June 19, 1923. 1,459,499

H. E. BROWN ET AL

WATERPROOF SHEET MATERIAL AND PROCESS OF MAKING THE SAME

Filed Dec. 2, 1921

Fig. 1.

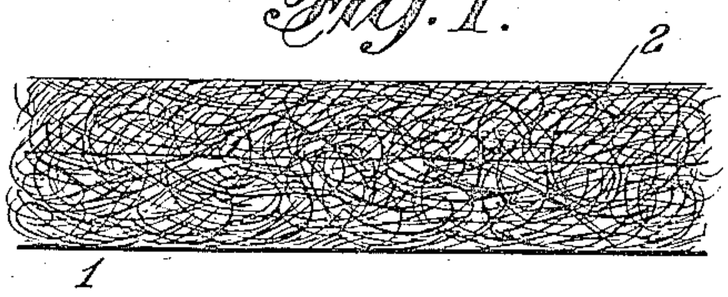

Fig. 2.

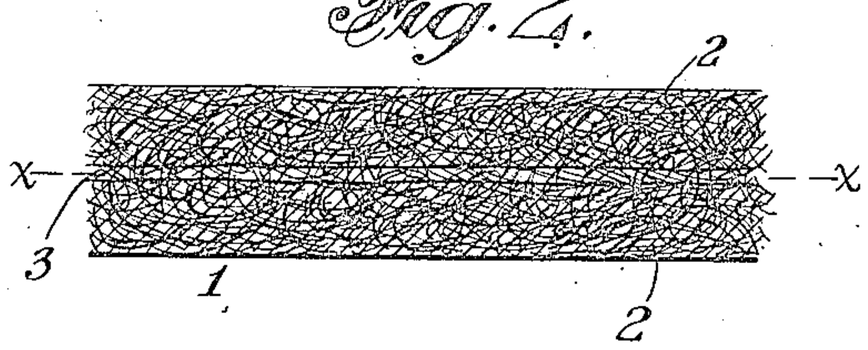

Fig. 3.

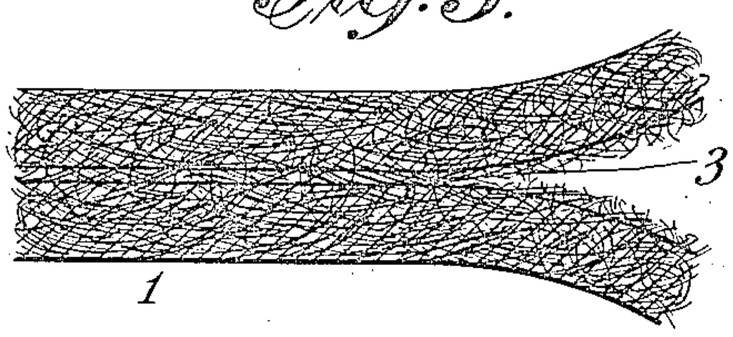

Fig. 4.

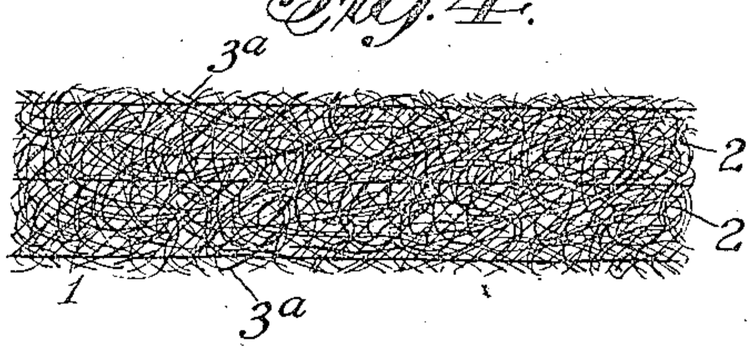

Fig. 5.

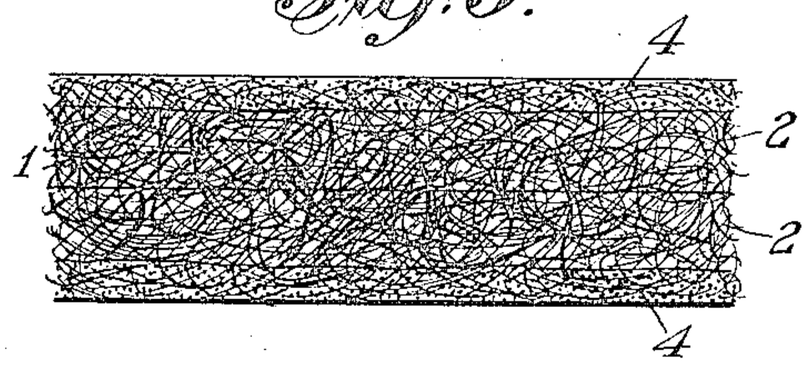

Fig. 6.

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Jordan Homer Stover
By their Attorney
Louis Prevost Holtaker

Patented June 19, 1923. 1,459,499

UNITED STATES PATENT OFFICE.

HERMAN E. BROWN, OF KINGSTON, NEW YORK, AND JORDAN HOMER STOVER, OF NUTLEY, NEW JERSEY, ASSIGNORS, BY MESNE ASSIGNMENTS, TO MULTI-FABRIC CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WATERPROOF SHEET MATERIAL AND PROCESS OF MAKING THE SAME.

Application filed December 2, 1921. Serial No. 519,333.

To all whom it may concern:

Be it known that we, HERMAN E. BROWN, a citizen of the United States, residing at Kingston, in the county of Ulster and State of New York, and JORDAN HOMER STOVER, a citizen of the United States, residing at Nutley, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Waterproof Sheet Materials and Processes of Making the Same; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention consists in the novel features hereinafter described, reference being had to the accompanying drawing, which shows one embodiment of the invention selected by us for purposes of illustration, and the said invention is fully disclosed in the following description and claims.

The invention relates to waterproof sheet material suitable for use for automobile tops and curtains, upholstery, imitation leather, coverings for cases, and any other purposes for which a flexible waterproof covering is desired. Sheet material for the purposes named have heretofore depended mainly for their waterproof qualities, either upon a waterproof coating applied to a material or fabric not in itself waterproof, as for example, the application of pyroxylin coatings, or linseed oil coatings, on one or both sides of a woven fabric, or by saturating a woven fabric in boiled linseed oil or other suitable material without any surface coating. In these cases the waterproof character of the sheet material must depend either upon the impermeability of the coating, as in the first mentioned class of fabrics, or upon the impermeability of the fabric, as in the second class of material. Both these classes of materials are open to serious objections. In the woven fabrics, which are provided with a surface coating, the waterproof character of the fabric continues only so long as the coating itself does not become cracked, broken, worn or separated from the fabric. Any injury to the surface coating permits moisture to be absorbed by the woven fabric with the result that it rots or mildews, thus shortening the life of the material, while its waterproof quality is destroyed. This is true whether the woven fabric is coated on one side or both sides, and such coatings applied to woven fabrics present distinct lines of cleavage between the fabric and the coating, which facilitates cracking, breaking and separation of the coating from the fabric. Where the woven fabric is saturated with boiled oil, or other suitable material, for example, the resulting material is not sufficiently waterproof for many purposes, and is not at all suitable for uses involving a rubbing of the surface which quickly destroys the fabric. These oil saturated fabrics also readily stretch, which causes a separation of the threads and impairs or destroys the waterproof character of the goods.

Our invention has for its object, the production of a waterproof sheet material, which is in its preferred form trebly waterproof, that is to say, provided with a waterproof coating on each side or face of the sheet, and an additional strata of impervious waterproof character between the exterior surfaces, so that in order to have this material leak or permit the passage of water therethrough, it is necessary that all three of the waterproof planes shall be completely destroyed in the same locality. The resulting fabric is thus admirably adapted for use in all situations where it is exposed to moisture, and will remain waterproof even though one or even two of the waterproof elements or planes of the fabric should be broken by accident or otherwise.

In the accompanying drawing, which illustrates diagrammatically, the manner in which our improved process for the production of our improved waterproof sheet material is carried out,

Fig. 1 represents diagrammatically a sectional view of a non-woven fibrous base material having one face treated with waterproof binding material.

Fig. 2 is a similar view showing the non-woven fibrous base material coated on both sides and partially impregnated with binding material, leaving a central stratum not so impregnated.

Fig. 3 is a similar diagrammatic view indicating the manner in which the coated and impregnated non-woven fibrous material is split.

Fig. 4 is a similar diagrammatic view

showing the manner in which the split portions of the coated and impregnated non-woven fibrous material are reversed and united by bringing their coated faces together to form a central water-proof stratum.

Fig. 5 is a similar diagrammatic view representing a section of the preferred form of our waterproof sheet material showing the three waterproof strata therein.

Fig. 6 is a similar diagrammatic view of a modification in which one split section of the fibrous material is provided with a surface coating.

In carrying our invention into effect in its preferred form, we employ as the base material for our improved waterproof sheeting a non-woven fibrous material, indicated at 1, in which the fibres are preferably unspun, such as cotton felt, cotton batting, hair felt, long fibred paper pulp, or similar material. The base material, after being dried, is coated on one face with a flexible waterproof binding compound, as shown at 2 in Fig. 1, which is caused to penetrate into the base sheet material, and preferably, almost but not quite, halfway through the thickness of the sheet. We prefer to apply the binding compound, which may consist for example of a suitable compound of India rubber, in the form and consistency of dough, by passing the fabric between the rolls of a three roll calender, and to supply the plastic binding material to one of the rolls so as to form a coating thereon, which is transferred to and forced into one surface of the non-woven fibrous sheet material, in substantially the manner set forth, for example, in our former application for Letters Patent of the United States filed August 19, 1921, and given Serial No. 493,526. The non-woven fibrous material may however, have the binding material applied thereto in other ways.

The material, after being coated on one side with the binding material, and partially impregnated therewith, is then similiary coated and impregnated with the flexible waterproof binding compound on the opposite side, as indicated in Fig. 2, the binding material being forced into the non-woven sheet material and preferably to a point almost halfway therethrough. This leaves a central stratum of fibres, indicated at 3, in the fibrous material, which is either entirely free from impregnation by the binding material, or is very slightly impregnated therewith, while the exterior surfaces of the fabric are densely impregnated and thoroughly coated with and consolidated by the binding material. The material is then split centrally and the non-impregnated layer extending centrally, as shown in Fig. 3, through the entire body of the sheet, facilitates the splitting or separation of the sheet into two sections. The two sections of the split material are then placed in juxtaposition with their exterior coated sides in contact, as shown in Fig. 4, and are passed between rolls or otherwise subjected to pressure for the purpose of causing the coated surfaces to unite. This operation is preferably performed before the binding compound has had an opportunity to harden after its application to the non-woven fabric. The resulting fabric has thus been practically turned inside out, and presents a structure in which the dense, heavily impregnated portions, 2—2 of the fabric are united through the center of the fabric to form an impervious waterproof layer, the exterior faces of the fabric at this stage comprising more or less loose fibres, as indicated at 3^a—3^a in Fig. 4, which are not impregnated with the binding material at all or are not impregnated to such an extent as to prevent them from extending outwardly and projecting from the general surface of the fabric. Thus there are formed on both sides of the fabric at this stage interstices between the fibres and outwardly projecting fibres which are peculiarly adapted to interlock with and form bonds with an exterior surface coating, and unite it firmly to the body of the fabric. The material is then coated on both sides with a waterproof surface coating, indicated at 4—4 in Fig. 5, of the pyroxylin and castor oil type, or any other preferred type of coating suitable for the purpose, which coating will enter into the interstices of the fibres of the base material and will surround and embed the outwardly projecting fibres thereof so as to thoroughly interlock and bond the surface coatings with the non-woven fibrous base material and the binding material of the central stratum. The resulting fabric therefore presents three waterproof strata namely, the two exterior surface coatings 4—4, which are firmly bonded to the non-woven fibrous material, and a central waterproof stratum, 2—2, extending throughout the sheet material between the two exterior waterproof coatings, and imparting not only a treble waterproof character to the sheet material, but also the property of great tensile strength and durability. One of the exterior faces of the sheet material may be embossed in any desired manner, if preferred, in imitation of leather, or otherwise imprinted for the purpose of imparting a desired appearance thereto. Instead of the pyroxylin and castor oil coatings any other waterproof coating may be applied on the opposite faces of the sheet material, such as a boiled linseed coating or suitable rubber coatings, if preferred.

It will be understood that it is within the scope of our invention to take one of the

split portions of the non-woven fibrous sheet material, which has been coated and impregnated and split in the manner hereinbefore described, and apply a surface coating to the non-impregnated or partially impregnated fibres thereof in the manner indicated in Fig. 6, in which 1ª represents one of the split portions of the coated and impregnated non-woven fibrous material having the coated and impregnated portion 2ª and the non-coated and non-impregnated fibrous portion 3ᵇ to which an exterior surface coating 4ª has been applied and interlocked with the fibrous portion 3ᵇ, in the manner previously described. This produces a duplex waterproof fabric from one half of the original sheet material, and while it is not as efficient or desirable as the treble waterproof sheet material previously described, it may be employed usefully for many purposes. It will be noted that the non-woven fibrous base material, prior to the application of the coating, that is to say, in the stage indicated in Fig. 4, is itself completely waterproof throughout its central strata with only enough of the fibres extending free on opposite sides of the waterproof strata to form bonds with the subsequently applied exterior surface waterproof coatings thereafter applied, as in Fig. 5. Thus in the preferred form of our improved waterproof sheetings, there are three waterproof strata provided each merging into each other so that the entire fabric is impervious and the penetration of water or moisture into any part of the fabric will be prevented at all times, and the passage of water through the fabric cannot occur until all three of the waterproof strata are broken through or the material completely worn out. It is also to be noted that the exterior coatings are firmly anchored to the central waterproof strata by the interlocking of the fibres indicated at 3ª with the coatings 4, so that these coatings cannot be separated from the central strata of the fabric, and thus imparting longer life and increased durability to the material. We do not desire to be limited to any particular binding material or surface coating material, as any suitable binding and coating materials may be employed in carrying out our invention, which will provide the three waterproof strata, interlocked with each other, the central strata containing sufficient of the fibrous material to supply the required strength and flexibility.

In some instances we prefer to prepare our improved waterproof sheet material, by providing one face of the material with a surface coating of one character and the other face with a surface coating of a different character, the composition of both of the surface coatings ordinarily being different from that of the waterproof binding material employed in the central strata. In such case, the fabric is provided with three waterproof strata of different characters and compositions and this embodiment of the invention produces a material of the widest possible utility. For example, in a waterproof sheet embodying our invention, having the central waterproof strata impregnated with and consolidated by a rubber compound, a coating of pyroxylin compound may be applied on one side, and a coating of linseed oil or composition containing the same may be applied on the other side, both surface coatings being interlocked with the more loosely associated fibres of the base material and consolidated with the flexible binding material, so as to form a trebly waterproof sheet, as previously described.

What we claim and desire to secure by Letters Patent is:—

1. The herein described process of producing a water-proof fabric, which consists in coating an unwoven fibrous sheet material on opposite faces with a flexible waterproof binding material, splitting the sheet material, and uniting the coated faces thereof to produce a centrally located waterproof stratum in the resulting sheet material, and then applying a coating of waterproof material to at least one exterior face of the resulting sheet material.

2. The herein described process of producing a waterproof fabric, which consists in coating an unwoven fibrous sheet material on opposite faces with a flexible waterproof binding material, splitting the sheet material, and uniting the coated faces thereof to produce a centrally located waterproof stratum in the resulting sheet material, and then applying a coating of waterproof material to each of the exterior faces of the resulting sheet material to provide three waterproof strata therein extending throughout the sheet.

3. The herein described process of producing a waterproof fabric, which consists in applying to opposite faces of a non-woven fibrous base sheet material, and forcing the binding material into the base material in a direction toward the center to impregnate and consolidate the fibres adjacent to both surfaces, splitting the sheet material and uniting the coated faces to produce a resulting sheet fabric having a centrally disposed waterproof stratum, and with loosely associated projecting fibres on its opposite faces, then applying a surface coating of waterproof material to at least one face of said fabric, interlocked with said loosely associated and projecting fibres, and consolidated with said centrally disposed waterproof stratum.

4. The herein described process of producing a waterproof fabric, which consists in applying to each face of a non-woven

fibrous base sheet material, a flexible waterproof binder, and forcing it into the base material to impregnate and consolidate the fibres thereof adjacent to each surface, and leaving a central stratum of fibres unimpregnated, splitting the coated non-woven base fabric through the stratum of unimpregnated fibres, and uniting the coated faces of base fabric to produce a fabric having a centrally located impervious waterproof stratum and exterior strata of loosely associated and projecting fibres, and applying a surface coating of waterproof material to the opposite surfaces of said fabric, interlocked with the loosely associated and projecting fibres and consolidated with the impervious centrally located waterproof stratum.

5. The herein described process of making a waterproof sheet material, which consists in applying a flexible waterproof binding material to one face of a non-woven fibrous base sheet material to coat the same and impregnate and consolidate the fibres adjacent to the surface, applying the flexible waterproof binding material to the opposite face of said sheet material, splitting the sheet material between said impregnated and consolidated portions, bringing the coated exterior faces of the split portions together and subjecting the sheet material to pressure to unite said coated faces, and form a centrally disposed impervious waterproof stratum, and applying a surface coating of waterproof material to at least one exterior face of the resulting sheet material, and causing said surface coating to interlock with the fibres of the base material, and consolidate with the said flexible binding material.

6. The herein described process of making a waterproof sheet material, which consists in applying a flexible waterproof binding material to one face of a non-woven fibrous base sheet material to coat the same and impregnate and consolidate the fibres adjacent to the surface, applying the flexible waterproof binding material to the opposite face of said sheet material, splitting the sheet material between said impregnated and consolidated portions, and applying a surface coating of waterproof material to the roughened fibrous surface of said sheet material produced by the splitting thereof, and interlocking said coating with the fibres of the base material.

7. The herein described process of making a waterproof sheet material, which consists in applying a flexible waterproof binding material to one face of a fibrous non-woven sheet material and causing it to impregnate and consolidate the fibres thereof toward but not to the center of the sheet, applying the flexible waterproof binding material to the opposite face of the fibrous non-woven sheet material, and impregnating and consolidating the fibres thereof toward but not to the center of the sheet, leaving a centrally disposed stratum of fibres substantially unimpregnated, splitting the sheet between the impregnated strata of fibres, bringing the coated faces of the split material together and uniting them to form a centrally disposed impervious waterproof stratum in the resulting fabric, and applying to the unimpregnated fibres, a waterproof coating and interlocking said coating material with said fibres, and consolidating it with the waterproof binding material of said centrally disposed waterproof stratum.

8. As a new article of manufacture, a waterproof sheet material comprising a base fabric composed of unwoven unspun fibres having a centrally located waterproof stratum and an exterior surface coating of waterproof material.

9. As a new article of manufacture, a waterproof sheet material comprising a base fabric composed of unwoven unspun fibres having a centrally located impervious waterproof stratum, and an exterior waterproof surface coating on both faces, and forming a trebly waterproofed fabric.

10. As a new article of manufacture, a waterproof sheet material comprising a base fabric composed of unwoven unspun fibres having a centrally located stratum thereof impregnated with and consolidated by a waterproof flexible binding material, and having at least one face provided with a waterproof surface coating.

11. As a new article of manufacture, a waterproof sheet material comprising a base fabric composed of unwoven unspun fibres having a centrally located stratum thereof impregnated with and consolidated by a waterproof flexible binding material, and having at least one face provided with a waterproof surface coating interlocked with the fibres of the base material and consolidated with the impervious central waterproof stratum.

12. As a new article of manufacture, a waterproof sheet material consisting of a body of unwoven unspun fibres having a central stratum thereof impregnated with and united by a flexible waterproof binding compound to form an impervious stratum, and exterior strata of said fibres interlocked with a waterproof surface coating, applied to both sides of the sheet material and extending into juxtaposition to and consolidated with the centrally disposed impervious waterproof stratum.

13. As a new article of manufacture, a waterproof sheet material consisting of unwoven unspun fibres having a centrally disposed stratum thereof impregnated and consolidated by a flexible waterproof binding material, and having surface coatings

on opposite faces, composed of waterproof material, the surface coating of one face being of a different character of waterproof material from that on the other face.

14. As a new article of manufacture, a waterproof sheet material consisting of unwoven unspun fibres having a centrally disposed stratum thereof impregnated and consolidated by a flexible waterproof binding material, and having surface coatings on opposite faces, composed of waterproof material, the surface coating of one face being of a different character of waterproof material from that on the other face, and both of said coatings being of different composition from that of said binding material.

In testimony whereof we affix our signatures.

HERMAN E. BROWN.
JORDAN HOMER STOVER.