

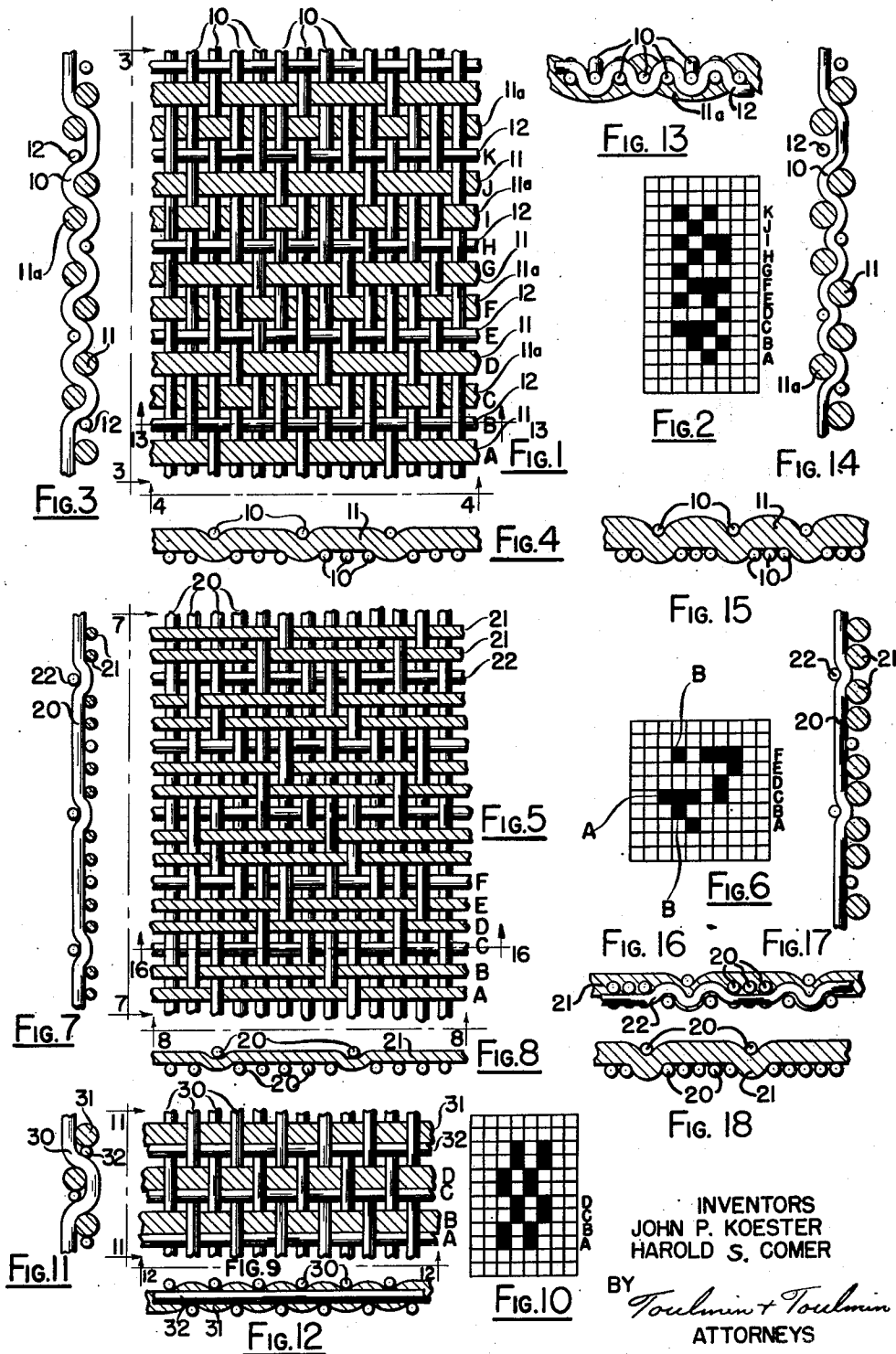
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PAPERMAKER'S FELT

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PAPERMAKER'S FELT

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This invention relates to woven felts and particularly to felts that are used in the papermaking industry, and like industries for supporting and carrying pulp-like materials.

There are numerous industries in which endless fabric belts or felts are used to pick up a wet pulp and support it while liquid is drained away from the pulp through the felt. These endless belts are common to the papermaking industry, and are also used in the manufacture of various pulpboards and asbestos boards and sheets.

The life of these felts is extremely short, varying from a few hours to a few days in an industry using highly abrasive pulp, such as asbestos pulp and asbestos cement pulp, to a few days to a few weeks in the papermaking industry, depending upon the kind of paper or paper-board that is being produced. In any event, however, these endless felts must be replaced at regular intervals, depending upon their usage in various industries, and this involves a major expense in the operation of a papermaking or a board-making plant. Thus, it has been a constant endeavor to obtain better wearing qualities of the felts so that they will resist physical abrasion and chemical action.

It is common practice to use an all-wool felt in many of the pulp-using industries since the high grade wools give the best resistance to physical abrasion and are resistant to the various chemicals used in the pulp-using industries. However, there is a limit to the physical abrasion that wool can take and yet it is highly desirable to have wool surfaces on felts that are used to obtain a surface finish on paper or various pulp-boards. Thus, the use of wool cannot be eliminated in the pulp-using industries that make paper and pulp-boards.

Particularly in the industry of manufacture of asbestos cement boards there is an extremely severe physical abrasion problem of the felts that has not been satisfactorily overcome. While this industry involves a serious physical abrasion problem on the surface of felts, yet the chemical problem is not so acute.

Therefore, it is an object of this invention to provide a woven papermaker's felt, or wet pulp handling felt wherein a non-wool non-felting yarn is used in either the warp or filling system of the woven felt, and a yarn composed in its major part of wool is used in the other system.

More particularly, it is an object of the invention to provide a wet pulp handling felt wherein the warp system of the woven felt is a cotton yarn and the filling system of the woven felt con-

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sists of both a cotton yarn and a wool yarn that are laid in the filling system in a regular repeating pattern.

It is still another object of the invention to provide a wet pulp handling felt in accordance with the foregoing object wherein the wool yarn forms the surface yarn of the felt on at least one side of the felt.

It is still another object of the invention to provide a wet pulp handling felt, or a papermaker's felt, in accordance with the foregoing objects wherein the wool-containing yarn is substantially larger than the non-wool non-felting yarn.

These and other objects of the invention will become apparent from the drawings and the following description.

In the drawings:

Figure 1 is a plan view of a woven felt constructed according to this invention;

Figure 2 is a weave diagram of the felt of Figure 1;

Figure 3 is a longitudinal edge view of the felt taken along line 3—3 of Figure 1;

Figure 4 is a transverse edge view of the felt taken along line 4—4 of Figure 1;

Figure 5 is a plan view of another weave of a felt constructed according to this invention;

Figure 6 is a weave diagram of the felt of Figure 5;

Figure 7 is a longitudinal cross-sectional edge view taken along line 7—7 of Figure 5;

Figure 8 is a transverse edge view of the felt taken along line 8—8 of Figure 5;

Figure 9 is a plan view of another weave of a felt constructed according to this invention;

Figure 10 is a weave diagram of the felt of Figure 9;

Figure 11 is a longitudinal edge view taken along line 11—11 of Figure 9;

Figure 12 is a transverse edge view taken along line 12—12 of Figure 9.

Figure 13 is a cross-sectional view taken along line 13—13 of Fig. 1 illustrating the condition of the fabric after fulling.

Figure 14 is a cross-sectional view like Fig. 3, illustrating the condition of the fabric after fulling;

Fig. 15 is a cross-sectional view like Fig. 4, illustrating the condition of the fabric after fulling;

Fig. 16 is a cross-sectional view taken along line 16—16 of Fig. 5 illustrating the condition of the fabric after fulling;

Figs. 17 and 18 are like Figs. 7 and 8 respec-

tively but illustrate the condition of the fabric after fulling.

The felt of this invention is what is known as a woven felt that can be produced on conventional weaving machinery. In constructing endless felts or belts for handling of wet pulp, the yarn of which the felt is composed is woven in a suitable pattern into a fabric having both warp yarn and filling yarn systems. After the felt is woven it is suitably fulled or shrunk to size to compact the yarn and to give the felt satisfactory body and surface support for pulp fibers and yet provide for satisfactory drainage of liquid away from the pulp.

In manufacturing endless felts or belts for handling of wet pulp, such as papermakers' felts, it is essential that the felt shall provide for water drainage from the pulp during the service life of the felt, and will give to the paper or board that is being produced a desired surface finish. It is also highly desirable that the felts shall have a reasonable service life to prevent undue cost of replacement.

In the papermaking industry, woven felts in which both the warp yarn system and the filling yarn system are composed of all-wool yarns have been found to be satisfactory. However, there are certain conditions of high physical abrasion that is greater than can be withstood by wool yarns to give a reasonable service life of the felt. While all-wool felts have been used in industries of high physical abrasion in the handling of wet pulp, yet their replacement has been often and their cost high as a result.

It is therefore the purpose of this invention to produce a felt having a wool surface finish that will give a reasonable service life in those wet pulp handling industries in which high physical abrasion of the pulp on the felt is a serious problem. Such an industry is that of the manufacture of asbestos cement board.

Therefore, in this invention the felt is composed of woven warp and filling yarn systems wherein the systems are composed partly of a nonfitting yarn and partly of a wool yarn or a wool yarn mixed with other fibers such as nylon, but wherein the wool comprises the major part of the yarn to maintain the surface finish characteristics that are given to a felt by the wool fibers.

More particularly, the felt of this invention is composed of woven warp and filling yarn systems wherein the warp system consists of a non-wool non-felting yarn, preferably cotton, and the filling system is composed of a non-wool non-felting yarn, preferably cotton, and a wool base yarn, or all-wool yarn, in which the two yarns in the filling system are laid in a regular repeating pattern so that the wool yarn, or wool base yarn, will provide the surface finish yarn on at least one side of the felt.

By constructing a felt in which the filling yarn system is composed at least in part of a wool yarn or a wool base yarn, the characteristics of the wool fibers to give surface finish to the product are retained, and yet the strength characteristics of a non-wool non-felting yarn in the filling and warp yarn systems are obtained. Thus, the benefit of the wool yarn is retained and the benefit of a non-wool yarn is gained.

It is also understood that in the manufacture of the felts, the fulling characteristics of the wool yarn are retained in the felt of this invention, as is the napping characteristic of the wool yarn, so that in those felts that are desired to have a

napped surface to give a high surface finish to the product, the nap surface can be obtained in regular wool napping machines.

In Figures 1, 5 and 9 there are illustrated three different weaves of a woven felt in which the warp yarns are non-wool non-felting yarns and the filling yarn system is composed of a non-wool non-felting yarn and a wool or wool base yarn.

In Figure 1 the warp yarns 10 are non-wool yarns, preferably are cotton yarns since cotton imparts a high tensile strength to the finished product. In the weave of the felt of Fig. 1 the warp yarn system is an all-non-wool system.

The filling yarn system consists of the wool or wool-base yarns 11 and the non-wool yarns 12. The non-wool yarns 12 can be the same yarn that is used in the warp yarn system, or they can be of a different composition to give to the filling yarn system the desired transverse strength.

The wool or wool-base yarns 11 may be of wool yarn, or they may contain other fibers to add to the characteristics of the wool fibers, such as nylon fibers. Nylon fibers added to the wool yarn increase the abrasive resistance of the yarn, but a high percentage of nylon fibers cannot be used for the reason that an extremely high percentage of nylon fibers eliminates the fulling characteristics of the wool which must be retained to obtain the desired density of the finished felt.

The weave pattern of the woven felt of Fig. 1 is shown in Fig. 2 wherein the corresponding rows of filling yarns are indicated by letters.

It will be noted that in Fig. 1 the wool or wool-base yarns 11 are woven through the warp yarns 10 in such a manner that the wool yarns 11 become surface yarns on the upper surface of the felt while the wool yarns 11a are woven through the warp yarns 10 so that they become surface yarns on the opposite side of the felt. A non-wool yarn 12 is woven through the warp yarns 10 between every other pair of wool yarns 11, 11a.

In Fig. 5 there is illustrated another weave for a felt in which the warp yarn system consisting of the warp yarns 20 is composed of non-wool yarns.

The filling yarn system of the felt of Fig. 5 is composed of the wool yarns 21 and the non-wool yarn 22. Figure 6 illustrates the weave pattern of the felt shown in Fig. 5 and corresponding filling yarn rows are lettered with corresponding letters in the weave diagram of Fig. 6 and the felt of Fig. 5.

In the felt shown in Fig. 5 it will be noted that the weave is such that the wool or wool-base yarns form the surface yarns on the top of the felt. Thus, the back of the felt is composed substantially of all-non-wool yarn.

Fig. 9 illustrates another weave of a felt in which the warp yarn system consists of the non-wool yarns 30 and the filling yarn system consists of the wool yarns 31 and the non-wool yarns 32.

From the foregoing it will be apparent that there are many weaves that can be used to obtain the benefits of this invention of making the filling system partly of wool yarn or wool-base yarn and partly of a non-wool yarn, such as cotton.

In Figs. 1 and 9 there is illustrated a method of placing a relatively large volume of wool in the filling yarn system wherein the wool or wool-base yarns 11, 11a of Fig. 1 and the wool or wool-base yarns 31 of Fig. 9 are substantially larger in size than the non-wool yarns in the warp and filling systems of the particular weaves. By this ar-

rangement a larger percentage of wool is brought to the surface of the felt, and which may be more readily napped.

Felts constructed in accordance with this invention have shown a tremendous increase in service life over felts constructed of all-wool yarns, giving as much as four times the service life of all-wool felts. One of the principal advantages of the use of non-wool yarns in the felt of this invention is that the felt does not disintegrate, as occurs when an all-wool felt is used since in an all-wool felt the warp yarn and the filling yarn give way at the same time, whereas in the felt of this invention the all-wool yarn may be abraded away without greatly affecting the non-wool yarns of the warp and filling systems that give the felt its tensile strength in both directions.

When speaking of all-non-wool yarns in this invention, preferably cotton yarn is to be considered, but other non-wool yarns are not to be eliminated from consideration as being within the scope of the invention. Also, when speaking of wool-base yarns or wool-containing yarns, wool shall be considered the major part of the yarn which may be blended with other non-wool yarns, such as nylon and others to give certain specific added qualities to the wool or wool-base yarn.

The invention has been described with reference to the use of non-wool yarns, or cotton yarns in the filling yarn systems of the felts. It has previously been considered impractical to use other than all-wool yarns in a felt for the reason that the non-wool yarns or cotton yarns do not have the fulling characteristics of all-wool yarn. The woven felts are woven with a relatively loose weave and thereafter fullled or shrunk to size to give to the felt the proper degree of compactness and body. As for example, felts are shrunk as much as 50% from the size of the original woven fabric. Thus, a felt woven 200" wide will be fullled or shrunk to approximately 100" in width.

However, this applicant has discovered that by properly combining wool yarns and non-wool yarns or cotton yarns in the filling yarn system of felts, the fulling characteristics of the wool yarns can be advantageously retained, and yet obtain the advantage of the strength of the non-wool or cotton yarns. It has been discovered that when the filling yarn system contains both a wool yarn and a non-wool or cotton yarn, that the wool yarn will full or shrink in exactly the same manner as would be expected. But the cotton yarn, or non-wool yarn, which does not have the same fulling characteristics as the wool yarn, will merely loop across the warp yarns, but without causing any tangling of the non-wool fill yarns with the non-wool warp yarns. Also, the loops of the non-wool fill yarns will still remain below the surface of the fullled wool fill yarns so that a satisfactory wool surface can be obtained on the felt. Thus, the felts can have a filling yarn system in which a substantially non-fulling yarn and a fulling yarn are used.

In Figs. 13 and 15 there is illustrated the condition of the woven fabric after fulling. It will be noted in Fig. 15 that the warp yarns 10 have been drawn closer together by the shrinking of the fill wool yarn 11 which has also increased in size due to the fulling or shrinking characteristic of the wool yarn. The upper surface is, therefore, substantially all-wool. The lower surface of the woven felt is also all-wool since the pattern repeats itself at the fill wool yarn 11a, shown in

Fig. 1, but in reverse as compared to the pattern of the fill wool yarns 11.

In Fig. 13 there is illustrated the effect of the fulling or shrinking of the wool fill yarns on the non-wool or cotton fill yarns. Here, the cotton fill yarn 12 is caused to loop over the warp yarns 10 because it does not full or shrink to the same extent as the wool yarns 11 or 11a. Thus, the fill yarn 12 makes a pattern such as that shown in Fig. 13, but the surface of the yarn 12 is still below the surface of the adjacent wool yarns 11, 11a.

In Figs. 16, 17 and 18 there is illustrated the result of fulling or shrinking of the felt carrying the weave shown in Fig. 5. In this instance, the wool yarns are all on the top of the felt and the non-wool and the cotton yarns constitute the back of the felt, thus giving a cotton-backed felt. However, the looping effect of the non-wool or cotton yarns 22 is clearly shown in Fig. 16.

While specific forms of the invention are disclosed herein, yet modifications can be made without departing from the spirit of the invention, and those modifications that fall within the scope of the appended claims are intended to be included herein.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A woven fullled wet pulp handling felt consisting of warp and filling textile yarn systems, said warp system consisting of all non-felting textile yarn and said filling system consisting of a non-felting textile yarn and a yarn composed in its major part of wool and substantially larger in size than the non-felting textile yarn and laid in a regular repeating pattern with the wool yarn of the filling system comprising at least 50% of the yarn of the filling system and with both yarns of the filling system extending through the felt to both faces thereof.

2. A woven fullled wet pulp handling felt consisting of warp and filling textile yarn systems, said warp system consisting of all cotton yarn and said filling system consisting of a cotton yarn and a yarn composed in its major part of wool and substantially larger in size than the cotton yarn and laid in a regular repeating pattern with the wool yarn of the filling system comprising at least 50% of the yarn of the filling system and with both yarns of the filling system extending through the felt to both faces thereof.

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