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METHOD OF MAKING COMBINED SPONGE RUBBER-TEXTILE MATERIALS

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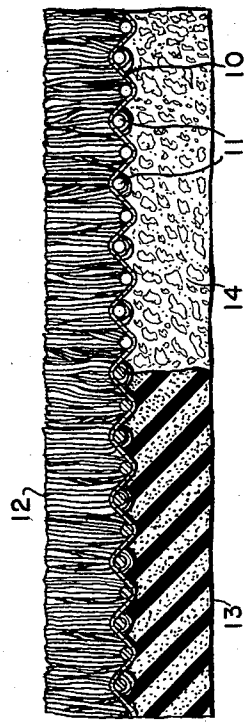


FIG. 2

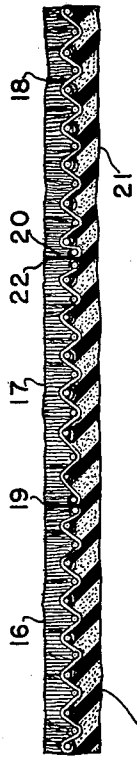


FIG. 4

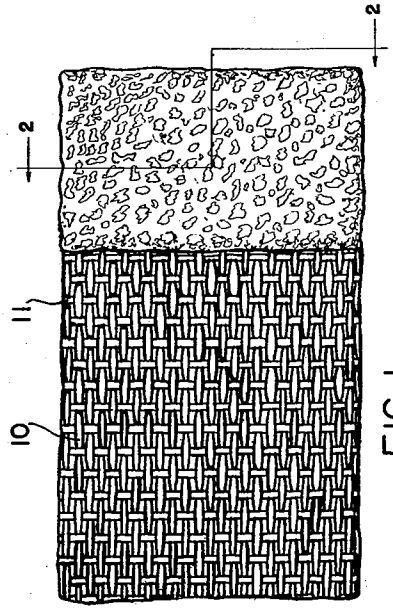


FIG. 1

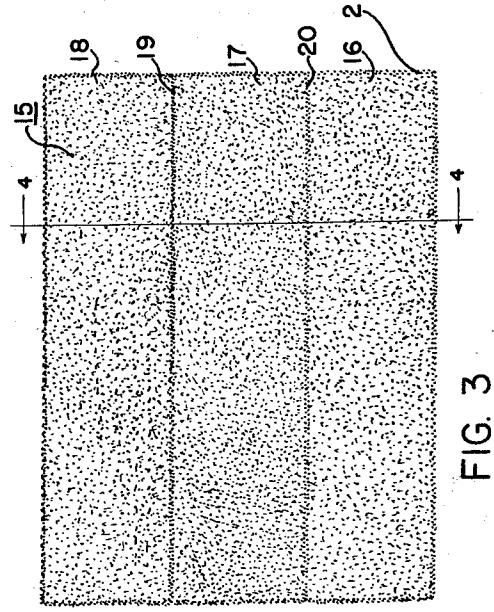


FIG. 3

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METHOD OF MAKING COMBINED SPONGE RUBBER-TEXTILE MATERIALS

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9 Claims. (Cl. 154—139)

1

This application deals with a combined sponge rubber-textile material and a method of making it and is a division of application Serial No. 19,568 filed April 7, 1948. The material of my invention has a great many uses as will be pointed out later, however, it is especially well suitable for floor coverings, such as rugs, carpeting and mats.

Floor covering material, especially when applied to hardwood floors, requires a padding in order to increase the grip of the carpeting with the floor and avoid that the floor covering becomes displaced. Such paddings have a number of disadvantages. During use, for instance when being walked on, the padding becomes displaced and after a while shows at the edges which gives a very unneat appearance. Moreover, dirt accumulated in the floor covering material falls through its porous base so that, for removing all of the dirt the floor covering has to be removed in order to have access to the padding. This is a very tedious procedure because any furniture on the carpets has to be taken off for this purpose.

It is an object of this invention to provide floor covering materials which are free from the disadvantages set forth above.

It is an object of this invention to provide a rubber-textile material which forms one integral unit.

It is an object of this invention to provide a rubber-textile material in which the rubber covers the back of the textile material and penetrates and fills the interstices thereof without appearing on the face of the textile material.

It is another object of this invention to provide a rubber-textile material which has a good gripping action so that it does not become dislocated during used.

It is another object of this invention to provide a rubber-textile material which has great softness and a high cushioning effect.

It is still another object of this invention to provide a rubber-textile material which is highly resilient so that impressions formed in the material disappear after the pressure causing such impressions has ceased; by this the material always resumes its original appearance and looks like new even after being used for a long period of time.

It is still another object of this invention to provide a rubber-textile material which may be cut to size and does not fray at its edges so that the customary step of binding the edges with tape or the like may be dispensed with.

It is still another object of this invention to

2

provide a rubber-textile material which is highly flexible so that it may be rolled up for the purpose of storage, shipping and the like.

It is still another object of this invention to provide a rubber-textile material which has sound-proofing characteristics.

It is still another object of this invention to provide a rubber-textile material which is flame-resistant.

It is still another object of this invention to provide a floor covering material having a nap the fibers of which are firmly anchored to the base which is responsible for a long service life.

It is still another object of this invention to provide floor covering material having a nap which always reassumes its upright position whereby its new appearance is retained.

It is still another object of this invention to provide floor covering materials on which furniture, when moved, does not leave permanent marks.

It is still another object of this invention to provide floor covering materials in which, when combined of a plurality of strips, the seams are practically invisible on the face of the floor covering.

These and other objects are accomplished by introducing nitrous oxide gas into a mixture of rubber latex and sodium silicate solution while subjecting said mixture to high-speed agitation whereby a rubber foam is produced, thereafter depositing said rubber foam still in fluid form on the back of the textile material to be treated and finally curing said foam on said textile material.

The process of my invention may be carried out in a continuous as well as a discontinuous operation. An apparatus suitable for manufacturing the material of this invention is described in detail in my co-pending application Serial No. 13,605 filed March 8, 1948, entitled "Method of Making Sponge Rubber," now abandoned.

While the quantity of sodium silicate may vary within wide ranges, it has been found that particularly good results are obtained with a proportion of substantially 2.25 per cent by volume of sodium silicate solution with regard to the latex. It has also been found that while nitrous oxide gas may be introduced under pressure, the use of high speed stirring is superior thereto, because substitution of agitation for pressure makes possible simplification of the process as well as of the apparatus for carrying out the process.

While most kinds of synthetic and natural

latices are satisfactorily operative for the process of my invention, it has been found that neoprene latex yields the very best results.

The addition of sodium silicate makes refrigeration of the latices unnecessary, since it prevents coagulation and acts as a curing decelerator. A quantity of 20 per cent sodium silicate for example, was used in one instance in order to dispense with refrigeration; however, 2.25 per cent by volume with regard to the latex yield the same favorable effect and in addition thereto have the advantage of producing a still higher volume increase than was obtained with 20 per cent of the agent. This finding was quite unexpected and contrary to logical reasoning.

The sodium silicate solution preferably used has a density of 41° Bé. and a ratio of alkali to silica of 1 to 3.22. The latices are advantageously employed in a concentration of or about 50 per cent.

High speed stirring may either be carried out by employing a simple stirrer and moving it up and down during operation so as to cause agitation in all layers or levels of the liquid, or else a so-called compound stirrer, which is one having a plurality of blades or vanes at its axle shaft, may be used. A speed of up to 5,000 R. P. M. has proven suitable.

It will also be satisfactory to combine the high speed agitation with the application of pressure. By this a still greater volume increase is obtained; however, since the application of pressure complicates the apparatus, it is a question of economy as to whether it is preferable to sacrifice a certain degree of porosity for the advantage of lower cost or whether to produce with the highest efficiency disregarding the cost of production.

After the foam has been prepared it is deposited while still in fluid condition onto the back of the textile material. Thereafter the combination is cured; while curing may be carried out in an oven, the use of infra-red light has been found preferable. Exposure for a time of from 15 to 20 minutes gave satisfactory results. If a backing of considerable thickness, for instance of 1" or more, is to be applied, it was found advisable to prepare, deposit and cure the foam in installments. This is carried out by first depositing a foam layer of, say, ¼" thickness, heating for 15 to 20 minutes, superposing another foam layer of about the same thickness and curing the added layer. These steps are repeated until a product of the desired thickness is obtained. The sponge product by this stepwise procedure does not show any lines of separation; it is an integral unit and has the same excellent qualities as sponge produced by the one-step process.

For the vulcanization with infra-red light, a voltage of 115 volts and 375-watt lamps were used. The distance of the lamps from the rubber surface was approximately 16".

Another very satisfactory modification of carrying out infra-red heating, it has been found, is first to use a voltage of 110 volts for approximately 5 minutes and thereafter 220 volts for another 10 minutes.

In some cases the increase of volume during the foaming step was so great, that the cell walls tended to or did collapse. In order to prevent this failure and to strengthen the cell walls from 3 to 5 per cent by volume of high alpha-cellulose was added to the latex.

In the following, an example is given of a latex composition which was found particularly advantageous for the production of combined sponge rubber-textile material by the process of my invention. This example, it will be understood, is given merely for the purpose of illustration but not for that of limitation.

Example

Neoprene latex (50%)	cc.	400
Sodium silicate solution (41° Bé.)	cc.	9
Light viscosity vegetable oil of cottonseed oil base	cc.	8
25% dispersion of sodium silico-fluoride	cc.	9.2

The ingredients are added in the order given above under rapid agitation with a compound stirrer. After the plasticizer such as a light viscosity vegetable oil is added, nitrous oxide is introduced; the mixture is foamed thereby and its volume increased by about 450%. Thereafter the sensitizer such as sodium silico-flucride dissolved in approximately 50 cc. water is added while still continuing the stirring operation. From the foam thus obtained, a ¼" thick layer is poured onto the back of the textile material, and the assembly is then cured under infra-red light for approximately 15 minutes. Thereafter, another layer is superposed and again curing carried out for the same time and under the same conditions as in the first step.

The product obtained has a sponge rubber backing of low density, a fine porous structure and high resiliency; no separation lines are visible in the sponge rubber where the second and first sponge rubbers contact.

It will be understood that the latex compositions used for the process of my invention may contain other additional ingredients than those mentioned in the example given. For instance, latices containing accelerators, vulcanizing agents and other auxiliary materials customary and well known to those skilled in the art are within the scope of my invention. Likewise, the compositions of the latex and the curing conditions may be chosen so as to obtain a final product of the desired degree of hardness.

It will also be understood that the term "textile materials" comprises not only woven fabrics, since the invention is equally well applicable to matted materials. If a completely non-inflammable material is desirable, glass fibers, either matted or woven, are advantageous. Such glass fibers-sponge rubber combination is also satisfactory as heat insulating material.

One of the prime advantages obtained with the rubber foam made according to the invention is that a non-inflammable product is obtained. The sponge rubber also makes the material soundproof which is especially valuable in the case of carpeting material and portieres. Since the sponge rubber is integrally united with the textile material and, in the case of carpeting, the nap is securely anchored by the sponge rubber, an excellently durable floor covering is obtained.

The interstices of the textile material being filled with rubber, the dust accumulated in the covering cannot fall through so that lifting of the carpeting is not necessary for cleaning purposes. The nap always retains its upright position due to the resiliency of the rubber material. Floors covered with the material of this invention are not as tiring as other floors having the conventional carpeting in view of the high cushioning effect and resiliency of the sponge rubber. No dislocation of a separate pad occurs which is another advantage of the article of my invention.

Furniture, which usually makes deep and permanent impressions in carpeting material so that the marks remain and spoil the appearance of the carpet when that furniture is moved, does not have any permanent effect on the carpeting of the invention, no matter how heavy the furniture is. The rubber provides for such a high degree of resiliency that the original appearance is always resumed shortly after impressions have been made on the nap.

Whereas carpeting when cut to size has to be bound at the edges by means of tape in order to avoid fraying, the material of my invention does not require such treatment of the edges since the fibers, including the nap, are firmly anchored by the rubber layer.

In the accompanying drawings, some embodiments of the products of the invention are diagrammatically illustrated.

Figure 1 is a plan view of a fabric used for the process of my invention;

Figure 2 is a cross sectional view taken along line 2—2 of Figure 1 showing the structure of the finished product;

Figure 3 is a plan view of a carpeting composed of three strips; and

Figure 4 is a cross sectional view taken along line 4—4 of Figure 3.

Referring to the drawings, in particular the reference numeral 10 designates warp threads of a fabric and 11 its filler threads. In Figure 2, nap fibers 12 which extend from said fabric are visible. A layer of sponge rubber 13 is applied to the back of said fabric and it may be readily seen that the sponge rubber penetrates the interstices of the fabric and thereby anchors the nap firmly to the fabric. The sponge rubber has a great number of uniformly distributed discrete cells 14.

Figure 3 illustrates a carpeting piece 15 composed of three strips 16, 17 and 18. The strips are sewn together at the seams 19 and 20. A sponge rubber layer 21 has been applied to said combined carpeting material. It will be seen from Figure 4 that this sponge rubber not only penetrates the interstices of the fabric but also the seams 19 and 20 and thereby anchors the strips and combines them into one integral unit. The nap layer 22 of the carpeting material 15 does not show any irregularity or spacing above the seams 19 and 20 so that the carpeting has the appearance of one single piece.

The material of the invention lends itself to a great many applications. It has been used with great satisfaction for rugs, carpeting, floor mats, draperies, portieres, chair cushions, and upholstering material. Other uses may be found once the excellent qualities and characteristics of the material of the invention have become known.

It will be understood that while there have been disclosed herein certain specific embodiments of my invention it is not intended thereby to have the invention limited to the details given in view of the fact that it is susceptible to various modifications and changes which come within the spirit of the disclosure and the scope of the appended claims.

I claim:

1. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with sodium silicate solution; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

2. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with a vulcanizing agent, an accelerator and sodium silicate solution; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

3. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing 100 parts by volume of a rubber latex having a concentration of approximately 50 per cent with 2.25 parts by volume of a sodium silicate solution of 41° Bé. and a proportion of alkali to silica of 1:3.2; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

4. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with sodium silicate solution and from 3 to 5 per cent of a high alpha-cellulose; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

5. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing neoprene latex with sodium silicate solution; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

6. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with sodium silicate solution; (*b*) introducing nitrous oxide gas under pressure while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon.

7. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with sodium silicate solution; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing said rubber foam on the back of said textile material while in a fluid form; and (*d*) curing said foam thereon for approximately 15 to 20 minutes with infra-red light.

8. In a process for making combined sponge rubber-textile materials the steps of (*a*) mixing rubber latex with sodium silicate solution; (*b*) introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; (*c*) depositing a thin layer of rubber foam while still fluid on the back of said textile material; (*d*) curing said foam on said textile material; (*e*) superposing another thin layer of rubber foam onto said first layer; (*f*) curing said second layer; and (*g*) repeating said deposition of layers and curing until a sponge rubber back of the desired thickness has been obtained.

9. In a process for making carpets the steps

of uniting a plurality of strips of textile material, said textile material having a napped surface; mixing rubber latex with sodium silicate solution; introducing nitrous oxide gas while subjecting the mixture to agitation whereby a rubber foam is produced; depositing said rubber foam on the back of said combined carpet; and curing said foam on said carpet whereby the strips are firmly bonded to each other, the said rubber layer integrally united with said textile material, the interstices of said textile material filled with said rubber and the fibers of said nap firmly anchored to said textile material.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,030,446	Allen	June 25, 1912
1,845,688	Untiedt	Feb. 16, 1932
2,092,825	Behr	Sept. 14, 1937
2,126,273	Ogilby	Aug. 9, 1938
2,163,289	Pennel et al.	June 20, 1939
2,288,190	Harrison	June 30, 1942
2,321,111	Stamberger	June 8, 1943