

UNITED STATES PATENT OFFICE.

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WATERPROOF MATERIAL AND PROCESS OF MAKING SAME.

1,236,460.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JAMES McINTOSH, a citizen of the United States, and a resident of Norristown, Montgomery county, Pennsylvania, have invented a Waterproof Material and Processes of Making Same, of which the following is a specification.

One object of my invention is to provide a novel form of waterproof or insulating material capable of use in connection with electrical apparatus and systems, or, in fact, for any of the purposes demanding a hard, durable, strong moisture-resisting substance, said invention contemplating a novel succession of steps for producing such a substance as that noted.

In carrying out my invention, I may in one case use as raw material, vulcanized fiber after it has been given its final washing and before it has been dried, the first step of the process involving replacing the water in such fiber by some organic material such as alcohol, acetone, etc., which has the quality of dissolving resinous materials such as those condensation products of phenol and formaldehyde known as "bakelite" or "condensite". It may be noted that while many attempts have been made to waterproof vulcanized fiber by the use of various substances, this to the best of my knowledge has been impossible since said substances are not absorbed by the fiber and cannot be forced into the same even under heavy pressure.

For this purpose the green fiber after its final washing, is placed in a vessel containing alcohol, acetone, etc., for a suitable period such as twenty-four hours, after which it is removed to a second bath of the same solvent, for another twenty-four hours. As a result of this treatment the alcohol or other solvent completely impregnates the fiber and replaces the water or other liquid which was hitherto carried by it. Thereafter the fiber is placed in liquid bakelite, condensite or equivalent material, for a period of from four to five days, it being noted that the times above specified will vary with the thickness of the fiber as well as with other variable conditions.

As a result of the above treatment, the solvent in the fiber is substantially replaced by the condensite, bakelite, or other resinous material and said fiber is then baked, in the ex-

ample noted, for a period of from six to eight hours, at a temperature varying from 100° to 110° centigrade, and preferably while it is under pressure or is held between plates to prevent its warping.

If desired the fiber as it leaves the machine saturated with the parchmmentizing agent, may be cured or washed in a bath containing an organic solvent such as wood alcohol, in which said agent is soluble. Since the cured fiber is saturated with such solvent, it is ready for impregnation by the above method, it being noted that the vulcanizing agent and the organic solvent left in the washing or curing bath may be conveniently separated or re-claimed by fractional distillation or any other suitable method.

The product resulting from this treatment is a hard, tough, thoroughly waterproof sheet, tube, block, etc., which may be easily sawed and machined and is capable of receiving a high polish. In its general appearance and qualities it closely resembles hard rubber, being a high-grade electrical insulator having a close grain and possessing no affinity for water.

The condensation product of phenol and formaldehyde is caused by the above process to uniformly impregnate the fiber so that its structure does not vary from its surface to its innermost portions, although in some cases it may not be necessary to carry my process so far as to completely and uniformly impregnate the fiber with the resinous material or other water repellant or insoluble substance employed, since for some purposes a body of fiber may be employed in which the water repelling substance merely extends for a definite distance below the external surface. In such a case the central or inner parts of the fiber structure are not impregnated. For example, after the fiber has been cured or washed in alcohol to remove the parchmmentizing material, it may be immersed in the bakelite or other impregnating material for a comparatively short time, so that the latter does not penetrate to its interior but merely enters and is incorporated with its structure for a given depth below its external faces. If a condensation product such as those above noted be employed, the fiber may be thereafter treated to cause it to assume its solid form as previously de-

scribed. In addition to the above materials, my invention contemplates the use of other resinous substances both natural and synthetic.

- 5 In some cases I may build up relatively thick structures of the impregnated fiber by impregnating thinner sheets or pieces of the same with bakelite or other material as above described and thereafter, before said
10 material is treated to solidify it, placing the sheets while in a tacky condition, one upon the other. By means of pressure, I maintain said sheets in intimate contact while they are exposed to heat or other
15 agency for causing the condensation product to assume its solid form, with the result that the final product may be made of any desired thickness and of uniform nature throughout, being suitable for machine
20 working and available for the manufacture of large objects.

I claim;—

1. The process which consists in impregnating fiber with a solvent of bakelite; placing the fiber in a liquid body of bakelite until said solvent has been substantially replaced thereby; and thereafter treating the fiber to cause the bakelite to assume its solid form.
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2. The process which consists in impregnating vulcanized fiber with alcohol; replacing the alcohol by a condensation product of phenol and formaldehyde; and finally treating the fiber to cause said condensation
30 product to assume its solid form.
3. The process which consists in displacing the parchmmentizing agent in green vulcanized fiber by a material capable of dissolving condensation products of phenol and formaldehyde; thereafter causing said solvent to be substantially replaced by such
40 condensation product; and finally heating

the fiber to cause the condensation product to assume its solid form.

4. As a new article of manufacture, a body of vulcanized fiber impregnated with a solid condensation product of phenol and formaldehyde. 45

5. As a new article of manufacture, a body of structurally unaltered vulcanized fiber impregnated with a resinous material. 50

6. The process which consists in displacing the parchmmentizing agent in green vulcanized fiber by a material capable of dissolving condensation products of phenol and formaldehyde; and thereafter causing said solvent to be substantially replaced by such condensation product. 55

7. The process which consists in displacing the parchmmentizing agent in green vulcanized fiber by a substance capable of dissolving resinous materials; and thereafter causing said solvent to be substantially replaced by a resinous material. 60

8. The process which consists in immersing green vulcanized fiber in alcohol; and thereafter immersing the fiber in a condensation product of phenol and formaldehyde. 65

9. As a new article of manufacture, a body of vulcanized fiber having its portions adjacent its faces impregnated with a water insoluble material to the exclusion of the intermediate portion. 70

10. As a new article of manufacture, a body of vulcanized fiber having its portions adjacent its faces impregnated with a resinous material. 75

11. As a new article of manufacture, a body of vulcanized fiber having its portions adjacent its faces impregnated with a solid condensation product of phenol and formaldehyde. 80

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