Aug. 16, 1960 T. HINDLE ET AL 2,949,134

PAPERMAKERS' FELTS AND LIKE INDUSTRIAL WOVEN TEXTILE FABRICS

Filed Aug. 15, 1956

2 Sheets-Sheet 1

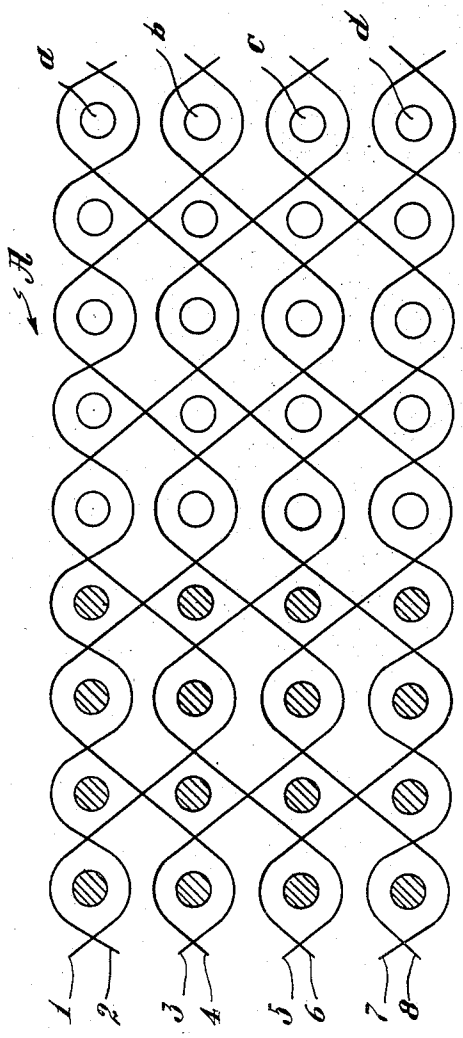

Fig. 1

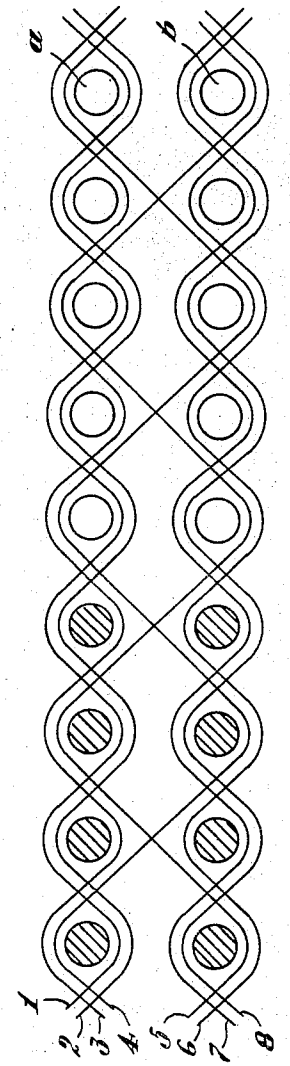

Fig. 2

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2 Sheets-Sheet 2

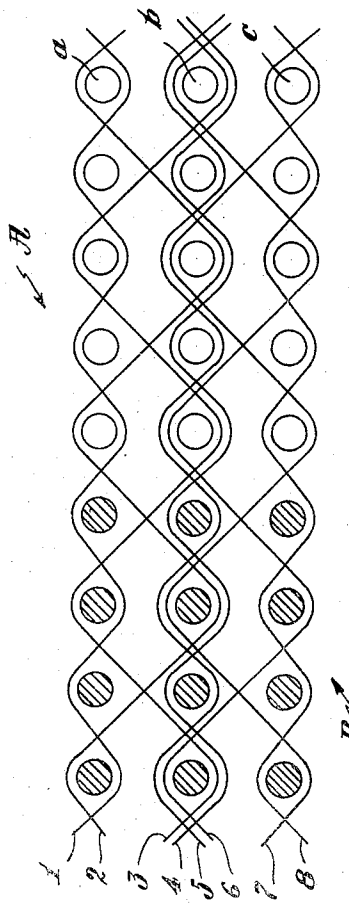

Fig. 3

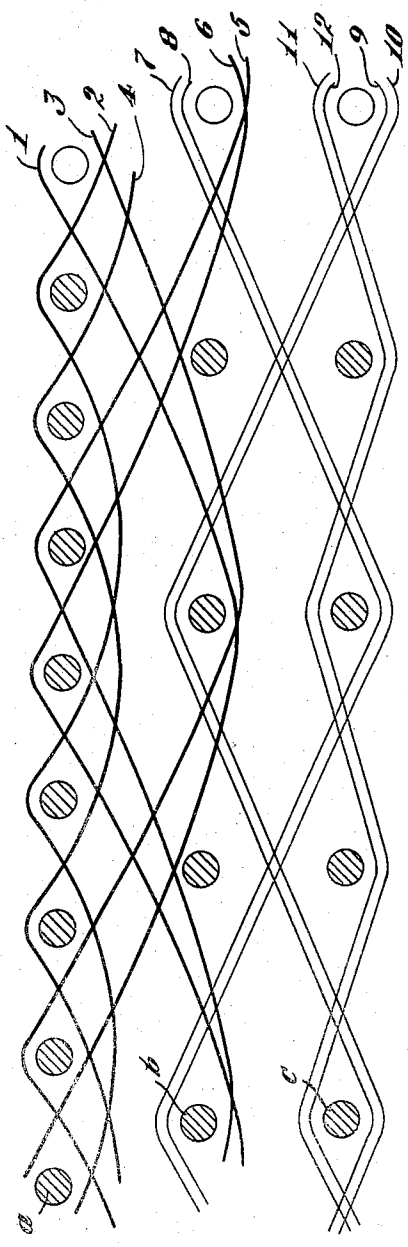

Fig. 4

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2,949,134

PAPERMAKERS' FELTS AND LIKE INDUSTRIAL WOVEN TEXTILE FABRICS

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Claims priority, application Great Britain Sept. 23, 1955

15 Claims. (Cl. 139—426)

This invention relates to woven textile fabrics for industrial uses and is particularly concerned with those endless woven bands which are termed "papermakers' dryer felts" which, in papermaking, are used to carry the sheet or web of paper in close contact with the drying cylinders of the paper machine.

In the early days of papermaking by machinery, the dryer felts were actually of wool and were subjected to a fulling operation such as is customary in the manufacture of true woven felts, so that the term "felt" as applied to these earlier drying felts was doubtless justifiable. It is because of certain peculiarities of both surface and internal structure that wool is susceptible to "felting," whereas smooth-surfaced fibers of vegetable origin, for instance cotton; fibers of mineral origin, for example asbestos; and synthetic fibers produced by extrusion, for example Dacron (which chemically speaking is polyethylene terephthalate) cannot be felted. As contrasted with wool and to distinguish therefrom, these smooth-surfaced fibers are herein referred to under the general term "non-felting" fibrous material.

As the art of papermaking progressed, the wool felts were superseded by cotton felts, and since cotton is not susceptible to felting, the term "felt" as applied to these woven cotton bands was really a misnomer, although its use as applied to these dryer bands has persisted. At a still later stage in the development of the papermaking art, felts of cotton combined with asbestos were introduced, and felts of this type, as well as those wholly of cotton, are commonly employed at the present time.

Since a function of the dryer felt is to assist in the drying of the paper web by absorbing moisture from the latter, it is essential that the pores or interstices of the felt be kept open for the absorption and passage of moisture. However, in practice it is found that the felt, particularly that face of the felt which contacts the paper web, becomes blocked with insoluble matter such as pitch, cellulose fibers, china clay and other materials present in the stock from which the paper web is made, or in the atmosphere surrounding the papermaking machine, and as the dryer felt thus becomes progressively less permeable to water, water vapor and air, the drying efficiency of the felt may be seriously impaired long before it is actually worn out. Under some circumstances, the collection of this extraneous matter on the face of the felt may become so great as to produce undesirable marks on or even to rupture the impressionable paper web. Thus, the problem of dirt collection on and in dryer felts is serious.

Recently, the employment of some of the synthetic fibers, for instance nylon or Dacron, in the manufacture of dryer felts has been suggested, and felts comprising such materials in substantial percentages have been made and are in actual use. The initial cost of an all-Dacron dryer felt is relatively high, but in many cases this is justified by the greatly increased service life which results from the known properties of such fiber, particularly its

resistance to dry heat and to attack by dilute acids at high temperature.

A felt in which filamentous synthetic yarn, constituting from 6% to 14% of the total weight of the felt, and wherein the synthetic yarn is incorporated as a helical wrapping about a core of another material, for example cotton, is disclosed in the United States patent to Hindle et al., No. 2,882,933, dated April 21, 1959, and which issued on application Serial No. 524, 410, filed July 26, 1955 and copending with the present application.

However, it has been observed that such felts comprising substantial proportions of these synthetic yarns tend to fill up with foreign material even more rapidly than the older felts of cotton or cotton and asbestos. In searching for a reason for this phenomenon it was noted that the synthetic fibers such as nylon or Dacron (which do not readily absorb moisture), generate and hold very high electrostatic charges when exposed to friction. While it would not appear reasonable to think that such electrostatic charges would develop in a dryer felt contacting a wet paper web and running in an atmosphere filled with moisture, tests have shown that such electrostatic charges are actually built up on felts while in operation, and particularly felts containing substantial percentages of the synthetic fibers. As a result of such tests, it has seemed possible that the plugging up of dryer felts with foreign material may be due, in part at least, to electrostatic action, and extensive tests have resulted in the surprising discovery, arising from experiments in making felts from mixtures of different fibers, that felts made from different mixtures not only generate different degrees of electrostatic charge, but also different properties as regards the collection or non-collection of dust. The present invention is based upon the conception that the collection of dirt and foreign matter on and in such dryer felts is due to a substantial degree to the presence of static electrical charges and that by the employment, in the manufacture of such felts, of fibers having different electrostatic properties in proper proportions, there will result a felt having the property of remaining cleaner throughout its service life than any of the felts which have heretofore been employed.

According to the present invention, there is provided a woven, papermakers' dryer felt of the kind referred to consisting of non-felting fibrous materials of diverse electrostatic properties and in such relative proportions and so relatively arranged that the felt is substantially neutral as respects its ability to generate or accumulate an electrostatic charge under the conditions of use.

An object of the present invention is a method of manufacture of a relatively non-electrostatic industrial woven textile fabric including the steps of selecting different non-felting fibers of such relative electrostatic properties and in such proportion that the generation and/or accumulation of an electrostatic charge is substantially reduced or eliminated in the manufactured fabric, and then weaving the fabric from said selected fibers.

Another object of the present invention is the provision of a papermakers' dryer felt as aforesaid, characterized in that the selected fibers are cotton and Dacron constructed with the Dacron in close contact with the cotton.

Another object of the present invention is to provide a papermakers' dryer felt characterized in that the selected fibers are nylon and Dacron constructed with the Dacron in close contact with the nylon.

Another object of the present invention is to provide a papermakers' dryer felt characterized in that the selected fibers are cotton, nylon and Dacron so arranged that each of the three kinds of fiber is in close contact with the other two.

Another object of the present invention is to provide

a papermakers' dryer felt in which Orlon is substituted for at least part of the Dacron. Orlon is the trade name applied to polyacrylonitrile fiber.

Another object of the present invention is to provide a papermakers' dryer felt in which asbestos fiber is substituted for at least part of the cotton.

The extent to which dryer felts manufactured in accordance with the present invention keep themselves clean during their life on the paper machine compared with dryer felts composed wholly of cotton or wholly of Dacron or wholly of nylon is most surprising.

It is believed that the chief factor of dirt repulsion or non-accumulation, giving the aforesaid new characteristic, is a function of the generation, and/or discharge of electrostatic charges on the electrostatically different fibers of the various components of the felt, on the fibers of the paper web and on the various components of the paper stock which comprise the "dirt." It is well known that when two materials such as silk and acetate rayon are rubbed together, one becomes positively charged and the other negatively charged and that different materials share this characteristic in different degrees. Let the positively charged material be called P and the negatively charged material be called N. If four different materials, A, B, C and D, are now tested against both P and N, it may be found that A becomes positive to both P and N, that B becomes negative to both P and N, or that C becomes negative to P and positive to N. What will not occur is that D will become positive to P and negative to N. It is, indeed, possible to arrange materials in a vertical series or list in which any material rubbed against another lower on the list will acquire a positive charge and rubbed against another higher on the list will acquire a negative charge.

Such list is hereinafter termed the "electrostatic series," an example of which is as follows:

(+)	Ramie
Glass	Vulcanized Rubber
Nylon	Cellulose Acetate
Wool	Orlon
Silk	Dacron
Viscose	Polyethylene
Cotton	(−)

As a result of research, the conclusion has been reached that the dirtying of a dryer felt composed of only one type of fiber, or composed of two types of fibers relatively close together in the electrostatic series, is due in no small degree to the accumulation of an electrostatic charge on the fibers of the felt, with consequent attraction between the charged fibers and the uncharged or oppositely charged components of the paper web. Having been brought into contact by electrostatic attraction, the extraneous matter adheres to the fibers of the felt by mechanical forces and by occlusion in pits and crevices of the fabric surface.

However, it has further been found that by the correct choice of fiber components and their proportions in a dryer felt according to the electrostatic series, both as regards the fibers of the felt and of the paper, it is possible to attain a state of, or approaching electrostatic neutrality in the system appertaining at that part of the paper-machine clothed by dryer felts.

In such a complex system as that presented at the drying section of a paper-machine, it is obviously impossible to predict the electrical charges which will be acquired by all of the many components present, and, therefore, equally impossible to predict the nature and proportions of the components necessary in a dryer felt to give maximum repulsion or non-attraction of those components of the paper stock which tend to deposit as "dirt" on the dryer felt.

From the results we have obtained, it is apparent that the nature and proportions of the components of dryer felts manufactured in accordance with the present invention are dependent upon a number of factors, chief among which are (*a*) the temperature of the system at the drying section of the paper-machine; (*b*) the humidity of the system at the drying end of the paper-machine; (*c*) the composition of the paper furnish; (*d*) the pH value of the paper web. Since these factors have different values on different paper-machines, and even on different sections of the same machine, it follows that, in fulfilling the objects of this invention, relatively wide variations in the proportions of the different fibrous ingredients of the dryer felts are possible. Under any given set of conditions on any drying section of a paper-machine, there are optima in the proportion of Dacron, cotton and/or nylon, but these optima vary with varying conditions.

It has been found that dryer felts having the following compositions exhibit greatly improved cleanliness:

(*a*) 25% to 75% by weight of Dacron and 75% to 25% by weight of cotton;

(*b*) 25% to 75% by weight of Dacron and 75% to 25% by weight of nylon;

(*c*) 2% to 75% by weight of Dacron, 2% to 20% by weight of nylon and 96% to 20% by weight of cotton, and

(*d*) felts composed as in (*a*) or (*c*) above but in which the cotton is partially or wholly replaced by asbestos.

Dryer felts having the aforesaid compositions achieve the object of keeping themselves cleaner during service use than felts composed wholly of cotton or of Dacron or of nylon.

In our invention, the nylon and Dacron may conveniently be present in the dryer felt as continuous filament yarn, as staple fiber carded and spun into yarn, as yarn spun directly from a continuous filament tow or as a blend with cotton, the blended mixture being carded and spun into yarn. When, herein, fibrous material is referred to, the term "fibrous" is to be understood as inclusive of any of the materials employed in the manufacture of yarns, whether as short fibers or long filaments, and whether of organic or inorganic materials, and whether synthetic or of natural origin.

In the accompanying drawings,

Figs. 1, 2, 3 and 4 are conventional longitudinal weave structure cross-sections through a straight weft showing several examples of a suitable weave for a papermakers' dryer felt made in accordance with the present invention, a single repeat of the weave being indicated by cross-section lines on the weft.

The following are examples of felts, which, on particular sections of particular paper-machines, possess the ability of keeping cleaner throughout their service lives than similar felts constructed wholly of one type of fiber:

Example 1

The weave structure of the dryer felt shown in Fig. 1 is used. In the diagram, the working face of the felt is at A and the back at B. The warp yarns **1**, **2** and **3**, which appear on the face of the fabric, are composed of 14s/9 cotton. Each of the weft threads, *a*, *b*, *c*, *d* is composed of three yarns of 7s cotton plied with one yarn of 6s spun Dacron. There are 68 warp threads per inch and 56 weft threads per inch in the finished dryer felt. Such a felt is composed of 33.9% by weight of Dacron and 66.1% by weight of cotton. In service on a particular section of a particular paper machine, a felt manufactured in the above construction kept very much cleaner throughout its life than did similar felts constructed wholly of cotton or wholly of Dacron.

Example 2

The weave structure of the dryer felt, shown in Fig. 1 is used. Each of the warp yarns **1**, **2**, **3**, **4** and **5** is composed of 6s/5 spun Dacron, and each of the warp yarns **6**, **7** and **8** is composed of 14s/9 cotton. Each of the weft threads is composed of two yarns of 7s cotton plied

with two yarns of 6s spun Dacron. There are 68 warp threads per inch and 56 weft threads per inch in the finished dryer felt. Such a felt is composed of 59.2% by weight of Dacron and 40.8% by weight of cotton.

Example 3

The weave structure of the dryer felt shown in Fig. 2 is used. Each of the warp yarns **1** to **8** inclusive, is composed of eight strands of 14s cotton plied with two nylon filament yarns each of 210 total denier (for example, 35 filaments of nylon each of 6 denier). Each of the weft yarns *a, b* is composed of nine strands of 7s cotton plied with two Dacron filament yarns each of 250 total denier (for example 50 filaments of Dacron each of 5 denier). There are 63 warp threads per inch and 27 weft threads per inch in the finished dryer felt. Such a felt is composed of 90.4% by weight of cotton, 6.4% by weight of nylon, and 3.2% by weight of Dacron.

Example 4

The weave structure of the dryer felt, shown in Fig. 2 is used. Each of the warp yarns **1** to **8** inclusive, is composed of eight strands of 14s cotton plied with one nylon filament yarn of 210 total denier. Each of the weft yarns *a, b* is composed of nine strands of 7s cotton plied with one nylon filament yarn of 210 total denier and one Dacron filament yarn of 250 total denier. There are 63 warp threads per inch and 27 weft threads per inch in the finished felt. Such a felt is composed of 90.1% by weight of cotton, 4.5% by weight of nylon and 5.4% by weight of Dacron.

Example 5

The weave structure of the dryer felt shown in Fig. 3 is used. The warp yarns **1**, **2** and **3**, which appear on the face of the fabric, are each composed of 6s/4 spun Dacron, and the warp yarns **4**, **5**, **6**, **7** and **8** are each composed of five strands of 7s cotton plied with two nylon filament yarns each of 210 total denier (for example, 35 filaments of nylon each of 6 denier). Each of the weft yarns *a, b, c* is composed of five strands of 7s cotton plied with two nylon filament yarns each of 210 total denier. There are 68 warp threads per inch and 48 weft threads per inch in the finished felt. Such a dryer felt is composed of 19.1% by weight of Dacron, 8.1% by weight of nylon, and 72.8% by weight of cotton.

Example 6

The weave structure of the dryer felt, shown in Fig. 3 is used. The construction of the warp of the dryer felt is the same as that of Example 5. Each of the weft yarns *a, b, c* is composed of five strands of 7s cotton plied with two Dacron filament yarns each of 250 total denier. There are 68 warp threads per inch and 46 weft threads per inch in the finished dryer felt which is thus composed of 24.3% by weight of Dacron, 3.8% by weight of nylon and 71.9% by weight of cotton.

Example 7

The weave structure used is as shown in Fig. 3, and the composition of the warps **1** to **8** inclusive, of the dryer felt are the same as those of Example 5. Each of the weft yarns *a, b, c* is composed of five strands of 7s cotton plied with one nylon filament yarn of 210 total denier and one Dacron filament yarn of 250 total denier. There are 68 warp threads per inch and 47 weft threads per inch in the finished dryer felt which is thus composed of 21.7% by weight of Dacron, 5.9% by weight of nylon and 72.4% by weight of cotton.

Example 8

The weave structure of the dryer felt shown in Fig. 3 is used. Each of the warp yarns **1**, **2** and **3** is composed of 6s/4 spun Dacron. A blend of 90% cotton and 10% nylon fiber is carded and spun to a count of 7s. Each of the warp yarns **4**, **5**, **6**, **7** and **8** and each of the weft

yarns *a, b, c* is composed of this 7s cotton-nylon plied 5-fold. There are 68 warp threads per inch and 48 weft threads per inch in the finished felt. Such a felt is composed of 21.2% by weight of Dacron, 6.5% by weight of nylon and 72.3% by weight of cotton.

Example 9

The weave structure is as shown in Fig. 3 and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as that of Example 5. Each of the weft yarns *a, b, c* is composed of asbestos, spun round a core of 20s/3 cotton to a resultant count of 0.8s. There are 68 warp threads per inch and 40 weft threads per inch. Such a felt is composed of 16.9% by weight of Dacron, 3.3% by weight of nylon, 36.1% by weight of cotton, and 43.7% by weight of asbestos.

Example 10

The weave structure of the dryer felt shown in Fig. 1 is used. Each of the warp yarns **1**, **2**, **3**, **4** and **5** is composed of 6s/4 spun Dacron and each of the warp yarns **6**, **7** and **8** is composed of eight strands of 14s cotton plied with two nylon filament yarns each of 210 total denier. Each weft yarn *a, b, c, d* is composed of five strands of 7s cotton plied with one Dacron filament yarn of 250 total denier. There are 68 warp threads per inch and 56 weft threads per inch in the finished dryer felt. Such a felt is composed of 35.4% by weight of Dacron, 2.3% by weight of nylon and 62.3% by weight of cotton.

Example 11

The weave structure is as shown in Fig. 1 and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as those of Example 10. Each weft yarn *a, b, c, d* is composed of five strands of 7s cotton plied with one Dacron filament yarn of 250 total denier and one nylon filament yarn of 210 total denier. There are 68 warp threads per inch and 56 weft threads per inch in the finished felt. Such a felt is composed of 34.5% by weight of Dacron, 4.7% by weight of nylon and 60.8% by weight cotton.

Example 12

The weave structure is as shown in Fig. 1 and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as those of Example 10. Each weft yarn *a, b, c, d* is composed of five strands of 8s cotton plied with one Dacron filament yarn of 250 total denier and two nylon filament yarns of 210 total denier. There are 68 warp threads per inch and 56 weft threads per inch in the finished dryer felt. Such a felt is composed of 35.6% by weight of Dacron, 7.4% by weight of nylon and 57.0% by weight of cotton.

Example 13

The weave structure of the dryer felt shown in Fig. 2 is used. Each of the warp yarns **1**, **2**, **3**, **4** and **5** is composed of 6s/4 spun Dacron and each of the warp yarns **6**, **7** and **8** is composed of eight strands of 14s cotton plied with two nylon filament yarns each of 210 total denier. Each weft thread *a, b* is composed of eight strands of 7s cotton plied with one Dacron filament yarn of 250 total denier and two nylon filament yarns each of 210 total denier. There are 63 warp threads per inch and 27 weft threads per inch in the finished felt. Such a felt is composed of 36.3% by weight of Dacron, 5.3% by weight of nylon and 58.4% by weight of cotton.

Example 14

The weave structure of the dryer felt shown in Fig. 3 is used. Each of the warp threads **1**, **2**, **3**, **4** and **5** is composed of 6s/4 spun Dacron, and each of the warp threads **6**, **7** and **8** is composed of eight strands of 14s cotton plied with two nylon filament yarns each of 210 total denier. Each of the weft threads *a, b* is composed of seven strands of 15s cotton plied with one Dacron

filament yarn of 250 total denier and one nylon filament yarn of 210 total denier. There are 67 warp threads per inch and 50 weft threads per inch in the finished dryer felt. Such a felt is composed of 43.4% by weight of Dacron, 2.8% by weight of nylon and 53.8% by weight of cotton.

Example 15

The weave structure shown in Fig. 1 is used and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as that of Example 10. Each of the weft yarns *a* is composed of 6s/5 spun Dacron and each of the weft yarns *b*, *c* and *d* is composed of six strands of 8s cotton plied with two nylon filament yarns each of 210 total denier. There are 68 warp threads per inch and 56 weft threads per inch in the finished dryer felt. Such a felt is composed of 43.8% by weight of Dacron, 5.8% by weight of nylon and 50.4% by weight of cotton.

Example 16

The weave structure shown in Fig. 2 is used and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as that of Example 13. Each of the weft threads *a* is composed of 7s/9 spun Dacron and each of the weft threads *b* is composed of eight strands of 7s cotton plied with two nylon filament yarns each of 210 total denier. There are 64 warp threads per inch and 27 weft threads per inch in the finished dryer felt. Such a felt is composed of 57.7% by weight of Dacron, 3.9% by weight of nylon and 38.4% by weight of cotton.

Example 17

The weave structure shown in Fig. 3 is used and the composition of the warps **1** to **8** inclusive, of the dryer felt is the same as that of Example 14. Each of the weft threads *a* is composed of 7s/4 spun Dacron and each of the weft threads *b* and *c* is composed of seven strands of 15s cotton plied with two nylon filament yarns each of 210 total denier. There are 67 warp threads per inch and 50 weft threads per inch in the finished dryer felt. Such a felt is composed of 52.0% by weight of Dacron, 6.4% by weight of nylon and 41.6% by weight of cotton.

Example 18

The weave structure of the dryer felt shown in Fig. 4 is used. Each of the warp yarns **1**, **2**, **3**, **4**, **5** and **6** and each of the face weft yarns *a* are composed of 6s/4 spun Dacron. Each of the warp yarns **7**, **8**, **9**, **10**, **11** and **12** and each of the weft yarns *b* and *c* are composed of eight strands of 15s cotton plied with two nylon filament yarns each of 210 total denier. There are 48 warp threads per inch and 64 weft threads per inch in the finished felt. A dryer felt of this construction, which has a completely weft-flushed face, is composed of 52.1% by weight of Dacron, 6.2% by weight of nylon and 41.7% by weight of cotton.

Example 19

The weave structure of the dryer felt is the same as that of Example 18 as shown in Fig. 4. Each of the warp yarns **1** to **12** inclusive, and each of the face weft yarns *a* are composed of 6s/4 spun Dacron. Each of weft yarns *b* and *c* is composed of eight strands of 15s cotton plied with two nylon filament yarns each of 210 total denier. There are 48 warp threads per inch and 68 weft threads per inch in the finished felt. A dryer felt of this construction is composed of 72.4% by weight of Dacron, 3.6% by weight of nylon and 24.0% by weight of cotton.

Example 20

The weave structure of the dryer felt is the same as that of Example 18 as shown in Fig. 4. Each of the warp yarns **1**, **2**, **3**, **4**, **5** and **6** is composed of 6s/4 spun Dacron and each of the warp yarns **7**, **8**, **9**, **10**, **11** and **12** is composed of five strands of 7s cotton plied with two nylon filament yarns each of 210 total denier. Each of the face weft yarns *a* is composed of asbestos, spun round a core of 6s spun nylon to a resultant count of 0.8s. Each of the weft yarns *b* and *c* is composed of eight strands of 15s cotton plied with two nylon filament yarns each of 210 total denier. There are 46 warp threads per inch and 62 weft threads per inch in the finished felt. A dryer felt of this construction is composed of 17.7% by weight of Dacron, 8.4% by weight of nylon, 36.6% by weight of cotton and 37.3% by weight of asbestos.

Example 21

The weave structure of the dryer felt is the same as that of Example 18 as shown in Fig. 4. Each of the warp yarns is composed of 6s/4 spun Dacron. Each of the face weft yarns *a* is composed of asbestos, spun round a core of 6s spun nylon to a resultant count of 0.8s. Each of the weft yarns *b* and *c* is composed of eight strands of 15s cotton plied with two nylon filament yarns each of 210 total denier. There are 48 warp threads per inch and 62 weft threads per inch in the finished felt. A dryer felt of this construction is composed of 35.7% by weight of Dacron, 8.5% by weight of nylon, 18.4% by weight of cotton, and 37.4% by weight of asbestos.

Example 22

The weave structure of the dryer felt is the same as that of Example 1 as shown in Fig. 1. A blend of 90% cotton and 10% nylon is carded and spun to a count of 14s. Each warp yarn **4** to **8** inclusive, is composed of this 14s cotton-nylon plied 9-fold. Each weft yarn *a*, *b*, *c*, *d* is composed of eight strands of 15s cotton plied with one Dacron filament yarn of 250 total denier. There are 70 warp threads per inch and 54 weft threads per inch in the finished felt. Such a felt is composed of 3.3% by weight of Dacron, 5.9% by weight of nylon and 90.8% by weight of cotton.

Example 23

The weave structure of the dryer felt is the same as that of Example 3 as shown in Fig. 2, and the warp yarns are of the same composition as those of Example 22. Each weft yarn *a*, *b* is composed of seven strands of 7s cotton plied with two Dacron filament yarns each of 250 total denier. There are 63 warp threads per inch and 27 weft threads per inch in the finished felt. Such a felt is composed of 3.6% by weight of Dacron, 5.8% by weight of nylon and 90.6% by weight of cotton.

Example 24

The weave structure of the dryer felt is the same as that of Example 5 as shown in Fig. 3, and the warp yarns **1** to **8** inclusive, are of the same composition as those of Example 22. Each weft yarn *a*, *b*, *c* is composed of six strands of 7s cotton plied with two Dacron filament yarns each of 250 total denier. There are 68 warp threads per inch and 46 weft threads per inch in the finished felt. Such a felt is composed of 5.0% by weight of Dacron, 5.0% by weight of nylon and 90.0% by weight of cotton.

Example 25

Equal weights of Dacron staple fiber and nylon staple fiber are blended, carded, and spun to a count of 6s. Both warp and weft yarns of the dryer felt, the weave structure of which may be that of Example 1 (Fig. 1), Example 3 (Fig. 2), or Example 5 (Fig. 3) are composed of the above 6s blended yarn plied 4-fold.

Example 26

The weave structure of the dryer felt may be the same as that of Example 1 (Fig. 1), Example 3 (Fig. 2), or Example 5 (Fig. 3). Warp and weft yarns are all composed of two strands of 6s spun Dacron, plied with two strands of 6s spun nylon. Dryer felts constructed in ac-

cordance with Examples 25 and 26 are composed of 50% by weight of Dacron and 50% by weight of nylon.

Example 27

The weave structure of the dryer felt may be that of Example 1 (Fig. 1), Example 3 (Fig. 2) or Example 5 (Fig. 3). Each warp yarn is composed of 6s/4 spun Dacron and each weft yarn of 6s/4 spun nylon. Such a dryer felt, when of the weave structure shown in Fig. 1, is composed of 54.8% by weight of Dacron and 45.2% by weight of nylon; when of the weave structure shown in Fig. 2, the dryer felt is composed of 70% by weight of Dacron and 30% by weight of nylon; and when of the weave structure shown in Fig. 3, the dryer felt is composed of 58.6% by weight of Dacron and 41.4% by weight of nylon.

It is to be understood that our invention is not limited to the above examples. The dryer felts employed on a paper-machine vary considerably in weight per unit area, weave structure, counts of yarn and other factors, the nature of the felt being dependent upon the type and structure of the paper-machine, upon the type of paper manufactured, and upon conditions of temperature and humidity appertaining at that drying section of the paper-machine which the felt clothes. Consequently, it is impossible to define all the types and structures of the fabrics to which this invention relates. It is to be understood, however, that yarns of the quality, counts, twist and the like would be used to produce a dryer felt according to the invention as have normally been used hitherto, and that papermakers' dryer felts of the quality, weave, structure, weight per unit area, threads per inch and the like as have hitherto been manufactured for use on a paper-machine, can be produced in accordance with the invention, such dryer felts being constructed of Dacron, cotton and/or asbestos, and/or nylon, in such a manner that any one material is in close contact with the other materials.

In the normal production of paper, during its passage through the drying sections of a paper-machine, the web of paper acquires a high electrostatic charge. On fast-running machines, this static electricity is so troublesome that its discharge through earthed copper wires is essential. From theoretical considerations, it appears probable that if all the drying sections or even those drying sections nearest to the reel-up of the paper-machine were clothed with dryer felts constructed in accordance with this invention, the electrostatic charge on the paper web would be much less than when the drying sections are clothed with felts of the type hitherto manufactured.

It is obvious that the principle of the invention is one which is not confined to the dryer felts used on paper-machines. There are many instances in which the use of fabrics for industrial purposes results in the production of undesirable electrostatic charges, and it is believed that fabrics constructed in accordance with the present invention, because of their ability to eliminate, reduce or, in certain cases, reverse the polarity of the electrostatic charges which tends to accumulate when the fabrics rub against other materials, will find useful applications in many spheres in which fabrics are used industrially. For example, the fabrics which clothe the laundry machines which dry and press laundered textiles were formerly made of wool or cotton. Recently, laundry cloths constructed wholly of Dacron have been introduced, but the expected advantages of the Dacron fabrics have been offset by the disadvantages resulting from the accumulation of electrostatic charges which attend their use. It is believed that a laundry cloth constructed in accordance with the present invention, while retaining the desirable features of a wholly Dacron fabric, will be free from the defect of producing high electrostatic charges in itself and in the materials with which it comes into intimate contact.

As a further example of the application of the present invention, synthetic fibers are being used in the manufacture of filter fabrics and bags which are employed in the filtration of dry materials, for example, in dust extraction apparatus. It is contemplated that such filter fabrics and bags, constructed in accordance with the present invention, will exhibit less tendency to become ineffective due to the blocking of fiber interstices by dust particles than the fabrics and bags now constructed of only one type of fiber.

We claim:

1. A papermakers' dryer felt consisting of non-felting fibrous material, a portion of said fibrous material being Dacron which is electro-negative as compared with cotton, and another portion of said fibrous material being nylon which is electro-positive as compared with cotton, the relative proportions of the Dacron and nylon being such as to render the felt, as a whole, substantially neutral electrostatically, the Dacron constituting from 3.6% to 72% of the total weight of the felt, and the nylon constituting from 3% to 50% of the total weight of the felt.

2. A papermakers' dryer felt, according to claim 1, wherein Dacron constitutes at least 3.2% and nylon constitutes at least 2.3% of the total weight of the felt.

3. A papermakers' dryer felt, according to claim 1, wherein the total amount of Dacron and nylon combined constitutes at least 50% by weight of the felt.

4. A papermakers' dryer felt, according to claim 1, wherein the total amount of Dacron and nylon combined constitutes at least 75% of the total weight of the felt.

5. A papermakers' dryer felt, according to claim 1, wherein the felt consists solely of Dacron and nylon in equal proportions by weight.

6. A papermakers' dryer felt, according to claim 1, wherein Dacron and nylon constitute the entire felt, the proportion of Dacron to nylon being of the order of 72% to 28%.

7. A papermakers' dryer felt, according to claim 1, wherein the felt comprises a natural fibrous material in addition to the Dacron and nylon.

8. A papermakers' dryer felt, according to claim 1, wherein the felt comprises cotton in addition to Dacron and nylon.

9. A papermakers' dryer felt consisting of interwoven warp and weft yarns, certain at least of said yarns comprising Dacron which, under the conditions of use of such a dryer felt, tends to accumulate a negative electrostatic charge, and certain at least of said yarns comprising nylon which, under the conditions of use of such a felt, is electro-positive relatively to Dacron, the Dacron and nylon being disposed in electrical conducting relation within the felt and being in such relative proportions that they electrically neutralize each other so that the felt, as a whole, does not tend to accumulate foreign material by electrostatic attraction.

10. A papermakers' dryer felt, according to claim 9, further characterized that in certain at least of said yarns both Dacron and nylon are incorporated.

11. A papermakers' dryer felt, according to claim 9, further characterized in that certain at least of the warp yarns consist of Dacron and nylon in contact with each other.

12. A papermakers' dryer felt, according to claim 9, wherein certain at least of the yarns consist of a blend of Dacron and nylon alone.

13. A papermakers' dryer felt, according to claim 9, further characterized in that certain at least of the yarns consist only of Dacron.

14. A papermakers' dryer felt, according to claim 9, further characterized in that certain at least of the yarns comprise Dacron, cotton and nylon spun together.

15. A woven fabric which, if subjected to friction during use, remains substantially neutral electrostatically, said fabric comprising fibrous textile material spun into yarns, some of the fibrous material being Dacron and

some of the fibrous material being nylon, the Dacron material being characteristically electro-negative while the nylon material is characteristically electro-positive, the Dacron and nylon fibrous materials being so disposed in the fabric as to contact each other, and being in such relative proportions that the fabric, as a whole, remains of substantially zero potential electrostatically during use.

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