

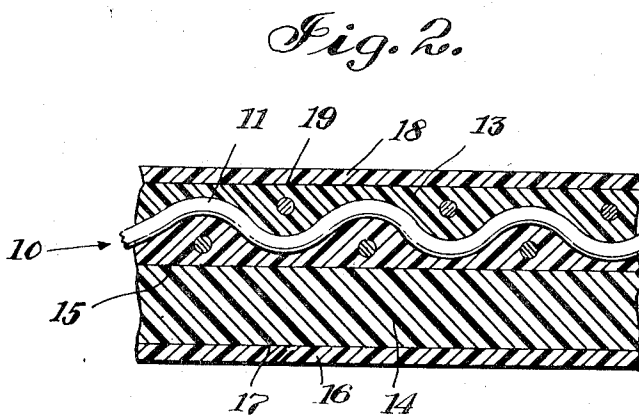
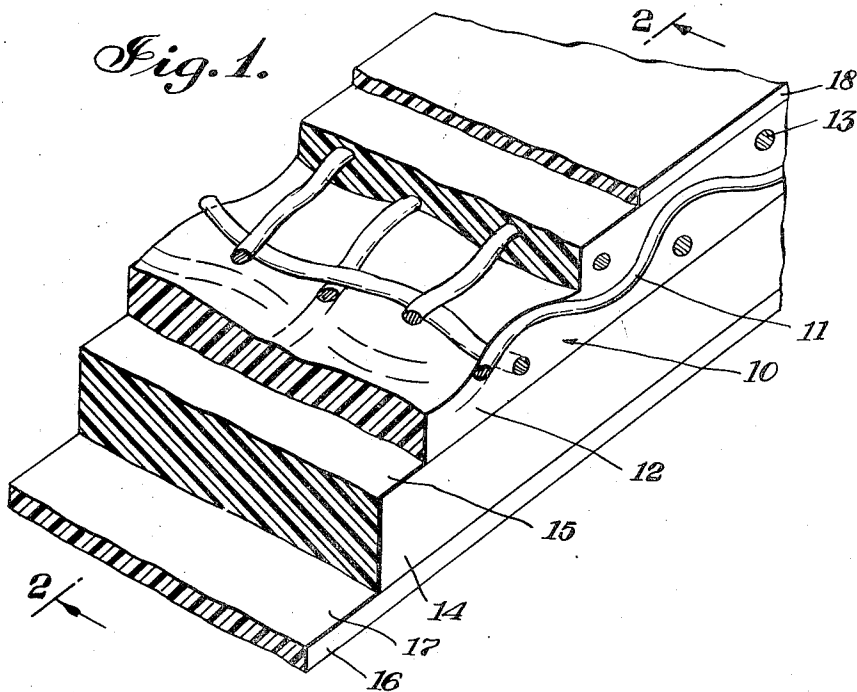
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2,527,299

WATER IMPERMEABLE SHEET MATERIAL

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22

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WATER IMPERMEABLE SHEET MATERIAL

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4 Claims. (Cl. 154—50)

1

The present application is a continuation-in-part of my copending U. S. patent application Serial No. 565,311, filed Nov. 27, 1944, and entitled "Coated Fabrics and Methods of Producing the Same," now abandoned.

My present invention relates to fabric sheets and more particularly to water impervious but moisture vapor transmitting fabric sheets.

It is an object of my present invention to provide a fabric sheet which is simultaneously highly water impervious and moisture vapor transmitting.

More particularly, it is an object of my present invention to provide a water impervious textile fabric sheet which is adapted not only to transmit but also to absorb moisture vapors.

It is a further object of my present invention to provide a coated fabric which is adapted to withstand considerable hydrostatic pressure and has at the same time a relatively high vapor transmission.

Furthermore, it is also a very important object of my present invention to provide a fabric the moisture vapor transmission rate of which is greater in one direction than in the opposite one.

Still another object of my invention is to provide coated fabrics of the above type which can be joined by cementing and the cemented edge portions of which will be at least as strong as the coated fabrics themselves.

Finally, it is also an object of my present invention to provide a coated material which can be joined by heat sealing to form waterproof joints without losing the characteristic properties of the joined fabrics, namely their water impermeability, absorptivity, predetermined moisture vapor transmission, and ability to withstand hydrostatic pressure.

With the above objects in view, my present invention mainly consists of a fabric sheet of the character described above comprising in combination a fabric layer, a relatively thick moisture vapor transmitting plastic coating adhering to one face of this fabric layer, and a relatively thin moisture vapor transmitting plastic coating adhering to the other face of this fabric layer.

I have found it advisable to produce a fabric sheet of the above type so that at and near its both faces it is highly absorbent so as to be adapted to absorb moisture vapors which are then transmitted through the fabric sheet by the moisture vapor transmitting plastic coatings.

A preferred embodiment of a fabric sheet according to my present invention is composed of

2

a fabric layer, a relatively thick, moisture vapor transmitting, water impervious plastic coating adhering to one face of this fabric layer, a relatively thin, moisture vapor transmitting, absorbent plastic coating adhering to the other face of this fabric layer and a moisture vapor transmitting absorbent plastic coating adhering to the outer face of the above mentioned relatively thick, moisture vapor transmitting, water impervious plastic coating.

I have found that fabric sheets of the above defined type have the characteristic feature of transmitting moisture vapors through the fabric sheet predetermined in one direction at a higher rate than in opposite direction. Actually, I have found that fabrics of the above described type transmit moisture vapors from the outer face of the moisture vapor transmitting plastic coating adhering to the outer face of the relatively thick, moisture vapor transmitting, water impervious plastic coating to the outer face of the relatively thin, moisture vapor transmitting, absorbent plastic coating adhering directly to the fabric layer much quicker, i. e. at a faster rate than in opposite direction.

Generally speaking, if a fabric is provided on its two faces with coatings of moisture vapor transmitting plastic material and one of these coatings is thicker than the other, then moisture vapors absorbed on the outer face of the thicker coating are transmitted through the fabric sheet to the outer face of the thinner coating at a much faster rate than in opposite direction. Thus, the moisture vapor transmission rate of a fabric of this type in direction from the outer face of the thicker coating to the outer face of the thinner coating is substantially greater than in opposite direction, i. e. in direction from the outer face of the thinner coating to the outer face of the thicker coating.

In this connection, it should be mentioned that it is of great importance from the point of view of the present invention that the fabric sheet is highly absorbent, i. e. that it contains highly absorbent strata at least at and near its outer faces.

I have found that particularly good results were obtained with a fabric sheet comprising in combination a fabric layer, a relatively thick, moisture vapor transmitting, substantially not absorbent and water impervious plastic coating adhering to one face of this fabric layer, a relatively thin highly absorbent moisture vapor transmitting and water pervious plastic coating adhering to the other face of this fabric layer, and a relatively thin, highly absorbent, moisture

vapor transmitting and water pervious plastic coating adhering to the outer face of the above mentioned relatively thick, moisture vapor transmitting, substantially not absorbent and water impervious plastic coating.

In order to obtain good adherence of the coatings to the fabric layer, I have found it advisable to produce first a supporting sheet consisting of a layer of moisture vapor transmitting plastic material having a fabric sheet embedded therein and to provide on one face of this supporting sheet the relatively thick coating and on the other face the relatively thin coating defined above.

The plastic coatings described above might include different ingredients. Although variations within wide limits are possible, I have found it advisable to use for the relatively thick, moisture vapor transmitting, water impervious plastic coating a composition including as main active ingredients at least one vinyl copolymer and a transmitting agent having a low solubility in water and a relatively high solubility for water; furthermore, I have found it advisable to use for the outer relatively thin plastic coating defined above a composition including as main active ingredients at least one vinyl copolymer and a highly absorbent agent.

In accordance with a particularly preferred embodiment of my present invention, the relatively thick coating defined above comprises at least one vinyl copolymer, at least one transmitting agent having a low solubility in water and a relatively high solubility for water, at least one pigment substance, at least one chemical plasticizer and at least one inert filler material; furthermore, also in accordance with a particularly preferred embodiment of my present invention, the outer relatively thin highly absorbent coatings defined above consist of a composition composed mainly of at least one vinyl copolymer, at least one pigment substance, at least one chemical plasticizer, and at least one highly absorbent agent.

It should be stressed that the outer plastic coatings preferably include at the time when they are applied to the fabric sheet a great percentage of a highly volatile fluid being a solvent for the composition of which these coatings consist; however, this solvent volatilizes soon after application of the plastic coatings so that it is not present and does not form part of the final fabric sheet. Nevertheless, its presence during application of the outer plastic coating is of great importance as its evaporation causes formation of small pores in the outer plastic coatings making the same porous and thus increasing their initial absorptivity which is due to the incorporation of the highly absorbent agent or agents into the composition of which the outer plastic coatings consist.

I wish to note that by changing the compositions used for the various coatings defined above, I might not only regulate within wide limits the absolute moisture vapor transmission rate of a fabric sheet according to my present invention, but also adjust the difference between the moisture vapor transmission rate of such a fabric in opposite directions.

Particularly good results, i. e. particularly high moisture vapor transmission in one direction and particularly low moisture vapor transmission in the opposite direction, were obtained with fabric sheets in which the above defined relatively thick, moisture vapor transmitting, substantially

not absorbent and water impervious plastic coating comprises at least one vinyl copolymer having an average molecular weight of between 16,000 and 24,000, at least one monomeric elasticator of a fatty acid, at least one pigment, at least one chemical plasticizer being a solvent for the above mentioned vinyl copolymer and having a low solubility in water and a relatively high solubility for water, and at least one inert filler material; in a fabric sheet of this type, the outer highly absorbent and highly moisture vapor transmitting coatings preferably consist of a composition composed mainly of at least one vinyl copolymer having an average molecular weight of between 16,000 and 24,000, at least one pigment substance, at least one chemical plasticizer being a solvent for the above vinyl copolymer and having a low solubility in water and a relatively high solubility for water and at least one light-weight, porous, solid absorbing agent having a high water absorbing capacity and a low water transmitting capacity.

Actual tests carried out showed that by use of certain compositions it is possible to obtain a fabric sheet having a moisture vapor transmission rate in one direction which is more than twice as great as the moisture vapor transmission in the opposite direction. To obtain such results, I have found it advisable to use for the relatively thick coating refined above a composition comprising at least one vinyl copolymer made by the conjoined polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of between 88.5 and 95% and an average molecular weight of between 16,000 and 24,000, at least one transmitting agent selected from the group consisting of dicaprylate of triethylene glycol with some of the triethylene glycol di-esters of other fatty acids, methoxy glycol subacetate, methoxy glycol acetylricinoleate, and polyethylene glycol di- α -ethyl hexoate, at least one pigment substance, at least one chemical plasticizer selected from the group consisting of tricresyl phosphate, butoxy glycol phthalate and ethoxy diglycol phthalate, and at least one inert filler material selected from the group consisting of calcium carbonate, china clay and asbestine; for the outer highly absorbent coating I preferably use in a fabric sheet of this type a composition consisting mainly of at least one vinyl copolymer made by the conjoined polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of between 88.5 and 95% and an average molecular weight of between 16,000 and 24,000, at least one pigment substance, at least one chemical plasticizer selected from the group consisting of tricresyl phosphate, butoxy glycol phthalate and ethoxy diglycol phthalate, and at least one light-weight porous solid absorbing agent selected from the group of activated siliceous materials, activated earths and activated clays.

Finally, it should be mentioned that fabric sheets combining high water impermeability with high moisture vapor transmission and great difference between such moisture vapor transmission in opposite directions were obtained by using for the various coatings the following compositions: for the relatively thick water impervious coating a composition was used which contained about 38% of at least one vinyl copolymer having an average molecular weight of between 16,000 and 24,000, about 11% of a monomeric elasticator of a fatty acid, about 14% of a pigment, about 12% of a chemical plasticizer being

5

a solvent for said vinyl copolymer and having a low solubility in water and a relatively high solubility for water, and about 25% of an inert filler material; for the outer highly absorbent coatings a composition was used containing about 15% of a vinyl copolymer having an average weight of between 16,000 and 24,000, about 4% of a pigment substance, about 4% of a chemical plasticizer being a solvent for said vinyl copolymer and having a low solubility in water and a relatively high solubility for water, about 1% of an inert filler material, about 73% of a highly volatile solvent for the above mentioned vinyl copolymer, and about 5% of a light-weight porous solid absorbing agent having a high water absorbing capacity.

It should be stressed that the supporting sheet defined above, i. e. the anchor-coated fabric, contains a plastic composition which is identical or similar to the composition of which the outer highly absorbent coatings defined above consist.

Furthermore, it should be stressed that it is possible to apply the various coatings defined above in various manners, e. g. by knife coating, calender coating, laminating, or in any other desired way. However, I have found that particularly good results were obtained if the anchor-coats forming the supporting sheet are applied by knife coating, the relatively thick water impervious coating defined above is applied by calender coating, and the outer highly absorbent coatings are again applied by knife coating. In this manner, it is possible to make the relatively thick inner coating water impervious and to make the outer coatings porous and thus highly absorbent.

The novel features which I consider as characteristic for my invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 shows a perspective view of a fabric according to my present invention with the coatings partly broken away; and

Fig. 2 shows a cross section through the fabric shown in Fig. 1, along line 2—2 of Fig. 1.

As shown in the drawing, a fabric sheet according to my present invention consists of a supporting sheet 10 which is composed of a textile fabric 11 provided on both faces with knife coated anchor coats 12 and 13 penetrating through the fabric so that the same is actually embedded in these anchor coats.

The relatively thick, water impervious, substantially not absorbent and moisture vapor transmitting coating 14 of the type defined above is applied to the outer face 15 of the anchor coat 12 by calendering.

The relatively thin, moisture vapor transmitting, highly absorbent and water pervious coating 16 is applied by knife coating to the outer face 17 of coating 14.

Similarly, the relatively thin, moisture vapor transmitting, highly absorbent and water pervious coating 18 of the type defined above is applied by knife coating to the outer face 19 of the anchor coat 13.

Good results were obtained with a fabric sheet in which the entire thickness of the supporting sheet 10 was about nine thousandths of an inch, the thickness of the relatively thick coating 14

6

about five thousandths of an inch and the thickness of each of the outer coatings 16 and 18 about one thousandth of an inch.

The following examples illustrate various fabric sheets according to my present invention without, however, limiting the same to the particular fabric sheets described below:

(1) A fabric sheet according to my present invention consists of:

(a) A cotton fabric;

(b) Two anchor coats applied by knife coating to both faces of this fabric and consisting of a plastic composition composed of 14.47% of a vinyl copolymer, 3.5% of a color pigment, .92% of calcium carbonate, 72.63% of acetone, 4.58% of activated earth, and 3.9% of tricresyl phosphate;

(c) A relatively thick coat applied by calendering to the outer face of one of the above described anchor coats and consisting of a plastic composition composed of 38.1% of a vinyl copolymer, 11.4% of methoxy-glycol acetyl-ricinoleate, 13.5% of a color pigment, 12% of butoxy glycol phthalate, and 25% of china clay; and

(d) Two relatively thin outer knife coats, one adhering to the outer face of the other anchor coat defined above and the other adhering to the outer face of the relatively thick coat also defined above. These knife coats consist of the same plastic composition as the anchor coats described above, namely of 14.47% of a vinyl copolymer, 3.5% of a color pigment, .92% of calcium carbonate, 72.63% of acetone, 4.58% of activated earth, and 3.9% of tricresyl phosphate.

(2) Another fabric sheet according to my present invention consists of:

(a) A cotton fabric;

(b) Two anchor coats applied by knife coating to both faces of this fabric and consisting of a plastic composition composed of 14.47% of a vinyl copolymer, 2.5% of a color pigment, .92% of calcium carbonate, 64.31% of acetone, 12% of activated earth, and 5.8% of tricresyl phosphate;

(c) A relatively thick coat applied by calendering to the outer face of one of the above described anchor coats and consisting of a plastic composition composed of 38.1% of a vinyl copolymer, 4% of methoxy-glycol acetyl-ricinoleate, 13.5% of a color pigment, 19.4% of butoxy glycol phthalate, and 25% of china clay; and

(d) Two relatively thin outer knife coats, one adhering to the outer face of the other anchor coat defined above and the other adhering to the outer face of the relatively thick coat also defined above. These knife coats consist of the same plastic composition as the anchor coats described above, namely 14.47% of a vinyl copolymer, 2.5% of a color pigment, .92% of calcium carbonate, 64.31% of acetone, 12% of activated earth, and 5.8% of tricresyl phosphate.

(3) Still another fabric sheet according to my present invention consists of:

(a) A cotton fabric;

(b) Two anchor coats applied by knife coating to both faces of this fabric and consisting of a plastic composition composed of 14.47% of a vinyl copolymer, 4.5% of a color pigment, 66.55% of acetone, 8.58% of activated earth, and 5.9% of tricresyl phosphate;

(c) A relatively thick coat applied by calendering to the outer face of one of the above described anchor coats and consisting of a plastic composition composed of 38.1% of a vinyl copolymer, 36% of methoxy-glycol acetyl-ricinoleate, 5% of

a color pigment, 4% of butoxy glycol phthalate, and 16.9% of china clay; and

(d) Two relatively thin outer knife coats, one adhering to the outer face of the other anchor coat defined above and the other adhering to the outer face of the relatively thick coat also defined above. These knife coats consist of the same plastic compositions as the anchor coats described above, namely of 14.47% of a vinyl copolymer, 4.5% of a color pigment, 66.55% of acetone, 8.58% of activated earth, and 5.9% of tricresyl phosphate.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of insulating sheets, differing from the types described above.

While I have illustrated and described the invention as embodied in fabric sheets, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent is:

1. A coated fabric sheet characterized by high water impermeability and high moisture transmission properties, comprising a fabric layer, a thick base layer of a substantially non-absorbent, water impervious, moisture transmitting, plastic coating adhering to one face of the fabric layer, which comprises a major amount of a vinyl copolymer prepared by the polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of 88.5%-95% and an average molecular weight of 16,000-24,000, and minor amounts of a glycol ester of a fatty acid as a moisture vapor transmitting agent, pigment, plasticizer selected from the class consisting of organic phosphates and phthalates, and inert filler, and two thin outer layers of porous, absorbent, water pervious, plastic coatings which transmit water vapor, one of which adheres to the other face of the fabric layer and the other of said thin layers adhering to the outer face of the thick base layer, each of said thin layers comprising a major amount of said vinyl copolymer and minor amounts of a solid porous absorbent, pigment, filler, and said plasticizer.

2. A coated fabric sheet characterized by high water impermeability and high moisture transmission properties, comprising a fabric layer, a thick base layer having a thickness of about .005 inch of a substantially non-absorbent, water impervious, moisture transmitting, plastic coating adhering to one face of the fabric layer, which comprises a major amount of a vinyl copolymer prepared by the polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of 88.5%-95% and an average molecular weight of 16,000-24,000, and minor amounts of a glycol ester of a fatty acid as a moisture vapor transmitting agent, pigment, plasticizer selected from the class consisting of organic phosphates and phthalates, and inert filler, and two thin outer layers each having a thickness of about .001 inch of porous, absorbent, water pervious, plastic coatings which transmit water vapor, one of which adheres to the other face of the fabric layer and the other of said thin layers adhering to the outer face of the

thick base layer, each of said thin layers comprising a major amount of said vinyl copolymer and minor amounts of a solid porous absorbent, pigment, filler, and said plasticizer.

3. A coated fabric sheet characterized by high water impermeability and high moisture transmission properties, comprising a fabric layer, a thick base layer of a substantially non-absorbent, water impervious, moisture transmitting, plastic coating adhering to one face of the fabric layer, which comprises about 38% of a vinyl copolymer prepared by the polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of 88.5-95% and an average molecular weight of 16,000-24,000, about 11% of a glycol ester of a fatty acid as a moisture vapor transmitting agent, about 14% pigment, about 12% of a plasticizer selected from the class consisting of organic phosphates and phthalates, and about 25% inert filler, and two thin outer layers of porous, absorbent, water pervious, plastic coatings which transmit water vapor, one of which adheres to the other face of the fabric layer and the other of said thin layers adhering to the outer face of the thick base layer, each of said thin layers comprising the residue of about 14.5% of said vinyl copolymer, about 3.5% pigment, about 4% of said plasticizer, about 1% inert filler, about 72.5% of a highly volatile solvent for said vinyl copolymer, and about 4.5% of a solid porous absorbent.

4. A coated fabric sheet characterized by high water impermeability and high moisture transmission properties, comprising a fabric layer, a thick base layer of substantially non-absorbent, water impervious, moisture transmitting, plastic coating adhering to one face of the fabric layer, which comprises about 38% of a vinyl copolymer prepared by the polymerization of vinyl chloride with vinyl acetate and having a combined vinyl chloride content of 88.5%-95% and an average molecular weight of 16,000-24,000, about 36% of a glycol ester of a fatty acid as a moisture vapor transmitting agent about 5% pigment, about 4% of a plasticizer selected from the class consisting of organic phosphates and phthalates, and about 17% inert filler, and two thin outer layers of porous, absorbent, water pervious, plastic coatings which transmit water vapor, one of which adheres to the other face of the fabric layer and the other of said thin layers adhering to the outer face of the thick base layer, each of said thin layers comprising the residue of about 14.5% of said vinyl copolymer, about 4.5% pigment, about 6% of said plasticizer, about 1% inert filler, about 66.5% of a highly volatile solvent for said vinyl copolymer, and about 8.5% of a solid porous absorbent.

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