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FELTED MATERIAL AND METHOD OF MAKING THE SAME

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Fig. 1

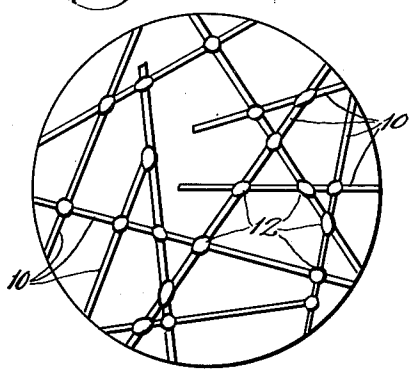


Fig. 2

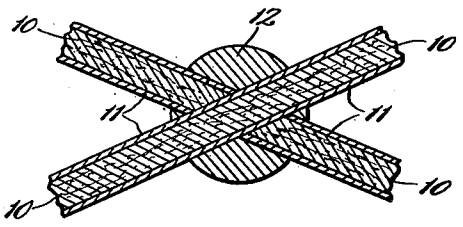


Fig. 3

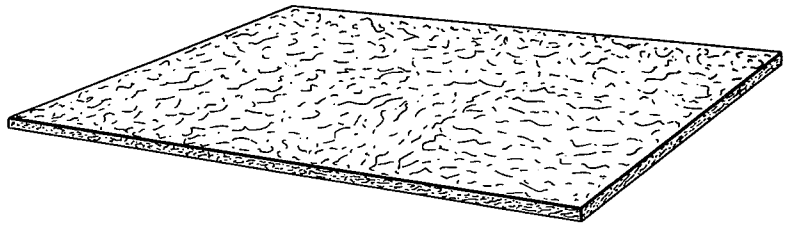


Fig. 4



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FELTED MATERIAL AND METHOD OF MAKING THE SAME

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15 Claims. (Cl. 154—101)

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This invention relates to felted material and method of making the same, and more particularly to materials formed of non-inflammable inorganic fibers such as asbestos, glass and the like.

In the formation of insulating batts or sheets or of cords or ropes which can be formed into fabrics, it is desirable that the material be resilient in compression and lateral bending. For many uses it is further necessary that the material be water resistant. It is one of the objects of the present invention to provide a material possessing all of these characteristics and a method of making the same.

Another object of the invention is to provide a felted material in which the fibers are bonded together only at points where they engage each other. In this material the fibers are preferably coated with a water repellant.

Still another object is to provide a method of making a felted material in which the fibers are first coated with a water repellant and are thereafter sprayed or otherwise treated with an aqueous binder solution to form separated globules of binder at points where the fibers engage each other.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which—

Figure 1 is an enlarged diagrammatic view illustrating the relation of the fibers in the felted material;

Figure 2 is a further enlarged section showing the joint between two engaging fibers;

Figure 3 is a perspective view of a batt constructed according to the invention; and

Figure 4 is a view of a cord or a rope embodying the invention.

It will be understood that the invention is applicable to substantially any type of fibers, but for convenience of discussion, it will be specifically described herein in connection with the felting or asbestos fibers. Asbestos is normally obtained from the mining companies in bundles made up of a plurality of fibers or filaments loosely bound together in parallel relationship. Such fibers are readily wettable by water. According to the process of the present invention, bundles of raw asbestos fibers are mixed with a waterproofing agent and are mechanically treated in a mechanical opening device which separates the individual fibers from the bundles and distributes the waterproofing agent uniformly therethrough.

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While substantially any desired waterproofing or water repellant agent in liquid form, in solution or in dry form can be employed, including metallic soaps such as calcium stearate, metallic resinates, wood resin, waxes or oils, or metallo-organic derivatives such as silicones, we have found that the most satisfactory waterproofing material is butyl phenolic resin in powder form. When applying a water repellant in liquid form, the fibers are coated after opening by spraying them with the liquid repellant or with a solution or dispersion of the repellant. However, the waterproofing or water repellant material is preferably mixed with the asbestos fiber bundles in the form of a dry powder and becomes uniformly distributed throughout the fibrous mass as the bundles are separated into their individual fibers in the mechanical opening operation.

After the opening treatment, the mixture of fibers and water repellant material is blown into a heated box or chamber. In the chamber the mixture becomes heated sufficiently to evaporate any solvent present and/or to soften the water repellant agent, such as the butyl phenolic resin, so that it will flow over the surfaces of the fibers and form a substantially complete coating on the fibers. The mixture is then sprayed with an aqueous binder solution, preferably in the same box or chamber. Any binding material either in water-soluble or in liquid-liquid dispersion or in solid-liquid dispersion systems may be employed, such as alkaline sodium silicate or acid aluminum phosphate, or any of the phenol formaldehyde resins or polyvinyl chlorides or ureas or melamines or natural latex or synthetic latices or any synthetic organic resins that can be prepared in the above indicated dispersion systems and that can have either thermo-plastic or thermo-setting properties, but we prefer to use phenol formaldehyde resin in solution or dispersion with water. This solution or dispersion is sprayed into the fibrous material in the form of a fine spray, and since the surfaces of the fibers are water repellant, the binder solution will form in fine droplets or globules which will flow along the surfaces of the fibers until they are caught at points where the fibers cross or engage each other.

After spraying the fibrous mixture is further heated to dry and set the binder solution. We have found that a single heating will suffice both to spread the water repellant agent and to dry and set the binder, since the water repellant agent even before being heated makes the fibers sufficiently water repellant to cause the binder

solution to flow as described above. The fibrous mass may be compressed or shaped to any desired extent during the heating and setting operation, so that when this operation is completed, a batt or strand of any desired shape or density will be produced.

Figure 1 illustrates in general the relationship of the several fibers in the completed mass. As shown, a plurality of fibers indicated at 10 are matted together in haphazard array, so that they will engage and cross each other at numerous points. As seen in Figure 2, each of the fibers is covered with a water repellant coating 11 of material such as butyl phenolic resin. At the points where the fibers engage each other, globules 12 of the binder enclose the individual fibers and bind them securely and rigidly together to form immovable joints. It will be understood that when the binding material 12 is set by the application of heat it becomes a hard mass which is substantially unaffected by water.

In the material thus treated the fibers are rigidly connected where they engage each other and free lengths of fiber are left between the points of connections, as seen in Figure 1. In compressing or flexing the material, the free lengths of the individual fibers will bend so that the completed material is resilient and flexible in all directions.

Figure 3 illustrates an insulating batt which may be formed of the felted material as described. As shown, the batt is substantially rectangular in outline although other shapes could be made as easily if desired. In forming the batt, the fibers may be pressed together to any desired extent, so that the batt can be either a relatively soft fluffy sheet or can be compressed into a relatively dense sheet, suitable for building papers and the like. In either case, the completed batt will be relatively resilient and flexible, so that it is capable of handling and will stand vibration without damage.

The material can also be formed into twisted ropes or cords, as shown in Figure 4. This can be accomplished by forming the material into such ropes or cords before heating it to set the binder, or it can first be formed into narrow strips and twisted into the form of ropes or cords after setting. Such ropes or cords are useful in forming insulated woven fabrics and the like and will possess a high degree of resilience and flexibility.

While one method and one material embodying the invention have been specifically illustrated and described, it will be understood that the scope of the invention is not limited thereto nor otherwise than by the appended claims.

What is claimed is:

1. A felted material comprising a plurality of asbestos fibers matted together in haphazard array, a water repellant coating on the fibers, and separated globules of binding material binding the fibers together at points where they engage each other.

2. A felted material comprising a plurality of asbestos fibers matted together in haphazard array, a water repellant coating on the fibers, and separated globules of binding material binding the fibers together at points where they engage each other, said binding material being phenol formaldehyde resin.

3. A felted material comprising a plurality of asbestos fibers matted together in haphazard array, a coating of butyl phenolic resin on the fibers, and separated globules of phenol formaldehyde resin binding the fibers together at points where they engage each other.

4. The method of making felted material which comprises coating a plurality of asbestos fibers which are to be felted with a water repellant, applying an aqueous solution of a binding agent to the coated fibers to form separated globules of said solution at points where the fibers engage each other, and allowing the aqueous solution to dry so that the binding agent will connect the fibers at said points.

5. The method of making felted material which comprises coating a plurality of asbestos fibers which are to be felted with a water repellant, applying an aqueous solution of a binding agent to the coated fibers to form separated globules of said solution at points where the fibers engage each other, and heating the treated fibers to dry and set the binding agent.

6. The method of making felted material which comprises mixing asbestos fibers to be felted with a dry powdered water repellant agent, heating the mixture to cause the water repellant agent to coat the fibers, spraying the coated fibers with an aqueous solution of a binding agent to form separated globules at points where the fibers engage each other, and drying and setting the binding solution to bind the fibers together at said points.

7. The method of making felted material which comprises mixing asbestos bundles with a dry powdered water repellant, treating the mixture to separate the fibers forming the bundles and to distribute the water repellant therethrough, heating the treated mixture to cause the water repellant to coat the fibers, spraying the mixture with an aqueous binder solution, and heating the mixture to dry and set the binder.

8. The method of making felted material with asbestos fibers comprising spraying the asbestos fibers to be felted with a water repellant material in liquid form, thereafter spraying the fibers with an aqueous solution of a binding agent to form separated globules of binding agent at points where the fibers engage each other, and drying and setting the binding agent to bind the fibers together at said points.

9. The method of making felted material with asbestos fibers comprising spraying the asbestos fibers to be felted with a water repellant material in liquid form to provide a water repellant coating on the fibers, thereafter spraying the fibers with an aqueous solution of a binding agent, and heating the material to dry and set the binding agent.

10. The method of making felted material with asbestos fibers which comprises mixing the asbestos fibers to be felted with a water repellant agent of dry powdered butyl phenolic resin, heating the mixture to cause the water repellant agent to coat the fibers, spraying the coated fibers with an aqueous binder solution, and heating the separate mixture to dry and set the binder.

11. The method as claimed in claim 10, in which the aqueous binder solution is formulated with a phenol formaldehyde resin.

12. The method as claimed in claim 10, in which the aqueous binder solution is formulated with sodium silicate.

13. The method as claimed in claim 10, in which the aqueous binder solution is formulated with a rubber latex.

14. The method of making felted material which comprises mixing asbestos fibers to be felted with a dry powdered metallic soap, heating the mixture to cause the water repellant agent

to coat the fibers, spraying the coated fibers with an aqueous binder solution, and heating the sprayed mixture to dry and set the binder.

15. The method of making felted material which comprises mixing asbestos fibers to be felted with a water repellant agent of dry powdered natural resin, heating the mixture to cause the resin to coat the fibers, spraying the coated fibers with an aqueous binder solution, and heating the sprayed mixture to dry and set the binder.

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