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DRIER FELT FOR PAPER MACHINES

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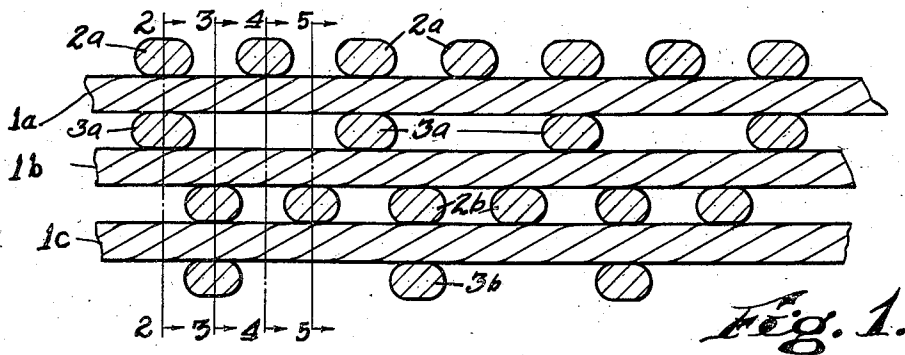


Fig. 1.

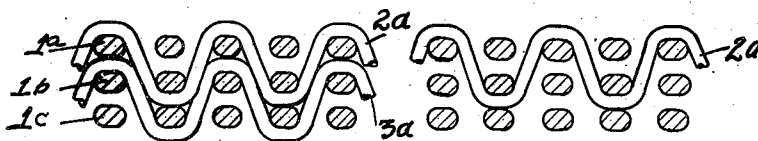


Fig. 2.

Fig. 4.

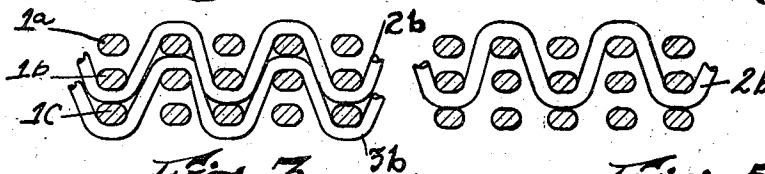


Fig. 3.

Fig. 5.

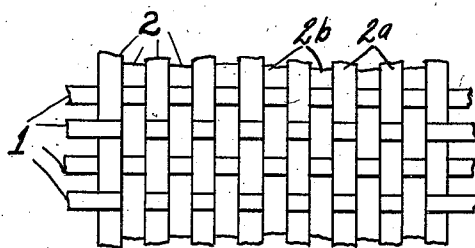


Fig. 6.

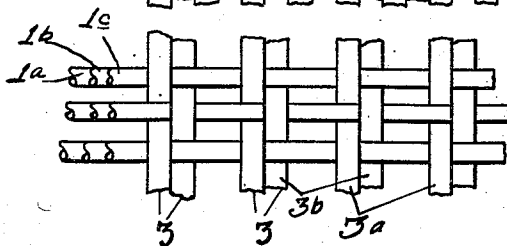


Fig. 7.

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DRIER FELT FOR PAPER MACHINES

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1 Claim. (Cl. 139—412)

The present invention relates to drier felts adapted for supporting the paper web as it comes from a paper machine and to carry the paper web through the drying mechanism.

For the past twenty years or more the conventional drier felt, which in reality is not a felt but a woven fabric, has been a multiple layer fabric having the weft threads arranged in sets of three or more with the threads of each set in superposed relation to each other to provide a relatively thick fabric. The warp threads are arranged in two or more groups, one of which is woven with the top two threads of the weft treating the top two threads of each set of weft threads as a single thread. The next group of warp threads is similarly woven with the second and third thread of each set of weft threads. All of the warp threads are as closely woven as is possible and thus a very thick woven fabric is produced.

This fabric has been in general satisfactory, but it has been expensive to produce because of the amount of cotton thread used in its construction and it has also required the use of a substantial amount of heat in the paper machine in order to keep the felt dry enough to function properly in the drying of the paper web. The principal object of the present invention is to produce a felt of substantially lighter weight than the conventional felt and which will, at the same time, provide a more satisfactory operation of the drying structure of the paper machine.

In accordance with the present invention a substantial part of the threads extending in one direction of the fabric on one face thereof are eliminated, so that the fabric, although similar to the conventional felt on one side thereof, has substantially less threads on the other side, thereby producing a less expensive and equally or more satisfactory felt, without impairing its proper functioning, in many cases improving its functioning.

Other and further objects and advantages of the invention will appear from the following detailed description taken in connection with the accompanying drawing in which—

Fig. 1 is a sectional view through a drier felt embodying the invention, showing the felt on a greatly enlarged scale.

Fig. 2 is a sectional view along the line 2—2 of Fig. 1.

Fig. 3 is a sectional view along the line 3—3 of Fig. 1.

Fig. 4 is a sectional view along the line 4—4 of Fig. 1.

Fig. 5 is a sectional view along the line 5—5 of Fig. 1.

Fig. 6 is a diagrammatic plan view of the face of the fabric of Fig. 1.

Fig. 7 is a diagrammatic plan view of the back of the fabric of Fig. 1.

Like reference characters refer to like parts in the different figures.

With reference to the drawing, the drier felt, which, as above stated, is in reality a woven fabric, has parallelly extending sets of weft threads 1, each set, as best shown in Fig. 1, consisting of three superimposed threads 1a, 1b and 1c. These threads, in the actual fabric, are substantially as close together as possible although the spacing shown in the drawing is necessarily exaggerated in order to show the arrangement of the threads clearly.

The warp threads consist of two sets of threads 2, Fig. 6, and 3, Fig. 7, the former appearing on the face of the fabric and the latter appearing on the back of the fabric. The warp threads 2, comprising pairs of threads 2a and 2b, are arranged as close together as possible and are woven into the two top threads 1a and 1b of each set of weft threads, treating the two threads of each set as a unit. Thus, as shown in Fig. 2, the warp thread 2a passes alternately over and under the two top threads 1a and 1b of successive sets of weft threads.

As shown in Fig. 3, the warp thread 2b adjacent to the warp thread 2a passes alternately over and under the top two threads 1a and 1b of successive sets of weft threads. The thread 2b, as will be apparent from Fig. 6, is woven opposite to the thread 2a and passes under the weft threads which are beneath the adjacent warp thread 2a. As stated, all of the warp threads 2 are as close together as they can readily be placed, and therefore the face of the fabric shown in Fig. 6, presents a nearly continuous surface of warp threads on which the paper may be laid prior to drying thereof.

Of the set of warp threads 3, which appear on the underside of the fabric, these threads are arranged in spaced pairs, each pair made up of two threads 3a and 3b and as best shown in Fig. 7, there are substantially half as many warp threads 3 as there are warp threads 2 in the top face of the fabric. The warp threads 3 are arranged in pairs and the threads 3a and 3b of each pair are woven with the weft threads in substantially the same manner as the warp threads 2a

and 2b. However, the warp threads 3a and 3b pass alternately over and under the bottom two threads 1b and 1c of each weft, thus treating the two bottom threads of each set as a unit. When woven in this manner substantially half the length of the weft threads of one set are exposed at the back of the fabric and portions of some of the face warp threads are also exposed at the back through the relatively large interstices formed between pairs of back warp threads.

This fabric or drier felt is thus substantially lighter in weight than the conventional felt which has been used for a great number of years and this new felt is thus less expensive, not only for manufacture, but also lower in cost to the paper manufacturers. The lighter weight of the fabric is obtained without affecting the top surface of the fabric on which the paper is laid and the fabric accordingly functions just as satisfactorily in supporting the paper as does the heavier weight conventional fabric.

The drier felt of the present invention has been in use in several paper mills and it has been found that the new felt requires less heat per square yard of paper or less steam per ton of finished paper than the conventional felt by reason of the fact that the felt, being lighter, retains less moisture and therefore requires less heat for drying the moisture out of the felt. A further result found in the use of the new felt is that the paper web is much more uniformly dried and thus produces a more uniform surface finish for the paper. Since the drier felt is lighter in weight per square yard, the felt is more readily thoroughly dried before the paper is laid thereon and the fabric being, at least on the backside thereof, more porous than the conventional three ply felt, the heat of the drier can more readily remove moisture from both the paper web and the felt.

A large number of paper mills which have been in operation for a substantial period of time have been extremely limited in production by the drying capacity of the mill. In order to assure complete drying of the paper with a limited supply of drying capacity, it has been necessary to limit the maximum rate of travel of the paper through the paper machine and thus production of some of these mills has been emphatically limited. By using the felt of the present invention it has been possible, by reason of the more rapid and the more uniform drying of the paper, to speed up the rate of production of paper in some of these old mills so that the output of the mill has been increased substantially. This increase in production has also been obtained with no increase in expense, since the new felt is less expensive per square yard than the conventional felt. There has also been no proportional increase in power consumption in these mills, since the new felt, being more flexible and lighter in weight, requires less power to drive it than is required to drive the conventional heavier and less flexible felt.

Because of the lighter weight of the felt of the

present invention, together with greater porosity, the moisture in the felt is more readily disseminated than would be possible with the heavier felts. The more rapid dissemination has resulted in lowering production costs since less steam for drying is required for each ton of finished paper, or in a plant of limited drying capacity, more pounds of paper can be produced each hour. The lighter felt also allows more of the steam used for drying to be utilized in drying the paper rather than in keeping the felt dry.

One familiar paper felt, as shown for example in the Barrell Patent No. 2,167,542, is made up of a plurality of separate plies of woven fabric, the several plies of which are held together at spaced points by connecting threads. When this felt has been in use for a period the plies of fabric tend to slide relative to each other and thus form humps or creases at the points where the plies are tied together, so that the felt no longer presents a smooth surface on which the paper is dried. This difficulty cannot arise in a felt made in accordance with the present invention as all the threads are held together over the entire area of the felt.

I claim:

A unitary woven fabric drier felt for paper making machines having a closely woven face and a relatively openly woven back and consisting, in combination, of three superposed horizontally extending layers of weft threads arranged in substantially vertically aligned groups and warp threads divided into a first, a second, a third, and a fourth set, the threads of said first set being woven over and under given successive weft threads of both the top and the intermediate layers, the threads of said second set being woven under and over said given successive weft threads of both the top and intermediate layers, the threads of said third set being woven over and under given successive weft threads of both the intermediate and bottom layers, and the threads of the fourth set being woven under and over said given successive weft threads of both the intermediate and bottom layers, the threads of the first and second sets being closely disposed weftwise of the fabric substantially to conceal the weft threads and to form a uniformly continuous and relatively smooth face, the threads of the third and fourth sets being equal in number to no more than substantially one-half the number of threads in the first and second sets and being arranged in pairs of closely disposed threads, the said pairs being substantially uniformly spaced weftwise to expose at the back of the fabric substantially no less in the aggregate than half the entire length of each weft thread of the lower layer and also to expose at the back of the fabric portions of some of the face warp threads, whereby there is provided a direct thread path or moisture from the exposed face of the felt to the exposed back of the felt.

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