Dec. 11, 1962 J. H. DRAPER, JR 3,067,779

ELECTROCONDUCTIVE PAPERMAKER'S FELT

Filed Feb. 4, 1960

FIG. 1

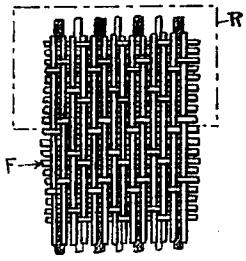


FIG. 2

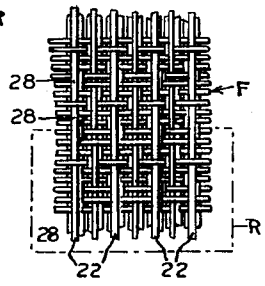


FIG. 3

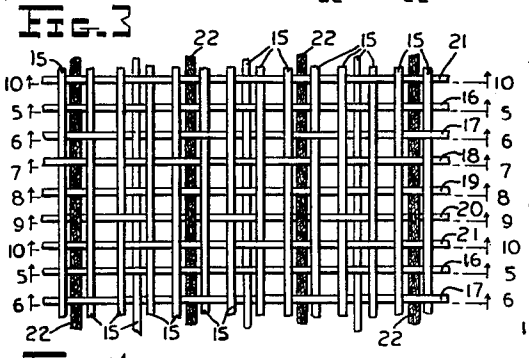


FIG. 4

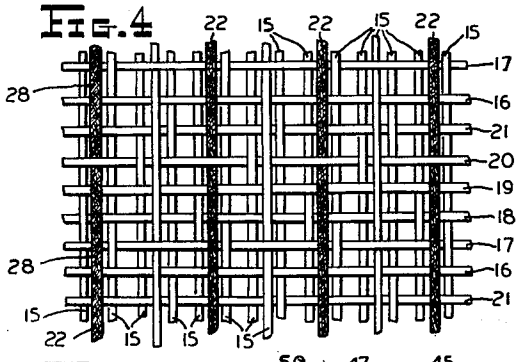


FIG. 5

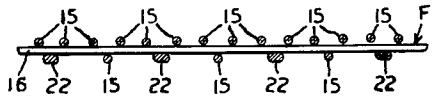


FIG. 6

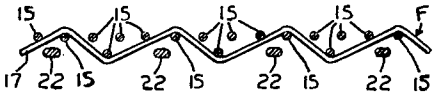


FIG. 7

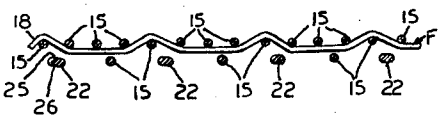


FIG. 8

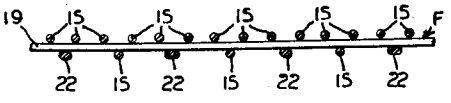


FIG. 9

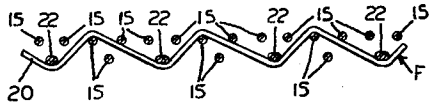


FIG. 10

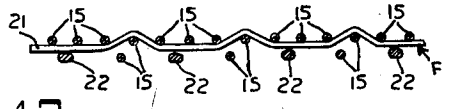


FIG. 11

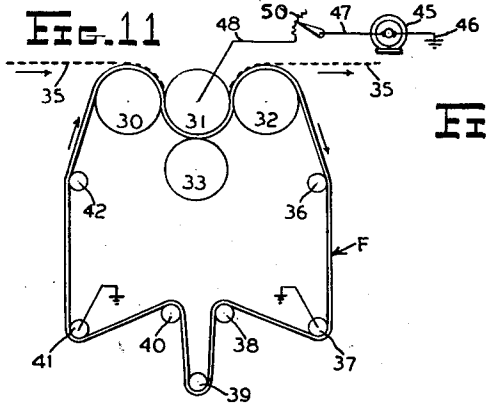
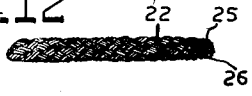


FIG. 12



JOHN H. DRAPER, JR.
INVENTOR.

BY

W Russell Greenwood
ATTORNEY

United States Patent Office 3,067,779 Patented Dec. 11, 1962

3,067,779

ELECTROCONDUCTIVE PAPERMAKER'S FELT

John H. Draper, Jr., Canton, Mass., assignor to Draper Brothers Company, Canton, Mass., a corporation of Massachusetts

Filed Feb. 4, 1960, Ser. No. 6,706
2 Claims. (Cl. 139—383)

This invention relates to papermaker's felts for use upon papermaking machines such as those employed in the manufacture of paper, paper board, 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 thereto.

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 uninsulated 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 unattached 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 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 grounded as indicated in FIG. 11.

The exposed bare metallic sections **28** 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 coacting press rolls, where the electric current then passes to the roll **31** from the conductors **22** through the wet felt F and the wet paper web **35** 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 content thereof 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 extracted 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 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 all 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.

What is claimed is:

1. An electroconductive papermaker's felt for supporting, transporting, and draining wet papermaking material, said felt having a multi-ply-fabric structure comprising at least two superposed woven fabric plies of which the bottom ply forms the back side of said felt and the top ply forms the front and outer side thereof for supporting and transporting wet papermaking material to be drained, each of said plies having an open porous weave to provide rapid liquid drainage passages through the felt from the front side to the back side thereof, all warp and filling strands of said top ply as well as alternate warp strands and all filling strands of said bottom ply being yarns of non-electroconductive all-textile fibers, and a plurality of completely bare linear metallic electric conductor warp elements extending longitudinally of the felt and alternating in the same plane with the all-textile warp yarns of the bottom ply and in spaced substantially parallel relationship therewith, said bare metallic electric conductor elements each being of flattened cross-section and firmly secured to said bottom fabric ply at definite intervals along its linear extent by certain filling strands effective to present readily engageable bare linear runs of said conductor elements lying in the plane of the bottom fabric ply, the said respective conductor-securing filling strands extending through the body of the felt and interlacing together said top and bottom fabric plies thereof at definite intervals across the felt to tightly bind them together into a resultant unitary felt structure.

2. An electroconductive papermaker's felt for supporting, transporting, and draining wet papermaking material, said felt having a double-ply fabric structure comprising upper and lower woven fabric plies of which the lower ply forms the back side of said felt and the upper ply forms the front and outer side thereof for supporting and transporting wet papermaking material to be drained, each of said plies having an open porous weave to provide rapid liquid drainage passages through the felt from the front side to the back side thereof, all warp and filling strands of said upper ply as well as alternate warp strands and all filling strands of said lower ply being yarns of non-electroconductive all-textile fibers, and a plurality of completely bare metallic electric conductor warp elements extending in a direction longitudinally of the felt and alternating in the same plane with the all-textile warp yarns of the bottom ply and in spaced substantially parallel relationship thereto and with each other, said metallic electric conductor elements each having bare linear runs exposed at definite intervals along its length and readily engageable for contact in the plane of the outer surface of said bottom fabric ply, certain of said respective filling yarns only extending through the body of the felt and interlacing together said upper and lower woven fabric plies at definite intervals across the felt and in the longitudinal extent of said metallic electric conductor warp elements so as to secure the latter firmly in place in the weave of said bottom fabric ply of the felt and also tightly bind together the top and bottom plies thereof into a resultant unitary felt structure.

References Cited in the file of this patent

UNITED STATES PATENTS

1,178,556	Tompkins	Apr. 11, 1916
1,739,766	Morris	Dec. 17, 1929
1,925,917	Chalon	Sept. 5, 1933
2,038,712	Brodin	Apr. 28, 1936
2,327,756	Adamson	Aug. 24, 1943
2,375,997	Larson	May 15, 1945
2,680,079	Huebner	June 1, 1954
2,955,969	Runton	Oct. 11, 1960
3,000,106	Christgau	Sept. 19, 1961

FOREIGN PATENTS

534,356	Canada	Dec. 11, 1956
447,299	France	Oct. 24, 1912
449,079	Germany	Sept. 1, 1927