Sept. 12, 1939. W. A. BARRELL 2,172,430

SINGLE PLY DRIER FELT WITH ASBESTOS FACING

Filed Oct. 14, 1937

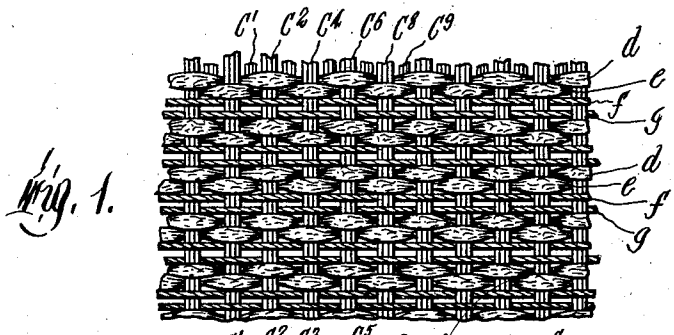


Fig. 1.

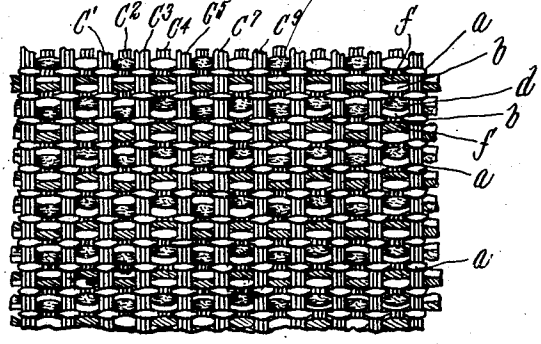


Fig. 2.

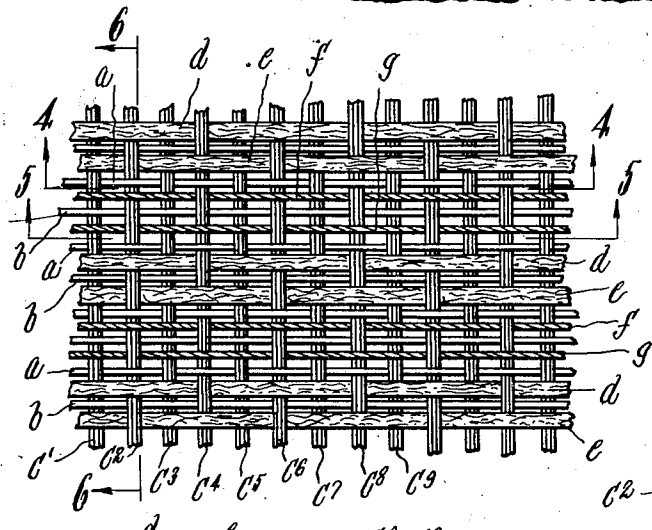


Fig. 3.

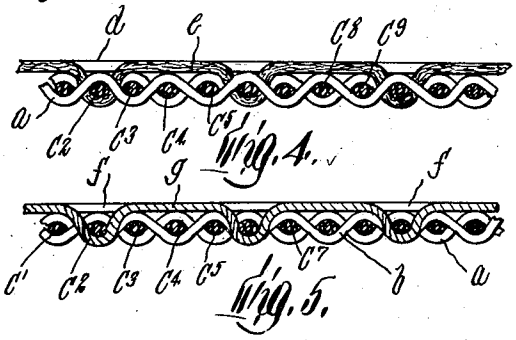


Fig. 4.

Fig. 5.



Fig. 6.

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UNITED STATES PATENT OFFICE

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SINGLE PLY DRIER FELT WITH ASBESTOS FACING

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Application October 14, 1937, Serial No. 168,856

8 Claims. (Cl. 139—383)

The invention herein described relates to drier felts for paper machines and is designed to provide a single ply felt of which the face which makes contact with the paper being dried, when in use, is largely, if not wholly, protected by asbestos fiber; which contains a minimum of asbestos in its construction; which is sufficiently porous to permit ready escape of water vapor from the paper; which will not glaze over on the surface after long continued use; and which stretches less and preserves more nearly its original width than asbestos faced felts of single ply construction heretofore made. Its purposes are in the main the same as those of the drier felt disclosed in my pending application Serial No. 153,309, filed July 13, 1937 (Letters Patent No. 2,168,928 granted August 8, 1939). It embodies a different solution of the same problem, while as compared with the felt of said prior application its objects are to reduce the ratio of asbestos strands to strands made of other materials, and to produce a stronger and more rugged felt which, under like conditions of use, will elongate less and diminish in width less than the felt there described.

The principles and particulars of the invention are described in the following specification in connection with the drawing, in which,—

Fig. 1 is a face view of a fragment of a drier felt embodying this invention;

Fig. 2 is a rear or bottom plan view of the same felt;

Fig. 3 is a diagrammatic face plan view of the felt showing the constituent strands separated and spaced apart for clearness of illustration;

Figs. 4 and 5 are longitudinal sectional views, and Fig. 6 a cross sectional view of the felt shown in Figs. 1 and 2 but on a scale twice as large as the latter figures. The planes on which such sections are cut correspond in relative locations to the lines 4—4, 5—5 and 6—6 respectively of Fig. 3.

Like reference characters designate the same parts wherever they occur in all the figures.

In its preferred construction, the felt of this invention is constructed mainly of cotton and contains a relatively small proportional content of asbestos. It is made of body warp, and weft or filling, strands interwoven as a plain weave, and float warp strands, part of which are asbestos and the rest of cotton overlying the face of the body structure and interlocked at intervals with certain of the filling strands.

The body warp strands are designated *a* and *b*, and the strands or picks of filling are designated *c* and distinguished from one another where necessary by exponents. Each warp strand designated *a* passes under a pick *c'* of the filling, over the next adjacent or successive pick c^2, under the next successive pick c^3, over the next pick c^4; and so on in regular order throughout the length of the felt. The warp strands designated *b* all pass over the pick *c'*, under the pick c^2, over c^3, under c^4; and so on throughout the length of the felt. The strands *a* and *b* alternate with one another throughout the width of the felt. This construction is what is referred to as a plain weave in this specification. The float warp strands comprise an asbestos strand *d*, which passes over a group of three successive picks *c'*, c^2 and c^3 of the filling, under the next pick c^4, over the next three picks c^5, c^6, c^7, under the next pick c^8; and so on throughout the length of the felt. The float warp strands further comprise an asbestos strand *e* which passes under the pick c^2 of the filling, over the group of successive picks c^3, c^4, c^5, under the pick c^6, over the next three picks c^7, c^8 and c^9; and so on throughout the length of the felt. The float warp strands further comprise a cotton strand *f* which passes over the same groups of successive picks of filling and under the same isolated picks as the strand *d*. The float warp strands further comprise a cotton strand *g* which passes over the same groups of successive picks of the filling and under the same isolated picks as the strand *e*. The pattern of such float warp strands is repeated in succession throughout the width of the felt. The float warp strands alternate with the body warp strands thus:—*g*, *b*, *e*, *a*, *f*, *b*, *g*, *a*, in repeated sequence. Thus the loops of each of the float warp strands which pass beneath a filling strand are embraced between two of the body warp strands and are both gripped and spaced apart thereby, and the loops of any float warp pass under the middle one of each group of three picks which are overpassed by the next float warp at either side.

Although I have described certain of the strands as being of asbestos, it is not to be inferred that they are made wholly and exclusively of asbestos fiber. Inasmuch as asbestos alone cannot practicably be spun with enough looseness and softness to be capable of spreading out so as to make a smooth and nearly continuous surface, and at the same time with enough tensile strength to hold together in weaving, the asbestos fibers are combined with other fibers or strands having greater tensile

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strength. I prefer to use compound asbestos strands of the construction shown in my Letters Patent No. 2,098,995 granted November 16, 1937, although I may, without departure from the invention, use strands of other constructions whether now known or which may become known hereafter. In any event the term "asbestos strand" is used in this specification and in the following claims with a scope wide enough to include all strands containing sufficient asbestos to serve the purposes hereinafter described.

Describing for illustration, but without any limiting intention or effect, the specific details of the felt here illustrated I would say that all of the cotton warp strands are of the same structure and character, being made of five single yarns twisted closely enough to be hard and firm, while the asbestos strands are of much greater diameter, (in proportions approximately as represented in the drawing), and are much softer and more compressible. The weft material is much bulkier than the cotton warp strands and is conveniently made of three strands of the warp yarn material laid in parallel, or slightly twisted together.

The body warp and float warp strands are all taken from the same beam, but as the take up of the body warp strands in weaving is greater than that of the float warp strands (due to the fact that the body warp strands pass over and under every other pick of filling, while the float warp strands pass under only one in four picks), they are put under greater tension and the float warp strands are laid loosely on the face of the felt. This virtual freedom from tension of the float warps is important, particularly as to the asbestos strands, because these are relieved of tensile stress and strain in carrying the paper through the drier, and left free to be mashed down and spread out by the pressure against the drums of the drier.

The relatively large size of the weft strands is important for a number of reasons. It causes the body warp strands to be somewhat indented into the weft strands in the course of the weaving, and resists crimping or bending of the weft strands by the pulling tension of the warp strands subsequently. Such crimping of weft strands tends to reduce their overall length and hence to narrow the fabric of which they are a part. Hence the resistance to crimping afforded by the thick wefts here prevents any substantial or considerable narrowing of the felt in use. Another function and purpose of the thick wefts is to hold the seam where the ends of the felt are sewed together on the drier.

In the illustrative specimen there are ten each of the body warp strands *a* and *b* and five each of the warp strands *d*, *e*, *f* and *g* per inch of width of the felt, and twelve picks of filling per inch of length. These details, however, may be widely varied, and so also may the dimensions and structure of the component strands.

Felts made in accordance with the principles of the felt herein described, and of like or equivalent construction, contain a minimum of proportional content of asbestos, but enough to protect the body warp strands and form a sufficiently smooth face to avoid making so-called felt marks in the soft wet paper.

In being flattened in the course of normal usage the soft asbestos strands spread out so that they wholly or nearly fill the interstices between them and the adjacent cotton float warp strands and so make the desired smoothness of face. But they do not contain enough of asbestos and are not close enough together to cause the face to "glaze over". The condition referred to as glazing over results from spreading of a superabundance of asbestos fibers over the face of the felt and the absorption of chemical substances and bits of fiber from the wet paper. It gives the appearance of a glazed surface and strongly resists passage of water vapor from the paper. The wide spacing of the asbestos strands and presence of intermediate cotton strands between them in the face of the present felt prevents development of any such impervious glazed surface covering and insures the preservation of numerous small open spaces uniformly distributed over the face of the felt, wide enough to permit free passage of vapor, but not wide enough to permit intrusion of the paper.

All of the float warp strands, the cotton as well as the asbestos strands, are so moved by the harnesses which control them in weaving that they are caused to lie on the surface of the felt outside of the more tightly tensioned body warp strands, and largely overlie and cover the wales or loops of the latter which overlie the weft strands. Thus the body warp strands are prevented from coming into direct contact with the paper and are insulated in some measure from the destructive effects of heat and moisture and do not become so weak as to break until the overlying strands have become unserviceable. No pulling load is imposed on the strands which form the contact surface, and the strands which take the tension are preserved for a useful life as long as that of the strands which compose the surface. This result is accomplished with the use of less material and with a construction of felt having less thickness and weight than the two ply felts of the prior art. The single ply construction and the bulky weft strands, which are indented rather than crimped by the pull of the warp strands, makes the felt more porous than the commercial two ply felts and preserves its original porosity in substantially full measure. The resistance of the weft strands to crimping prevents the warp strands from being crowded appreciably more closely together.

As compared with the commercial asbestos drier felts of the prior art the present felt is approximately 20% thinner, approximately 33% lighter in weight, and has breathing ability (ability to permit passage of vapor due to its porosity) which is lacking in the prior felts. It does not run wet, (i. e., deliver the paper with more than its permissible content of moisture), and it dries in its return passage to the receiving point more rapidly than the prior art felts. Its thickness is slightly greater than that of the felt described in my application Serial No. 153,309, (Patent 2,168,928) but its weight is approximately the same and it contains a much smaller proportional content of asbestos. It has greater strength and less capacity to narrow down in use.

While cotton is the preferred material for all the non-asbestos strands of this felt, and is the material which in practice will be used in the great majority of the felts made according to this invention, it is not the only material which may be used. I wish to make it understood that any other materials suitable for the purpose may be used within the scope of the protection here claimed. Such suitable materials are any which have adequate strength and pliability, including not only those which have been used in drier felt manufacture heretofore, but also others

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which may by test and experience be found hereafter to be satisfactory. Strands of such other suitable materials may be combined with cotton strands or with one another in producing a felt according to the invention.

What I claim and desire to secure by Letters Patent is:

1. A drier felt for paper machines comprising a warp and filling of non-asbestos strands woven as a plain weave with alternate warp strands passing over, and intermediate warp strands passing under, the same picks of filling and each warp strand passing over and under successive picks in sequence, float warp strands containing asbestos fiber each extending loosely over groups of successive picks and under single picks between such groups, and non-asbestos float warp strands similarly arranged with respect to said picks of filling, the asbestos and non-asbestos float warp strands being located in alternation with one another across the felt and protectively overlying the first named warp strands on the paper-contact face of the felt.

2. A drier felt for paper machines comprising a plain-woven body made of interwoven non-asbestos warp and filling strands, asbestos float warp strands of soft texture arranged loosely on one face of said body with loops at intervals interwoven with non-adjacent picks of the filling, the lengths of such float warp strands between said loops each overlying a group of successive picks, and non-asbestos float warp strands interspersed among the asbestos strands in sufficient number and sufficiently near together to prevent formation of a continuous asbestos surface of the felt by spreading of the asbestos strands; the warp strands of the body being substantially overlaid and protected by the float warp strands.

3. A drier felt as set forth in claim 2 in which the filling strands are more bulky than the non-asbestos warp strands and are indented thereby, whereby they substantially prevent narrowing of the felt under the stresses applied in normal usage.

4. A drier felt for paper machines consisting of a cotton warp and a cotton filling interwoven in a plain weave, asbestos float warp strands and cotton float warp strands extending side by side and interspersed with one another on the paper-contact side of the felt, each of said float warp strands being arranged to lie loosely over a group of successive picks of the filling and having loops passing under single picks of the filling between successive groups, said loops being so arranged that each float warp strand passes over the picks of the filling which are underpassed by the loops of adjacent strands.

5. A drier felt for paper machines consisting of cotton body warp strands, cotton float warp strands, asbestos float warp strands and a cotton filling, the body warp strands being interwoven with all the picks of the filling and alternate strands thereof passing oppositely to the intermediate strands around such picks, the float warp strands lying loosely on one face of the felt over groups of successive picks of filling and under single picks between successive groups, each of said loops being arranged between two of the body warp strands, and the float warp strands being sufficiently numerous and close together to make a substantially smooth paper-contact surface, and the cotton float warp strands being sufficiently numerous and interspersed among the asbestos strands at short enough intervals to prevent formation of a continuous asbestos surface on the felt by spreading of the asbestos strands.

6. A drier felt as set forth in claim 5, in which the filling strands are bulkier than the cotton warp strands sufficiently to prevent substantial narrowing of the felt under conditions of service.

7. A single ply drier felt consisting of warp and weft strands closely interwoven to form a self-contained body with the weft strands all substantially in the same plane, and float warp strands each passing over a group of successive weft strands, under the next weft strand, over a group comprised by a number of the next successive weft strands, under the weft strand next following said group, and so on in repeated sequence; the overpassing portions of said float warp strands lying directly on the face of said body in contact therewith outside of and, to some extent over, the loops of the body warp strands which lie in said face.

8. A single ply drier felt comprising non-asbestos body warp and weft strands woven together in a plain weave, and float warp strands containing asbestos lying under less tension than the first named warp strands over the face of the felt and overlying the body warp strands thereof, said float warp strands having loops at intervals passing between body warp strands and around certain non-adjacent ones of the same weft strands with which said non-asbestos warp strands are interwoven.

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