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ELECTROCONDUCTIVE PAPERMAKERS FELT
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This invention relates to papermaker's felts for use upon papermaking machines such as those employed in the manufacture of paper, paperboard, asbestos-cement products, and various types of insulating board, and more especially, it pertains to an electroconductive fabric apron or felt for use in the "wet" press section of a papermaking machine.

One important object of the invention is to produce a "wet" felt which incorporates on its bottom surface parallel sets of exposed bare wire electric conductors disposed in a longitudinal direction only therein and which will make use of an electrically induced current at the wet press section which passes from the electric conductors of the advancing and receding runs of the felt in operation through the felt apron and the wet paper web that is supported on the top surface thereof to a top press roll thereby effecting heating and faster removal flow of the water from the wet paper web and the wet felt passing through the nips of the press rolls to permit faster operation and production of the papermaking machine.

In carrying out the invention, I construct my improved felt with a multi-ply structure having at least two superposed woven fabric plies each including a plurality of woven warp and filling yarns of non-conductive all-textile material, one of said woven fabric plies forming the back surface of the felt, and I further incorporate in this back ply a plurality of uninsulated and completely bare metallic electric conductors which are disposed therein in spaced parallel relationship and extend longitudinally in the direction of the warp yarns only thereof. Thus, the top ply of the felt which supports and transports the paper web has no electroconductive material while the bottom or back ply incorporates electroconductive material therein.

Furthermore, these bare metal electric conductor members not only lie in the plane of the back face of this felt structure but they are further arranged so that they expose at definite intervals along their respective longitudinal runs a series of bare metal linear lengths which are to be engaged with the outer metal surface of an electrically connected guide member for the felt and with which such exposed bare metal runs of each conductor member are brought serially into direct metal engagement therewith to effect good electrical connection between them in the course of normal travel of the moving felt over such guide member when in working use thereof.

An illustrative embodiment of the invention is described in detail in the following specification and shown in the drawings, in which:

Fig. 1 is a fragmentary top plan view of the upper or top face of such illustrative felt embodiment;

Fig. 2 is an inverted fragmentary bottom plan view of the lower or back face of the Fig. 1 illustrative felt embodiment;

Fig. 3 is an expanded view, on enlarged scale, of the area of the upper face of the felt fragment shown in Fig. 2 and contained within the rectangular outline R indicated therein by the dot and dash lines;

Fig. 4 is an expanded view, on enlarged scale, of the area of the inverted back face of the felt fragment shown in Fig. 2 and contained within the rectangular outline R indicated therein by the dot and dash lines;

Figs. 5 through 10 are enlarged sectional views taken vertically on the lines 5—5, 6—6, 7—7, 8—8, 9—9, and 10—10, respectively, of Fig. 3 looking in the direction of the arrows and showing the respective disposition of the warp strands and of the proximate filling pick at such respective sections;

Fig. 11 is a diagrammatic view of a papermaking machine embodying an electroconductive felt constructed according to the present invention; and

Fig. 12 is a pictorial view, on enlarged scale, showing structural details of a fragmental portion of one of the electric conductor wires used in the construction of my felt.

Referring to the drawing in detail, the improved papermaker's felt apron according to the invention is generally designated by the reference letter F and comprises a multi-ply woven fabric which for the purpose of illustration is here shown as composed of two plies of woven construction and includes in each pattern repeat of the weave a plurality of longitudinal warp threads or strands 15 of wool or synthetic yarns, or blends thereof, and a plurality of transverse filling threads or strands 16, 17, 18, 19, 20 and 21 which may be composed of wool or synthetic yarns, or blends thereof. Additional longitudinal warp threads or strands are incorporated in the lower or inner ply which forms the back face of the woven felt and these consist of a plurality of unalloyed and completely bare metallic electric conductors 22.

The metallic electric conductors 22 used in the felt are alike in that they comprise a flexible braided bare metal strand, which may be made up of groups of copper or aluminum wires. Also, these conductors are of flattened cross-section, as indicated at 25 and 26, see FIGS. 7 and 12, whereby they offer a line contact with the periphery of the rolls against and over which they run as they travel with the moving felt F around such rolls, see FIG. 11. These electric conductors additionally, if desired, may be provided with a coating of silver (not shown) in order to enhance their electrical conductivity as well as to prevent corrosion and detrimental staining effects which might result from oxidation of an uncoated or bare copper wire.

As depicted in FIGS. 2 and 4, each of the electric conductors 22 presents at definite linear intervals along its longitudinal extent in the lower ply of the felt and in the plane of its back or bottom surface a succession of exposed bare metallic sections 28 which are unalloyed by filling threads or strands and are close at and readily accessible to the surface of the back face of the felt for direct rubbing contact with a metallic energizing member, such as, for example, the peripheral outer metal surface of one or more tail guide rolls operatively connected with a suitable source of electric current, see FIG. 11, as will be hereafter described. It will be noted from the weave arrangement as shown in FIGS. 5 to 10 inclusive that the bare metal electric conductors 22 are affixed to the felt only at predetermined intervals of their respective lengths and they are held in place in the felt solely by the binder filling picks 20, see FIG. 9, interlacing the upper and lower plies of the felt together to make this a unitary two-ply construction.

While the filling picks or strands 17 and 20 shown in FIGS. 6 and 9, respectively, are employed as binder strands for joining and binding the two plies together only the binder filling strands 20 on their downward and upward traverses pass under and engage the bare metal conductor wires 22 in the warp of the lower ply structure to secure and hold the bare wires 22 in the back surface or bottom face of my felt.

Referring now to FIG. 11, I have shown a diagrammatic representation of certain of the press rolls which make up a typical "wet press" section of a papermaking machine. As there shown, this figure of the drawing includes an...
upper row of rotatable press rolls 30, 31 and 32 and a lower rotatable press roll 33 which is disposed beneath and in a cooperating relationship with the upper intermediate press roll 31. The usual paper web 35 formed on the papermaking machine is depicted as being disposed to travel in the direction of the arrows and in the course of such movement, it is guided over, around and between the respective press rolls 30, 31 and 32 as it passes through the respective nips thereof as shown.

As is well known, the papermaker's felts or aprons are endless when installed on the press rolls of a papermaking machine. In the present instance, an electroconductive felt F constructed in accordance with the invention described herein is shown endless and running over, around and between the respective nips of the press rolls 30, 31, 33 and 32 under and along the paper web 35. It will be understood that the felt apron F is provided with a number of additional suitable guiding rolls 36, 37, 38, 39, 40, 41 and 42 which need not be described in detail since they form no part of the invention.

The electric current may be supplied in any suitable manner such as, for example, by means of a suitable generator 45, one pole of which is grounded, as indicated at 46, and the other pole of which is electrically connected to the upper intermediate press roll 31 as by means of leads 47 and 48 in series with a rheostat 50. The tail guide rolls 37 and 41 are ground as indicated in FIG. 11.

The exposed bare metallic sections 38 of the electric conductors 22 on the surface of the felt passing in succession between the nips of the press rolls 30, 31, 33, and 32 and bearing against and guided over the metal faces of the respective peripheries of the tail guide rolls cause electric current to flow from either or both grounded tail guide rolls 37 or 41 along the respective longitudinal advancing or receding runs of the metal conductors 22 to the sections thereof under the felt structure engaged at the aforementioned nips of said coating press rolls, where the electric current then passes to the roll 31 from the conductors 22 through the wet felt F and the paper web 35 and carried thereon, thereby completing the electrical circuit to the generator 45 by reason of its ground 46.

The flow of electric current through the moving wet felt F and the traveling wet paper web 35 supported thereon produces heating of the water contained therein and is effective to raise the viscosity of such water so as to cause faster liquid drainage through the felt and away from the nips of the press rolls 30, 31 and 32 than otherwise would be expected mechanically by the squeeze of the press rolls alone. It will be understood that the metallic electric conductors 22 are situated entirely in the lower woven fabric ply of the felt and do not come in direct contact at any time with the paper web 35 as they are kept separated therefrom by the non-conductive textile strands or threads of the woven structure of the felt F. Consequently, the drying of the paper web by the heating action of the electric current combined with the squeeze of the press rolls 30, 31, 32 and 33 permits faster extraction and more effective removal of water from the wet paper web and hence faster operation and production of the papermaking machine.

It is meant by the term "non-conductive strands" as used in this specification and the claims appended thereto that the all-textile yarns or threads which form the warp and the filling strands of the multi-ply woven fabric structure of the felt, as well as the filling yarns or threads used for binding the woven fabric plies together into a unitary felt structure, are characterized by not being of a nature as to be non-conductors of electricity.

While one specific form of the invention has been disclosed herein it will be apparent that various other forms and modifications can be made, including the number of plies in the felt structure, without departing from the spirit of the invention, and it is therefore intended that the invention include all modifications and equivalents which fall within the scope of the appended claims.

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