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WILLIAM BURTON WESCOTT, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO THE RUBBER LATEX RESEARCH CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

BATTING PROCESS.

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This invention relates to batting processes and products thereof; and it comprises a method of obtaining firm batted fabrics from normally smooth, non-felting fibers, such as cotton, flax, jute, woody fibers, asbestos, etc. wherein such fibers are batted in water to which is added during or after the batting a small proportion of latex under conditions precluding the coagulation of said latex and the batted material is thereafter dried in such a manner as to convert the latex solids into a homogeneous dried gel, such gel uniting and bonding together at their meeting faces the several fibers so batted; and it further comprises as a new material, a tough, strong resilient felt composed of fibers in random arrangement, such fibers being bonded together at meeting points by latex solids in the form of a dried gel, such gel being vulcanized or unvulcanized as the case may be; all as more fully hereinafter set forth and as claimed.

There is no particular difficulty in making firm, hard felts by simply batting wool and like fibers of irregular or serrated outline together in the presence of water. Wool as a fiber has an imbricated surface rendering possible a locking engagement between fiber and fiber. It is, however, substantially impossible to make similar felted materials by batting together smooth fibers such as cotton, flax, jute, asbestos, etc. While the felt made by batting such fibers in water may have some degree of consistency while the material is wet, it has little strength after drying. In order to make felts of smooth fibers it is the custom to use a greater or less proportion of rough fibers, wool or the like; and generally the strength of the felt is the better the greater the proportion of wool or the like therein and the less the proportion of cotton or smooth fiber. In order to make fabric of any strength from batted smooth fibers in random arrangement, it is in general necessary to use an adhesive; glue, starch, etc. Resilient felt cannot however be made from batted fibers with the use of substantial amounts of such sizing materials. Many of these bonding or sizing agents are water-soluble and while they may give a batted fabric strength in a dry condition, the "wet strength" is commonly very much less. Those materials which are not water-soluble, as with some of the rosin sizes, are apt to be brittle. These difficulties are particularly apparent in the case of asbestos fibers which do not tend to interlock or form any permanent union on batting in water; but they are also true with many other smooth fibers such as cotton.

It is the purpose of the present invention to produce an open-textured felt-like fabric from these smooth fibers; the fabric fibers resembling wool felt in that they are bonded together at meeting faces. Although the fabric is not felted in the same mechanical way as wool felt yet its characteristics are felt-like; and for the sake of convenience it is herein called "felt".

I have discovered that I can effect a particularly desirable type of union between smooth fibers in a batted fabric and produce this result by the use of limited amounts of latex; latex being the milky juices of certain plants. Latex in its natural state is not a particularly stable liquid, readily coagulating in the presence of many chemical agents, such as acids, phenols, etc., and by agitation. It can however be stabilized sufficiently for use by the presence of a little ammonia or other alkaline body. While latex is not presumed, because of its susceptible nature, to permit concentration or purification, I have discovered and elsewhere described and claimed (application Serial No. 601,909) that both concentration and purification can be effected by submitting latex to centrifugal action under certain conditions with production of a product of standardized nature. Either the stabilized ordinary latex or these preparations, which are more in the nature of a rubber emulsion, may be used in the present invention.

In the batted fabrics produced under the present invention very little latex is necessary to give a considerable degree of mechanical strength and a firm union between fiber and fiber. No such proportion is necessary to give firm union as is required with adhesives and sizes; and resilient felts can be produced with these small amounts of latex. By the use of certain expedients resilient felts of varied character can be produced. As in the case of wool felts, there is a union between fiber and fiber at their crossing or contacting points; this union however being effected by a dried gel of latex solids instead of mechanically as in the

case of wool. Dried latex gel being but little affected by water, and vulcanized dried gel not at all, the "wet strength" of the felt is high.

Latex can be dried down to give a gel; this gel comprising not only the "caoutchouc" of the latex but also the other dissolved and suspended solids (resins, proteids, etc.) as well. The gel formation is irreversible; the gel once formed not going back into suspension. The gel on drying forms an apparently homogeneous material (unlike rubber formed by coagulation), this material being of high mechanical strength and of desirable properties. In particular it vulcanizes in a desirable way; its properties in this respect being more nearly like those of long milled rubber than of raw rubber.

Latex mixes freely with water and solutions can be obtained in almost any desired concentration. Latex usually contains 20 to 30 per cent of caoutchouc. In the present invention I ordinarily dilute such a latex to form a considerably weaker liquid.

When diluted, of course, relatively small amounts of acids or other coagulants will suffice to produce a clotting, even as against the influence of ammonia or other alkali present and with many of the fibers whose use is here contemplated, there is enough acidity present in the fiber to neutralize the stabilizing agent of ordinary latex. As I do not desire any such coagulation in the present invention, I customarily maintain my batting liquids distinctly but faintly alkaline at the time the latex is added. With the rubber emulsions produced by purification of the latex, with removal of some or most of the non-caoutchouc solids of the latex, the susceptibility to coagulation by the action of acids is not so great and not so much care need be exercised in maintaining the batting materials alkaline as in using ordinary stabilized latex. The amount of latex and the strength of solution used depend upon circumstances; but I ordinarily adjust both so as to produce between 1 and 5 per cent of latex solids in my final dry product. Coagulation of latex is a localized operation and always produces localized coagulation of a stringy nature. This is not desirable since it is my object in the present invention to produce substantially uniformly distriuted filmiform dried gel upon the fibers throughout the article. Wherever the fiber is wetted by the latex solution and then dried, dried latex gel is produced. With such small amounts of this latex gel as is contemplated in this invention in an uncompressed felt, the space relations of the fibers remain unchanged by the present operation; and a resilient felt can be produced. The gel produced in the felt is more or less tacky; and where it is desired to obviate this tackiness, the rubber is simply vulcanized in place in the felt. If vulcanization be effected without compression, the volume relationship of the felted mass remains unchanged. There is produced a felt with the fibers firmly united at their meeting points, but otherwise in the relation in which they are left by the batting. With the rubber gel in its tacky condition, on compression the volume relationship can be altered to any extent which may be desired; that is, a denser felt can be produced at will. With compression and vulcanization, the fibers are fixed in their new relation. Within limits, the compression resilience of the felt can be adjusted as may be desired.

Latex though an emulsion has the property of diffusion to a large extent and advantage can be taken of this to produce felts with a graded impregnation; one side only of the moist batted felt being treated with the latex. This gives a material having more of the dried gel in one face than in the other; and in the latter face there may be but little. On brushing or combing, a loose textured face is produced. In making some classes of goods, a plurality of impregnations may be desirable. For example a batted felt may be made with the aid of a limited amount of latex and the felt dried and vulcanized (without pressure or much pressure) to obviate tackiness of the gel and give a resilient felt. This may then be reimpregnated from one face and then vulcanized under some pressure. The operation produces a fabric with one side open textured and resilient and the other of denser character. It may be dense, tough and impervious to water.

In the practice of the present invention the fibers may be simply batted together in water containing a small proportion of latex; or they may be first batted in water in the usual way and then given a treatment with latex solution, before or after drying.

Where batting is accomplished in the presence of water containing latex, on drying, the latex in and on the fiber finally passes into the gel condition. As stated, this gel is irreversible. On further drying, it forms a tough, dry filmiform gel in and on the fibers. Where a maximum compression resiliency in the final product is desired, I commonly subject the felt after drying to a gradually lowered gas or atmospheric pressure and then allow the pressure to return to atmospheric as rapidly as possible. On slowly lowering the pressure, any air or moisture which may remain between films of latex gel and the underlying fiber, is removed; the air and moisture escaping through the interstitial ducts. On suddenly renewing the pressure the film of dry gel is pressed firmly against the underlying fiber and a very good type of bond is secured. It has been found

that an alternation of 2 or 3 of such successive pressure oscillations with slowly lowering pressure and rapidly renewed pressure, effect a thorough forcing of the rubber gel into the most intimate contact with the fiber. A slow reduction of pressure is advantageous and a rapid renewal of the pressure is also advantageous, and particularly in resilient felted articles in which it is not desired to obliterate the voids.

Felts made as above described may be subsequently vulcanized or not. If not vulcanized, since the deposited dried rubber gel is more or less tacky, an applied pressure causes a certain amount of adhesion and may obliterate or materially lessen the voids thus reducing the compressive resiliency. If the material be vulcanized without compression, this tackiness is obviated and a high compressive resiliency may be obtained. If it be desired to vulcanize the material, a certain amount of fine or colloidal sulfur may be incorporated in batting at the same time as the latex. Or cold vulcanizing agents such as sulfur chlorid may be employed after drying the bat. Or any other suitable vulcanizing process, such as the Peachey cold vulcanization process may be used.

Where a dense, tough felted mass is desired, the impregnated felt may be, after thorough drying, cured with vulcanizing agents under mechanical pressure as between platens of a press. Sometimes it is desirable to introduce inert "compounding" materials into the batting during the manufacture. With the latex treatment the batted fiber will ordinarily take up a considerable proportion of filler without forfeiting mechanical strength in the finished product.

What I claim is:—

1. In the felting of smooth fibers the process which comprises batting such fibers, coating and impregnating the batted fibers with latex, drying, and during drying producing a slowly reduced atmospheric pressure.

2. In the felting of smooth fibers the process which comprises batting such fibers, coating and impregnating the batted fibers with latex, drying, and during drying alternately producing a slowly reduced atmospheric pressure and quick and rapid restoration of atmospheric pressure.

In testimony whereof, I have hereunto affixed my signature.

WILLIAM BURTON WESCOTT.