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J. G. JACKSON.

FLEXIBLE FABRIC AND PROCESS FOR MAKING SAME.

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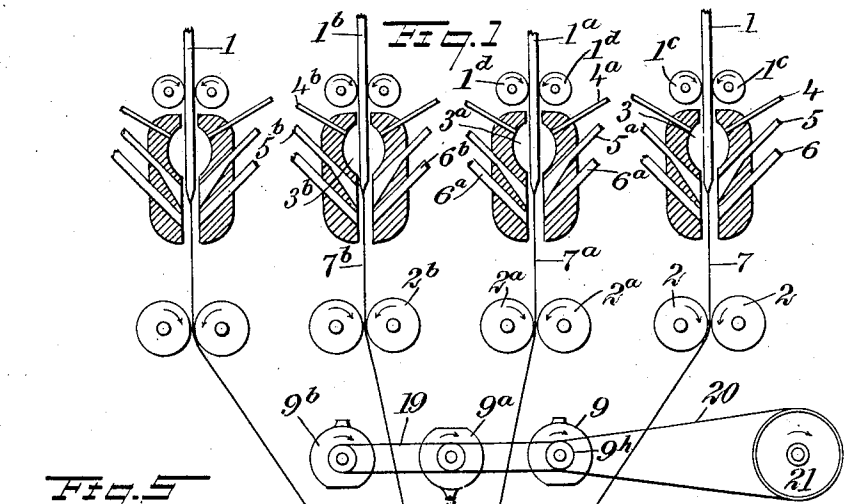

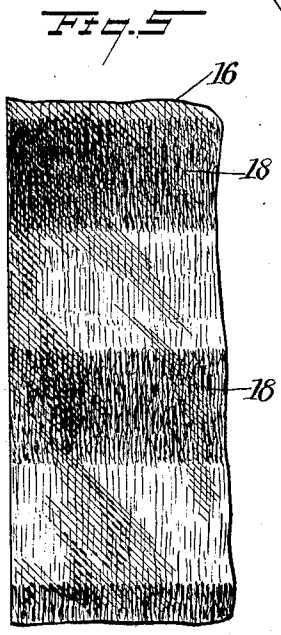

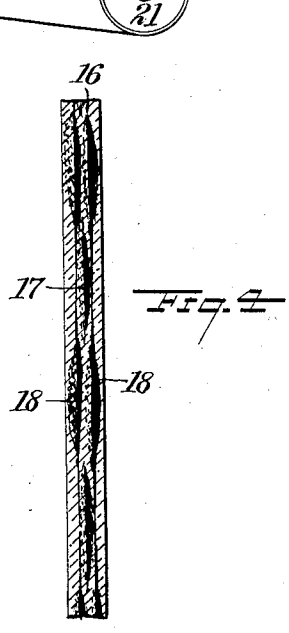

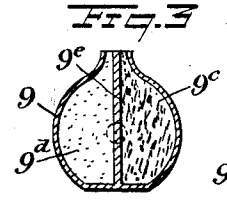

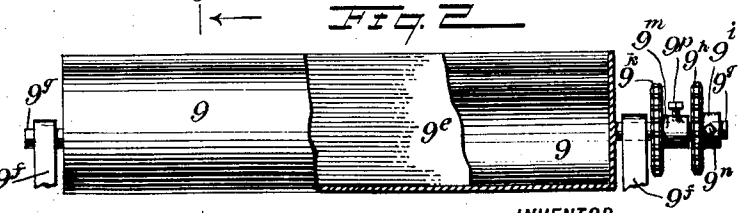

WITNESSES:

John A. Bergstrom

Walton Harrison.

INVENTOR

John G. Jackson

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN G. JACKSON, OF NEW YORK, N. Y.

FLEXIBLE FABRIC AND PROCESS FOR MAKING SAME.

No. 805,963. Specification of Letters Patent. Patented Nov. 28, 1905.

Application filed March 14, 1905. Serial No. 250,009.

To all whom it may concern:

Be it known that I, JOHN G. JACKSON, a subject of the King of Great Britain, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented certain new and useful Improvements in Flexible Fabrics and Processes for Making the Same, of which the following is a full, clear, and exact description.

My invention relates to the manufacture from silica, glass, or other fusible materials similar thereto of fabrics possessing a considerable degree of flexibility in addition to the usual properties possessed by substances made from such materials.

My invention relates more particularly to a flexible fabric suitable for use as a substitute for solid glass and the like, and more especially for use as an electrical insulating material somewhat analogous to sheet-mica.

My invention relates more particularly to the manner in which the fusible material when heated is drawn out so as to form sheets or films so thin as to be quite flexible and in building up these thin sheets or films so as to form a laminated fabric. Many comparatively brittle substances, including glass, may be drawn out to a thickness approximating one-thousandth of an inch or less, and when in this form they can be bent to a comparatively small radius without fracture.

I do not limit myself to any particular mechanism for carrying out my process nor to the exact details of the process herein described, the exact scope of my invention being commensurate with the claims hereunto appended.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional diagram showing one form of my apparatus adapted to be used in carrying out my process. Fig. 2 is a side elevation showing one of the hoppers, together with means for rotating and adjusting the same. Fig. 3 is a vertical cross-section upon the line 3 3 of Fig. 2 looking in the direction of the arrow and showing more particularly the division of the hopper into compartments for holding loose materials. Fig. 4 is a side elevation or edge view of a plate of the finished fabric, and Fig. 5 is a front elevation of the same.

At 1 1^a 1^b are shown a plurality of sheets of the material to be operated upon, which may or may not be previously heated to a moderate degree as a preliminary step. At 1^c 1^d are feed-rolls which engage the sheets and feed them downward, as indicated by the arrows. At 2 2^a 2^b are drawing-rolls arranged in pairs and adapted to rotate in the directions indicated by the arrows. A number of preheating-chambers 3 3^a 3^b are provided and into them, respectively, the sheets 1 1^a 1^b are fed, so as to acquire a temperature closely approximating that of fusion. For this purpose the preheating-chambers are provided with burners 4 4^a 4^b, and immediately below these burners are other burners or gaseous jets 5 5^a 5^b, which deliver against the material gases of such temperature as to effect the complete fusion of the sheet while under the action of these burners or gaseous jets 5 5^a 5^b. I do not limit myself to the use of such jets in accomplishing the fusion, for obviously the fusion of the material operated upon may be brought about in other ways. The burners 5 5^a 5^b employ gases acting under considerable pressure, so as to exert more or less pressure upon the fused portion of the sheet, and are so directed as to impel downwardly the material of the sheet at the moment when the latter reaches a proper stage of fusion. Immediately below the burners 5 5^a 5^b are comparatively cool jets 6 6^a 6^b, preferably air-jets, which are adapted to chill the thin sheet and cause its solidification and also adapted to exert pressure upon the thin sheet until the latter becomes solid. The aeriform pressure from the jets 6 6^a 6^b also assists in carrying the films downward toward the rolls 2 2^a 2^b. These rolls by exerting a tractive force upon the films 7 7^a 7^b tend to draw the same from the original comparatively thick sections 1 1^a 1^b to the minimum thickness desired, the drawing being assisted, as above stated, by the mechanical action of the burners 5 5^a 5^b and the air-jets 6 6^a 6^b. The plurality of exceedingly-thin films 7 7^a 7^b being formed as above described are drawn down individually and united. It is in some instances desirable, however, that a binding material be distributed between the thin films to effect their union, and it is also for this purpose sometimes desirable to reheat the films after the assembling thereof. For purposes of reheating I employ a pair of burners 8 8^a, which preferably consume gas.

Disposed adjacent to the rolls 2 2^a 2^b are a number of hoppers 9 9^a 9^b, each hopper being provided with separate compartments 9^c

9^d, containing different loose materials 10 11 and adapted to scatter the same when the hopper is rotated, as indicated in Fig. 1. The compartments 9^c 9^d are separated by a longitudinal partition 9^e running, preferably, the entire length of the hopper. Each hopper is supported upon bearings 9^f by means of journals 9^g, one of which is provided with sprocket-wheels 9^h 9^k, these sprocket-wheels, respectively, having hubs 9^l 9^m adjustably connected with the journals by means of set-screws 9^n 9^p. Below the hoppers are assembling-rolls 12 12^a, arranged as a pair, and below these are a pair of other rolls 15 15^a, adapted to exert a pressure upon the assembled sheet 13, and thus cause the laminæ thereof to adhere together, the burners 8 8^a being intermediate of the upper and lower pair of rolls just mentioned. The finished sheet is shown at 16 with the intermittently-distributed binding material 17 18. The sprocket-wheels 9^h 9^k are connected together by sprocket-chains 19 and are driven by means of a sprocket-chain 20, which is actuated from a driving-pulley 21, propelled in any suitable manner. As the sprocket-wheels are adjustable, the hoppers can be rotated so as to dump one at a time and in a predetermined successive order; but, if desired, the driving-pulley 21 may be stopped and any one, two, or three of the hoppers may be caused to discharge continuously, the finely-divided material 10 11 being distributed accordingly between the films or sheets.

While I do not limit myself to the particular materials used, I preferably employ some vitreous and fusible material, as 10, in conjunction with a practically non-fusible fibrous material 11, preferably comminuted asbestos. By feeding into the apparatus material in the form of solid plates at a temperature considerably less than that of fusion it is possible to apply a high degree of heat, effecting the fusion of the material altogether out of contact with other solid substances which might contaminate the material operated upon if in contact therewith at the temperature of fusion. It is also thus rendered possible to constrain the drawing of the film directly from the point of fusion and from thence up to the point of solidification during one continuous step. This is accomplished by directing strongly-heated gaseous jets upon the sheet from a point preceding that of fusion, so as to impel the fused material continuously forward (in the present instance downward) and deliver the thin film to comparatively cool jets, which also impel it downward, and finally release the film in its ultimate thin section and in a substantially solid state.

It will be seen that by the steps above described the fused sheet remains continuous and unbroken throughout the entire drawing zone, the continuity of said fused sheet not being altogether dependent upon the ability of the resultant thin sheet or film to transmit the tractive force necessary to draw out the fused material from the initial comparatively thick sheet.

In order to aid the cohesion of the thin films, so as to form the same into a comparatively thick laminated fabric, an oily or resinous adhesive material, such as linseed-oil or shellac, may be employed. In order to render the product heat-resistant, however, I prefer to employ as an intermediate material between the laminæ an admixture of asbestos or like fibrous material and a finely-divided vitreous material, such as pulverized glass, and to unite the lamina of the fabric to the intermediate material by fusion. The flexibility of the fabric is further assured by introducing the intermediate fusible material at definite intervals, as above described. The composition of the intermediate material varies with the fusibility of the thin sheets or films forming the primary laminæ of the fabric.

Referring to the lower part of Fig. 1, it will be seen that the several films 7 7^a are brought together, the intermediate comminuted materials being sprinkled between them at intervals. The rollers 12 12^a force the thin sheets or films and the materials mentioned into the closest possible mechanical relation. The burners 8 8^a next apply heat and cause the entire mass to become somewhat viscous. The rollers 15 15^a next apply pressure to the entire mass of materials, causing them to unite firmly into a sheet 16, as indicated in Fig. 4. The finished sheet is preferably fed continuously and may be cut up or otherwise treated.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The process herein described for the manufacture of flexible fabrics from silica, glass or the like, which consists in continuously feeding, in the form of a sheet, the material to be operated upon, applying heat to said material so as to fuse the same while still in the form of a sheet, and simultaneously drawing out the material thus fused so as to reduce the thickness thereof and thus form a comparatively thin film.

2. The process herein described of manufacturing flexible fabrics from silica, glass or the like, which consists in continuously feeding the material operated upon as a comparatively solid sheet, fusing the edge of said sheet, and drawing out said edge to a comparatively thin film.

3. The process herein described for the manufacture of flexible fabrics from silica, glass or the like, which consists in feeding a sheet of material to be operated upon, directing upon said sheet one or more gaseous jets, for the purpose of fusing the same, and drawing out said material while thus fused so as to form a comparatively thin film.

4. The process herein described of manufac-

turing flexible fabrics from silica, glass and the like, which consists in feeding, in the form of a plate, the material to be operated upon, subjecting said material to the successive action of means whereby it is first heated and then immediately cooled, and simultaneously drawing said material to a comparatively thin section while thus acted upon.

5. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in feeding the material as a sheet, fusing said sheet, drawing the same to a comparatively thin section without destroying its character as a sheet, and subjecting the fused portion to the action of gaseous jets adapted to continuously exert a pressure thereupon while in the state of fusion.

6. The process herein described for the manufacture of flexible fabrics from silica, glass or the like, which consists in feeding in a substantially sheet form the material to be operated upon, drawing the same to a comparatively thin section while in a state of fusion, and directing upon said material gaseous agents adapted to impel the fused material in the general direction of drawing.

7. The process herein described for the manufacture of flexible fabrics from silica, glass or the like, which consists in feeding the material to be operated upon in substantially sheet form, fusing successive portions of said material while thus fed, continuously drawing said material out to a thin section, and directing upon said material while thus being drawn gaseous jets inclined obliquely to the general direction of drawing.

8. The process herein described for the manufacture of flexible fabrics from silica, glass and the like, which consists in fusing the material operated upon, continuously drawing the same to a comparatively thin section while in substantially sheet form, and subsequently assembling the resultant thin sheets or films so as to form a laminated fabric.

9. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in fusing the material to be operated upon, drawing the same to a comparatively thin section while in substantially sheet form, subsequently assembling the resultant thin sheets or films with an interposed binding material, and pressing the whole into a laminated fabric.

10. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in fusing the material, drawing the same to a comparatively thin section while in substantially sheet form, assembling the resultant thin sheets, and causing the same to cohere so as to form a laminated fabric.

11. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling a plurality of comparatively thin sheets of the material to be operated upon, raising the temperature of said sheets thus assembled, and applying pressure to said sheets so as to promote the cohesion thereof.

12. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling a plurality of films to be operated upon, and fusing said films so as to cause the same to adhere at certain points of contact between said films, but not at all points of contact therebetween.

13. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling thin sheets or films of the material operated upon so as to form a laminated fabric, introducing intermediate of the laminæ thereof a material having a different temperature of fusion, and subjecting the whole to suitable pressure and to a temperature lower than that required to fuse the more refractory elements and yet sufficient to effect the cohesion of the more fusible components.

14. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in forming and assembling thin films of the material to be operated upon so as to build up a laminated fabric and during the formation of said fabric intermittently introducing between the individual laminæ thereof a more easily-fusible vitreous material, and subjecting the whole to heat and pressure sufficient to promote the cohesion thereof.

15. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling thin films of the material to be operated upon, thereby forming a laminated fabric, and during the formation of said fabric introducing between the laminæ thereof asbestos or other heat-resistant fibrous material, and subjecting the whole to heat and pressure sufficient to promote the cohesion thereof.

16. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling thin films of the material to be operated upon so as to form a laminated fabric, and introducing between the laminæ of said fabric during the formation a heat-resistant fibrous material together with a readily-fusible vitreous material, and subjecting the whole to heat and pressure sufficient to effect the cohesion thereof.

17. The process herein described of manufacturing flexible fabrics from silica, glass and the like, which consists in assembling thin films of the material to be operated upon, thereby forming a laminated fabric, during the formation of said fabric introducing between said films pulverized glass, and finally subjecting the whole to heat and pressure sufficient to promote the cohesion thereof.

18. The process herein described of manu-

facturing flexible fabrics from silica, glass and the like, which consists in assembling thin films of the material to be operated upon so as to build up a laminated fabric, and during the formation of said fabric introducing intermediate of the laminæ thereof a mixture of pulverized glass and a heat-resistant fibrous material.

19. As an article of manufacture, a laminated fabric consisting of thin films of fusible material, the successive laminæ of said fabric being intermittently fused together over their adjoining surfaces.

20. As an article of manufacture, a laminated fabric consisting of thin films of silica, glass or the like built up as laminæ, and a more easily fusible material interspersed intermediate of said laminæ.

21. As an article of manufacture, a laminated fabric consisting of comparatively thin films of silica, glass or the like, and a heat-resistant fibrous material interspersed intermediate of the successive films.

22. As an article of manufacture, a laminated fabric consisting of thin films of silica, glass or the like, a heat-resistant fibrous material, and a more readily fusible vitreous material.

23. As an article of manufacture, a laminated fabric consisting of thin sheets of vitreous material interspersed with asbestos and united by fusion into a coherent mass.

24. As an article of manufacture, a laminated fabric consisting of thin films of silica, glass or the like, a quantity of pulverized glass intermittently distributed between said films, and the whole being fused together.

25. A laminated fabric, consisting of thin films of vitreous material interspersed by an admixture of asbestos and pulverized glass, the whole being united by fusion.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN G. JACKSON.

Witnesses:
WALTON HARRISON,
EVERARD BOLTON MARSHALL.