April 8, 1924.

1,489,567

H. F. WEISS

INSULATING MATERIAL

Filed Aug. 12, 1919

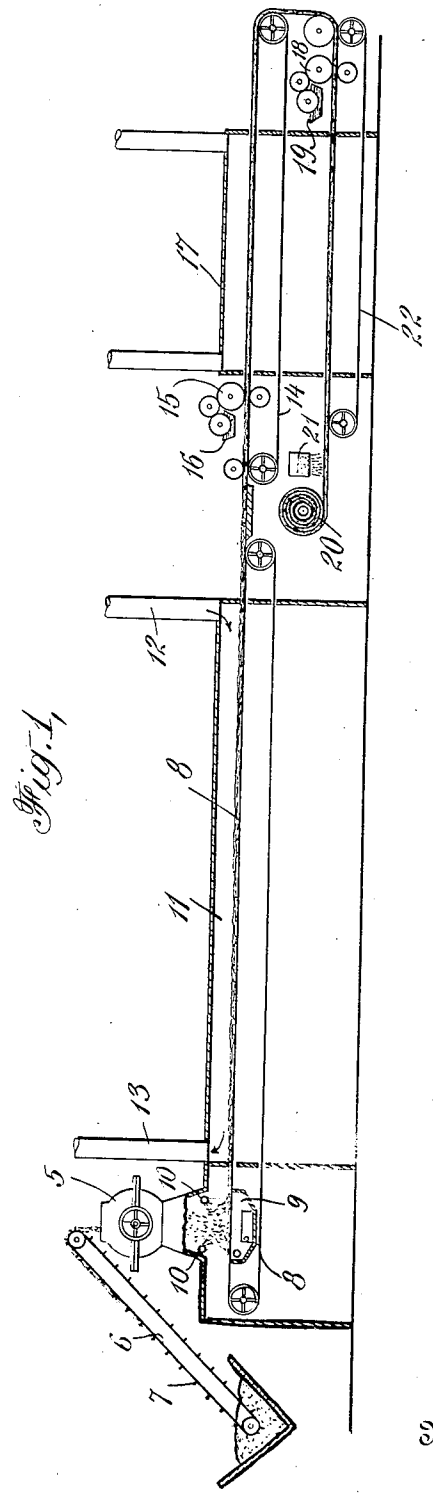

Fig. 1.

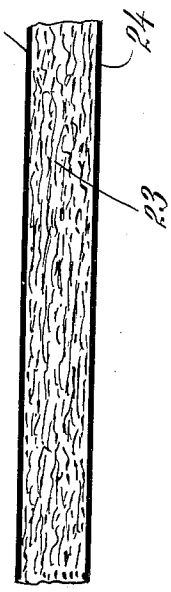

Fig. 2.

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UNITED STATES PATENT OFFICE.

HOWARD F. WEISS, OF MADISON, WISCONSIN, ASSIGNOR TO C. F. BURGESS LABORATORIES, OF MADISON, WISCONSIN, A CORPORATION OF WISCONSIN.

INSULATING MATERIAL.

Application filed August 12, 1919. Serial No. 317,061.

To all whom it may concern:

Be it known that I, HOWARD F. WEISS, a citizen of the United States, residing at Madison, in the county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Insulating Material (Case D); and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to insulating materials and similar products and has for its objects the provision of an improved insulating or similar material and an improved method of making the same.

The invention contemplates, as an article of manufacture, a product particularly adapted for use as an insulating material, although I do not intend to limit either the article or the method of the invention to insulating materials since both may be advantageously applied to other uses. Fibrous material confined between sheets of paper, or the like, is extensively used as a heat insulating medium particularly in building construction. It has heretofore been the general practice to sew the fibrous material between the liners or enclosing sheets of paper. This sewing of the fibrous material between these sheets of paper has heretofore been necessary, because the fibres themselves are not cemented or fastened to each other in such a manner that they form a felt or fabricated sheet, and unless the enclosing sheets of paper were sewed, there would be no way in which the sheets of paper could be kept in place. The sewing is objectionable, first, because it is expensive, second, because it perforates the paper, thereby admitting moisture to the fibrous material, and third, because the thread frequently breaks off in the process of manufacture, thus materially reducing the speed and capacity of the manufacturing apparatus.

In my application for Letters Patent of the United States, Serial No. 237,446, filed May 31, 1918, I have described a method of producing a felt or mat of fibrous material, in which the fibres are bound or fastened together so as to form an integral fabric of fibres in heterogeneous arrangement and cemented together with adhesive material. I have found that a felt or mat in which the fibres are cemented or fastened together, as described in the aforementioned application, is admirably adapted as the fibrous body portion of an insulating material.

The present invention contemplates the provision of an insulating material having a body portion of fibres cemented together with one or more of the surfaces thereof covered with an adhesive coating. The article of the invention, in its preferred form, comprises a body portion of fibres cemented together in heterogeneous arrangement with the fibres extending in all three cubical dimensions and having the surfaces of the body portion coated with a layer of air-resisting and moisture resisting material, such, for example, as asphalt, pitch, rubber, or the like.

The air-resisting and moisture resisting coating of adhesive material replaces the covering sheets or liners of paper, cloth, and the like, which have heretofore been customarily used for enclosing or protecting the body portion of this form of insulating material. The adhesive coating contemplated by the invention may be applied by passing the fibrous body portion with the fibres cemented together through appropriately arranged coating or adhesive-applying rolls which serve to spread a film or layer of the adhesive coating on to the exposed surfaces of the fibrous body portion, thus forming a moisture and air resisting covering agent which is directly cemented to the fibres of the body portion. As the adhesive coating, asphalt, coal tar and similar pitches, rubber, solutions of gums and resins, and the like may be advantageously used.

Reference will be made in the following discussion of the invention to the accompanying drawings for the purpose of more clearly explaining and illustrating certain aspects of the invention. In these drawings—

Fig. 1 diagrammatically illustrates in elevation one form of apparatus for carrying out the invention but the showing is purely diagrammatic and is given merely to facilitate a complete understanding of the invention. For this reason the precise structural details of the apparatus are omitted, as forming no part whatever of the present invention; and

Fig. 2 is a sectional view of the improved article of the invention.

Referring to the drawings, there is shown

in Fig. 1 a shredding engine 5 for separating the fibres into individual particles. In this figure, the fibrous material is fed into the shredding engine 5 from an endless belt or conveyor 6 provided with transversely arranged baffles or paddles 7. The belt 6 carries the fibrous material to the mouth of the shredding engine where it is fed into the engine and subjected to a shredding operation of the well-known character.

The purpose of the shredding operation is to separate the fibres into individual particles of such a character that they can be deposited on a support to form a more or less flocculent layer of heterogeneously arranged fibres adapted to be cemented or fastened together by an adhesive agent to form an integral fabric of fibres. The shredding operation should be conducted with the view of cutting the fibres as little as possible, and only to such an extent as is necessary to secure the desired separation of the individual fibres. I have herein employed the term "shredding" and its derivatives in a generic sense, to describe the operation of so treating the fibres that each fibre thereof is substantially free from any other fibre. In practice, the shredding of the fibres will usually be most satisfactorily effected in a shredding engine, but the desired result may be secured in other ways, as, for example, by brushing or combing. For example, a stiff wire brush revolving at a high rate of speed and coming in contact with the fibrous material will separate the fibres into individual particles of the desired character.

The shredding engine 5 is arranged to discharge the shredded fibres on to a belt conveyor 8 preferably of the form of a screen conveyor. The fibrous material is thus shredded in the engine 5, and, falling through the discharge thereof, the shredded fibres are deposited on the conveyor 8 to form a flocculent layer of the desired thickness in which the fibres are heterogeneously arranged with the fibres extending in all three cubical dimensions.

I find it desirable to subject the shredded fibres to a slight suction during and directly after their deposition on the conveyor 8. To this end a suction chamber 9 is arranged below the shredding engine 5, and directly beneath the supporting screen surface of the conveyor 8. The conveyor 8 may be in the form of a screen of suitable mesh or its supporting surface may be composed of a suitably perforated or foraminated material, so that the fibres deposited on the conveyor may be subjected to the action of the suction applied beneath the conveyor.

Sprayers 10 are suitably arranged for spraying the fibres with an adhesive agent as they are deposited on the conveyor 8. The sprayers 10 serve to discharge the adhesive, either directly upon the fibres deposited upon the conveyor or outwardly in the form of a spray or mist through which the fibres fall. These sprayers may be placed directly under the discharge of the shredder 5, or to one side thereof, either arrangement proving satisfactory. In either case, the adhesive serves to bind or cement the fibres together, but I have found that when these fibres fall through a mist or spray of the adhesive, a somewhat firmer mat or felt containing fewer loose fibres is produced. In some instances, it has also been found desirable to deposit a very thin layer of dried fibres upon the conveyor before the application of the adhesive solution, to provide a cushion, which will act to prevent the fibres from sticking to the conveyor.

The layer of shredded fibres deposited on the conveyor 8 is borne along by the conveyor to a drying chamber 11. A suitable drying medium may be passed through the chamber 11 for the purpose of drying the layer of fibres carried along by the conveyor 8. The chamber 11 is thus represented in the drawing as having an entrance conduit 12 and an exit conduit 13 for passing a drying or heating medium, such as heated air, through the chamber 11. Where the adhesive for cementing the fibres together contains a volatile solvent, it will be observed that the solvent may be removed while the fibrous mat is passing through the drying chamber 11 and may be recovered by suitably treating the vapor passing from the chamber 11 through the exit conduit 13. When using an adhesive which dries or sets quickly, the drier 11 can, if desired, be entirely omitted, although its use is preferred. Thus, for example, with such adhesives as sodium silicate, I find that drying in a room is sufficient, but that a drier speeds up the rate of drying and for this reason is desirable.

Numerous adhesive agents are available for cementing the fibres together such, for example, as sodium silicate, asphalt, coal tar pitch, etc. By suitably selecting the adhesive for cementing the fibres togther, the resulting fibrous mat can be rendered fireproof, rat-proof and moisture-proof. The adhesive may consist of a solution of sodium silicate, or sodium silicate may be incorporated with the adhesive as a fire resistant agent. Ammonium sulfate may also be incorporated in the adhesive as a fire resistant agent. Water resistant glue may also be employed as the adhesive for cementing the fibres together. A water resistant glue for the purpose may be made by adding bichromate of potassium to animal glue and exposing the mixture to strong light. A solution of tar or pitch in a volatile solvent, such as benzol or the like,

can also be used as the adhesive. I have found a solution of coal tar pitch, or asphalt pitch, in carbon tetrachloride, a very suitable adhesive for cementing the fibres together.

The greatest cubical lightness and resiliency are secured by drying the fibres with a minimum of pressure on them and preferably with no pressure at all. Thus, in practicing the invention, pressure on the fibres after they have been deposited in heterogeneous arrangement and formed into a resilient fabric of cemented-together fibres is kept at a minimum until after the adhesive has set or hardened and the fibres thereby cemented together. One of the characteristic features of the fibrous mat or felt of my improved insulating material resides in the fact that the fibers extend in all three cubical dimensions, whereby a single layer or integral fabric of cemented-together fibres is obtained. Such a fabric in which the fibres are cemented together in heterogeneous arrangement to form a light and resilient fibrous mat or felt is admirably adapted as the body portion of an insulating material and when enclosed between air-resisting and moisture resisting adhesive coatings, in accordance with the present invention, produces an insulating material possessing many points of superiority over similar products of the prior art.

The fabricated felt or mat of cemented-together fibres, produced as hereinbefore described, passes from the drier 11 on to a belt conveyor 14. A covering or coating of adhesive material is spread on the upper surface of the fibrous mat by means of a coating roll 15 which is fed with the adhesive from a pan 16. The thus-coated fibrous mat passes through a drying chamber 17 where the adhesive coating sets or hardens into an air-resisting and moisture resisting covering for one surface of the insulating mat. The coating roll 15 is designed to spread on to the upper surface of the fibrous mat a layer of adhesive material of the desired thickness, and the dimensions of the drying chamber 17 are such that this layer of adhesive sets or hardens during the passage of the material therethrough.

The fibrous mat is then turned back and advanced through the drying chamber 17 in the reverse direction, being supported during this movement upon a belt conveyor 22 arranged below the conveyor 14 and operatively moving in the reverse direction. Prior to its entrance into the drying chamber 17, the other surface of the fibrous mat is coated with adhesive material by means of a coating roll 18 and cooperating pan 19 containing the adhesive material. The adhesive coating or covering applied to the fibrous mat by the roll 18 sets or hardens during the passage of the mat through the drying chamber 17. The finished product passing from the drying chamber 17 may be wound upon a roll or winder 20, and in order to keep the convolutions of this wound roll from sticking together mica dust may be sprinkled on the material prior to the winding operation, as indicated by reference character 21 in the drawings.

From the foregoing description it will be seen that the fibrous body portion of my improved insulating material is covered or coated on each surface with a layer of moisture and air resisting adhesive material. In Fig. 2 of the drawings there is represented an article embodying the novel features of the invention. The body portion 23 of the insulating material is composed of a layer of fibres cemented together in heterogeneous arrangement with the fibres extending in all three cubical dimensions. Each surface of this fibrous body portion is coated or covered with a layer 24 of adhesive material, such as asphalt, coal tar pitch, rubber, or the like, thereby providing a moisture and air resisting covering agent which is directly cemented to the fibrous body portion of the insulating material.

I claim:

1. The method of forming a fibrous mat, which comprises shredding the fiber, coating the fiber with an adhesive, depositing the coated fiber in a loose flocculent layer of heterogeneously arranged individual fibers, whereby the fibers will be secured together in a loose, open and porous formation, drying the layer and coating the opposite faces with a material substantially impervious to air and moisture.

2. The method of manufacturing insulating material which comprises, forming a body portion of fibres cemented together in heterogeneous arrangement with the fibres extending in all three cubical dimensions, and coating one or more surfaces of the fibrous body portion with a layer of adhesive material substantially impervious to air and moisture; substantially as described.

3. The method of manufacturing insulating material which comprises, depositing fibrous material upon a support to form a layer of the desired thickness, treating the fibres as they fall with an adhesive spray to cement them together, and covering one or more surfaces of the resulting layer of cemented-together fibres with a coating of adhesive substantially impervious to air and moisture; substantially as described.

4. The method of manufacturing insulating material which comprises, forming a layer of fibres in heterogeneous arrangement with the fibres extending in all three cubical dimensions, treating the fibres with an adhesive to cement them together, removing dust and loose fibres by suction and coating one or more surfaces of the resulting

layer of cemented-together fibres with a covering of adhesive substantially impervious to air and moisture; substantially as described.

5. The method of manufacturing insulating material which comprises, subjecting fibrous material to a shredding operation, depositing the shredded fibres upon a support to form a layer of the desired thickness, spraying the shredded fibres with an adhesive while the fibres are being deposited to cement the fibres together, subjecting said layer to suction, and coating one or more surfaces of the fibrous mat so produced with a layer of material substantially impervious to air and moisture; substantially as described.

6. A fibrous mat, composed of fibers heterogeneously arranged, and cemented together in a loose, open porous formation, and provided on one or more faces with coatings of material substantially impervious to air and moisture.

7. An article of manufacture comprising an integral fabric of fibres cemented together in heterogeneous arrangement with the fibres extending in all three cubical dimensions and coated with a layer of material substantially impervious to air and moisture; substantially as described.

8. An article of manufacture comprising a body portion of heterogeneously arranged woody fibres cemented together with adhesive and having one or more surfaces thereof covered with a coating of adhesive substantially impervious to air and moisture; substantially as described.

9. An article of manufacture comprising a body portion of wood fibres cemented together in heterogeneous arrangement with the fibres extending in all three cubical dimensions and having one or more surfaces thereof covered with a coating of adhesive material substantially impervious to air and moisture; substantially as described.

In testimony whereof I affix my signature.

HOWARD F. WEISS.