[0005]** Press felts typically include one or more base fabric layers; these can be “flat-woven” and formed after weaving into an endless belt, or can be woven in endless form. Also, in many instances loops are woven into the machine direction yarns of the fabric.

**[0006]** Weaving a fabric of a base layer requires that provision be made for joining it into endless belts. Such joints should be constructed in such a manner that they are sufficiently strong to withstand the extreme load, temperature, and wear conditions the press felt experiences, yet do not cause the surface of the press felt above the seam to unduly mark the paper. One popular method of joining the base fabric of a press felt is to form loops with machine direction yarns on each end of the base fabric. To form the base fabric into an endless belt, the ends of the fabric are placed adjacent to each other, with each of the loops on one end positioned between two loops on the other end in interdigitating fashion. A “pin” (usually formed of multifilament or monofilament polymeric fiber strands) is then inserted into all of the loops to join the ends. After the batt layer(s) are needed or otherwise attached to the base layer, the batt layer(s) are cut at the seam location, the pin is removed, and the finished press felt is shipped to a paper mill. Once at the paper mill, the press felt can be installed by placing it onto a paper machine, then inserting

another (usually more flexible) multifilament or monofilament pin into the loops. Examples of this type of seam are described in U.S. Pat. Nos. 4,764,417 and 4,737,241 to Gulya and U.S. Pat. No. 4,601,785 to Lilja et al., the disclosures of which are hereby incorporated herein by reference in their entireties.

**[0007]** In some press felts, the base fabric layer itself contains multiple fabric layers (i.e., is a “laminated” base layer). For example, a felt may contain a “duplex” fabric (i.e., a fabric having upper and lower sets of machine direction yarns interwoven with at least one set of cross machine direction yarns—also known as a “double layer” fabric) as well as a finer mesh single layer fabric (i.e., a fabric having only one set each of machine direction yarns and cross machine direction yarns). This combination provides a good balance of strength and durability to the felt with relatively little marking. Typically, the felt is constructed by flat weaving the duplex fabric, endless weaving the single layer fabric, joining the duplex fabric with a pin as described above, overlaying the single layer fabric over the duplex fabric, needling both fabric layers with batt to form machine side and paper side batt layers, removing the pin from the double layer fabric and cutting the batt layers and the single layer fabric at the seam to form a flat structure. Once at the paper mill, the felt is installed on the papermaking machine by inserting a new, more flexible pin into the duplex fabric layer.

**[0008]** This press felt construction has at least one significant shortcoming. When the single layer fabric is cut, its yarns, particularly its cross machine direction yarns, tend to fray somewhat at the cut. Thus, when the felt is installed and operated on the paper machine, the frayed ends of the finer mesh single layer fabric can interfere with the manner in which the cut portion of the batt layer (which is often a flap of batt layer material) overlays the base fabric. As such, paper formed with such a felt can have an inconsistent appearance and be more susceptible to breaking on the paper machine due to the presence of the seam of the felt.

### SUMMARY OF THE INVENTION

**[0009]** As a first aspect, embodiments of the invention are directed to a papermaker's felt, comprising: a base fabric having a seam; and at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam. The batt layer comprises multiple batt sublayers and at least one scrim layer, the scrim layer comprising a polyamide elastomer or a polyolefin elastomer.

**[0010]** As a second aspect, embodiments of the invention are directed to a papermaker's felt, comprising: a base fabric having a seam; and at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam. The batt layer comprises at least three batt sublayers and at least two scrim layers.

**[0011]** As a third aspect, embodiments of the invention are directed to a papermaker's felt, comprising: a base fabric having a seam; and at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam. The batt layer comprises multiple batt sublayers and at least one scrim layer, the scrim layer comprising a polyether block amide polymer selected from the group consisting of PTMG and PTG.

### BRIEF DESCRIPTION OF THE FIGURES

**[0012]** FIG. 1 is a schematic illustration of the press section of a paper machine employing a press felt of the present invention.

[0013] FIG. 2 is an enlarged partial cutaway perspective view of the press felt of FIG. 1.

[0014] FIG. 3 is a greatly enlarged side section view of the press felt of FIG. 1.

[0015] FIG. 4 is a greatly enlarged side section view of one of the batt layers of the press felt of FIG. 1.

[0016] FIG. 5 is a greatly enlarged side section view of another press felt of the present invention.

[0017] FIG. 6 is a greatly enlarged side section view of the press felt of FIG. 5 showing the formation of a flap at the seam area.

#### DETAILED DESCRIPTION OF EMBODIMENTS OF THE PRESENT INVENTION

[0018] The present invention will now be described more fully hereinafter, in which embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity.

[0019] As used herein, the terms “machine direction” (MD) and “cross machine direction” (CMD) refer, respectively, to a direction aligned with the direction of travel of the papermakers’ fabric on a papermaking machine, and a direction parallel to the fabric surface and transverse to the direction of travel. Also, both the flat weaving and endless weaving methods described hereinabove are well known in the art, and the term “endless belt” as used herein refers to belts made by either method.

[0020] Referring now to the drawings, a papermaking machine press section, designated broadly at 10, is illustrated in FIG. 1. The press section 10 includes a press felt 14 that is installed upon and conveyed by a set of rollers 12. In its travel, the felt 14 travels over a press roll 15. An opposed press roll 17 is positioned to, in conjunction with the felt 14 and press roll 15, form a nip N between the press rolls 15.

[0021] In operation, a paper web P is conveyed from a forming section 16 through the nip N formed by the press rollers 15, 17, wherein pressure is applied to the paper web P by the press rolls 15, 17. The pressure forces moisture from the paper web P that is absorbed by the felt 14. As the felt 14 is conveyed around its roller set 12, moisture is removed therefrom, and the felt 14 is conditioned by one or more suction boxes 20.

[0022] FIGS. 2 and 3 illustrate an enlarged section of the felt 14. As can be seen in FIG. 2, the felt 14 includes a laminated base fabric layer 22 which comprises two separate fabrics: namely, a lower fabric layer comprising a duplex fabric 24 and an upper fabric layer comprising a single layer fabric 36. The duplex fabric 24 includes two sets of machine direction yarns 26 and one set of cross machine direction yarns 28 interwoven with the machine direction yarns 26. The duplex fabric 24 has two free ends 29a, 29b, one of which (29a) includes loops 30 (formed by machine direction yarns 26), and the other of which (29b) includes loops 32 formed by machine direction yarns 26. When the duplex fabric 24 is in an endless condition such as that illustrated in FIGS. 2 and 3, the loops 30, 32 are positioned in interdigitated fashion, and a pin 34 is inserted through the loops 30, 32 to join the ends 29a, 29b of the duplex fabric 24 (see FIGS. 4A and 4B).

[0023] Those skilled in this art will recognize that other types of fabrics can be employed as the lower fabric layer of the base fabric layer 22 in the manner of the duplex fabric 24, including single layer fabrics, other duplex fabrics, and triplex fabrics (i.e., those having two sets of machine direction yarns and two sets of cross machine direction yarns). Virtually any weave pattern known to those skilled in this art, such as the illustrated plain weave, twills, satins, and the like, can be used for this fabric layer. The lower fabric layer will typically, but not always, have a mesh that is somewhat more coarse than that of the upper fabric layer. The lower fabric layer should have the aforementioned loops 30, 32 at its ends 29a, 29b to enable it to be joined into an endless belt with the pin. The construction of the loops 30, 32 and pin 34 are known to those skilled in this art and need not be described in detail herein; exemplary loop and pin constructions are described in U.S. Pat. Nos. 4,737,241 and 4,764,417 to Gulya.

[0024] Still referring to FIGS. 2 and 3, the single layer fabric 36 comprises machine direction yarns 38 interwoven with cross machine direction yarns 40 in a plain weave pattern. Those skilled in this art will recognize that other types of fabrics can be employed as the upper fabric layer of the base fabric layer 22 in the manner of the single layer fabric 36, including other single layer fabrics, duplex fabrics, and triplex fabrics. Virtually any weave pattern known to those skilled in this art, such as the illustrated plain weave, twills, satins, and the like, can be used for this fabric layer. The mesh of the upper fabric layer typically will be somewhat finer than that of the lower fabric layer. Typically, the single layer fabric 36 is woven in an endless weaving.

[0025] The form of the yarns employed in the lower and upper fabric layers of the base fabric layer 24 can vary, depending upon the desired properties of the final press felt. For example, the yarns may be multifilament yarns, monofilament yarns, twisted or cabled multifilament or monofilament yarns, spun yarns, or any combination thereof. Also, the materials from which the yarns employed in the fabric layers are formed may be those commonly used in press felts, such as nylon, cotton, wool, polypropylene, polyester, aramid, polyamide, or the like, and blends and combinations thereof. In addition, either or both of the fabric layers may be a non-woven fabric.

[0026] The felt 14 also includes two batt layers: a machine side batt layer 50 and a paper side batt layer 52. Typically, these batt layers 50, 52 are attached to the base fabric layer 22 through a needling process, although other attachment techniques, such as heat bonding and adhesives, can also be used with the present invention. The machine side and paper side batt layers 50, 52 should be formed of material, such as a synthetic fiber like acrylic, aramid, polyester, or nylon, or a natural fiber such as wool, that assists in wicking water away from the paper sheet. Typical materials for the batt layers 50, 52 include polyamide, polyester and blends thereof. The weight and thickness of the batt layers 50, 52 can vary, although it is typical that the ratio of batt weight to fabric weight is about between about 0.5 and 2.0, with 1.0 being particularly suitable.

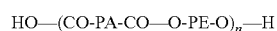
[0027] Notably, the felt 14 includes a seam cut 48. The seam cut 48 extends through the paper side batt layer 52, the single layer fabric 36, and the machine side batt layer 50. Illustratively and preferably, the seam cut 48 is made at an angle of between about 30 and 90 degrees to the plane of the base fabric layer 22, and a flap 52a is formed by loosening the portion of the paper side batt layer 52 adjacent the seam cut

**48.** This process is described in detail in the aforementioned U.S. Patents to Gulya and Lilja. Of course, no cut is necessary for the duplex fabric **24**, as the pin **34** can simply be removed to enable the ends **29a**, **29b** of the duplex fabric **24** to be separated.

**[0028]** The batt layers **50**, **52** are typically laid over the base fabric layer **22** in a stratified fashion, with multiple sublayers of batt being overlaid on the base fabric layer **22**. In some instances, the batt sublayers are separated by a scrim layer. This arrangement can be seen schematically in FIG. **4**, which illustrates the batt layer **52** with four batt sublayers **53** alternately layered with three scrim layers **54**. The scrim layers **54** are included to help to hold the individual fibers of the batt layers **50**, **52** in place after the flap **52a** has been formed. Ordinarily, after the batt layers **50**, **52** have been applied to the base fabric layer **22**, a subsequent heat treatment of the felt **14** melts some or all of the scrim layers **54**, which provides additional bonding points for the fibers of the batt layers **50**, **52** near the flap **52a**.

**[0029]** The additional bonding can help to retain the fibers of the batt layers **50**, **52** in place as water flows through the seam area of the press felt **14**. Hydraulic pressure can accelerate the removal of batt fibers from the flap **52a**. As the flap **52a** becomes more open, the flow of water onto the paper sheet carried by the press felt **14** increases. Eventually, the increased flow produces visible marking on or even breakage of the paper sheet, at which point the press felt **14** must be replaced.

**[0030]** In some embodiments, the scrim layers **54** are formed of a polyether block amide polymer (PEBA). PEBA is an elastomeric block copolymer formed by polycondensation of a polyamide (such as nylon 6, nylon 11 or nylon 12) with an alcohol-terminated polyether, such as polytetramethylene glycol (PTMG) or polyethylene glycol (PEG). The general chemical structure of a PEBA is:



wherein PA represents a polyamide and PE represents a polyether. Exemplary PEBA materials include PEBAX® compounds 2533, 3533 and 5533, available from Arkema, Inc. (King of Prussia, Pa). Exemplary materials may have a melting point of between about 115 and 165° C., a Shore D hardness of between about 20 and 60 D, and a density of between about 1.00 and 1.10 g/cm<sup>3</sup>.

**[0031]** PEBA is elastomeric and enjoys a higher tensile strength than the polyamide compounds used previously in scrim layers. As such, and not wishing to be confined to a single theory of operation, the inventors theorize that the elastomeric nature and the higher tensile strength of the PEBA provide greater anchoring of the batt fibers in the batt layers **50**, **52**, and particularly in the flap **52a**. As such, the fibers should remain in the flap **52a** longer, thereby increasing the life of the press felt **14**. Other exemplary polymers include other thermoplastic polyamide elastomers (e.g., PAE, TPA, TPE-A and COPA) and polyolefin elastomers produced via metallocene polymerization. Polyamide elastomers are block copolymers, based on nylon and polyethers or polyesters, that comprise alternating hard and soft segments joined by amide linkages.

**[0032]** Another example of a press felt according to embodiments of the invention is shown in FIGS. **5** and **6** and is designated at **101**. FIGS. **5** and **6** are sections through the felt **101**, which comprises a woven base **107**. The felt **101** is given an endless form by providing its ends with loops **108**

and **109** which in a manner known per se are arranged in intermeshing relationship and locked in this position by means of insertion through the loops **108**, **109** of a pintle wire or connector **110**. On top of the base **107** is then attached in a needling operation an upper batt layer **111** and a bottom batt layer **112**. Behind the seam loops **108**, **109**, as seen in the intended direction of travel of the felt **101** in the machine, the upper batt layer **101** is cut through in the manner indicated in FIG. **3** and a piece **111a** thereof is loosened in the area, across the seam and somewhat beyond the seam itself. It should be understood that in felts comprising also a bottom batt layer **112** a corresponding operation must be made with regard to the bottom batt. It is then possible to pull out the pintle wire **110** and the felt is then in a flat form.

**[0033]** The batt layers **111**, **112** can be formed in the manner discussed above: namely, with batt sublayers alternating with scrim layers. Again, the presence of one or more scrim layers comprising PEBA can provide additional fiber retention, particularly in the area of the flap **111a**, which can increase the life of the felt **101**.

**[0034]** The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. The invention is defined by the following claims, with equivalents of the claims to be included therein. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures.

That which is claimed is:

1. A papermaker's felt, comprising:  
a base fabric having a seam;  
at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam;  
wherein the batt layer comprises multiple batt sublayers and at least one scrim layer, the scrim layer comprising a polyamide elastomer or a polyolefin elastomer.
2. The papermaker's felt defined in claim 1, wherein the scrim layer comprises a polyether block amide copolymer.
3. The papermaker's felt defined in claim 1, wherein the at least one scrim layer is one scrim layer and the multiple batt sublayers comprise two batt sublayers.
4. The papermaker's felt defined in claim 1, wherein the at least one scrim layer comprises at least two scrim layers and the multiple batt sublayers comprises at least three batt sublayers.
5. The papermaker's felt defined in claim 1, wherein the base fabric is a woven fabric.
6. The papermaker's felt defined in claim 2, wherein the polyether block amide copolymer is a material having a melting point of between about 115 and 165° C., a Shore D hardness of between about 20 and 60 D, and a density of between about 1.00 and 1.10 g/cm<sup>3</sup>.
7. A papermaker's felt, comprising:  
a base fabric having a seam;  
at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam;  
wherein the batt layer comprises at least three batt sublayers and at least two scrim layers.

8. The papermaker's felt defined in claim 7, wherein the scrim layers comprise a polyether block amide copolymer.

9. The papermaker's felt defined in claim 1, wherein the base fabric is a woven fabric.

10. A papermaker's felt, comprising:

a base fabric having a seam;

at least one batt layer overlying the base fabric, wherein the batt layer includes a flap that overlies the seam;

wherein the batt layer comprises multiple batt sublayers and at least one scrim layer, the scrim layer comprising a polyether block amide polymer.

11. The papermaker's felt defined in claim 10, wherein the at least one scrim layer is one scrim layer and the multiple batt sublayers comprise two batt sublayers.

12. The papermaker's felt defined in claim 10, wherein the at least one scrim layer comprises at least two scrim layers and the multiple batt sublayers comprises at least three batt sublayers.

13. The papermaker's felt defined in claim 10, wherein the base fabric is a woven fabric.

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