

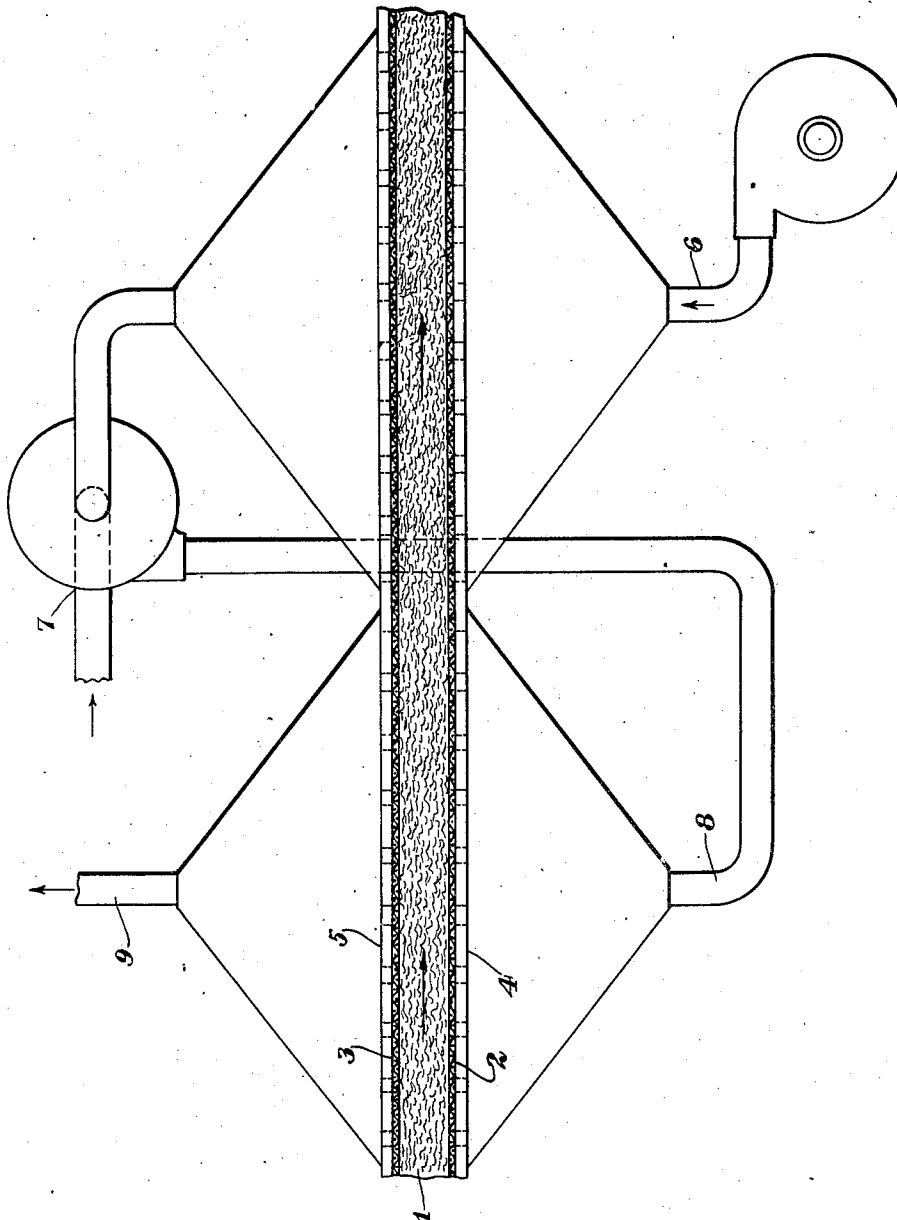
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MINERAL WOOL PRODUCT AND THE METHOD OF MAKING IT

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MINERAL WOOL PRODUCT AND THE
METHOD OF MAKING IT

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This invention relates to a mineral wool product and the method of making it. More particularly, the invention relates to the use of a drying oil binder in a layer of matted mineral wool fibres.

In hardening a drying oil binder in mineral wool products, such as rock, slag, or glass wool, special difficulties arise. In the first place, the very large amount of oil surface, due to the oil forming a thin coating over the innumerable fibres, promotes exceedingly quick reaction with the oxygen of the air brought into contact with the drying oil at drying temperatures. In the second place, the thermal insulating effectiveness of a thick layer of mineral wool tends to preserve within the layer the heat evolved in the reaction of the drying oil with the air. As a result, it is difficult to set the drying oil at a desirably high temperature and rate and, at the same time, avoid burning or badly scorching the oil, due to the rise in temperature above that at which the setting is initiated. For instance, the setting of the drying oil binder at an initial temperature of about 400 to 600° F. ordinarily would lead to serious overheating of the drying oil binder, because of the heat evolved during the setting of the binder.

It is an object of the present invention to overcome the difficulties encountered in the use of drying oil binders in mineral wool products. Another object is to provide a mineral wool felt of improved properties and an economical method of producing it. Other objects and advantages will appear from the following detailed description.

A preferred embodiment of the invention will be described in connection with the attached drawing showing diagrammatically a side view of equipment for effecting the setting of the binder. Other equipment used is conventional and, therefore, not illustrated.

In general, the method is as follows: There is formed a layer or felt of matted mineral wool fibres including the drying oil binder composition distributed over the fibres. The layer of fibres and binder is then subjected to treatment to harden (set) the binder under conditions so carefully controlled that the binder may be hardened at a sufficiently elevated temperature to produce the best results while there is prevented additional rise of the temperature to such point as to produce substantial scorching of the binder. The desired results are obtained by forcing through the layer a very large excess of hot air. The hot air initiates and promotes the exo-

thermic reactions of setting, such as oxidation and/or polymerization. Once the reaction or reactions are initiated, the large excess of air maintains the binder composition at the desired temperature and carries away heat which is developed by the setting and which, otherwise, would cause scorching. The setting occurs in a relatively short period of time.

The invention will be illustrated more specifically by the following detailed example.

There is provided, first of all, a molten silicate composition suitable for use in the manufacture of mineral wool. This molten composition is shredded, as by being caused to fall in the form of a very thin stream into a steam blast including the selected drying oil binder composition dispersed in the blast.

There is thus produced an air suspension of fibres coated with the binder composition. The fibres and adhering binder are then collected into a layer on a suitable felting member. This collection may be made (1) on the moving conveyor constituting the floor of a conventional rock wool blow chamber or, preferably, (2) under the influence of suction applied behind a screen wire or like felting member. In any case, the fibres are collected into a layer that is relatively thick, say $\frac{1}{4}$ inch to 4 inches or so in thickness.

The felt or layer of matted fibres thus formed is then subjected to treatment to set the binder composition therein. Hot air in large excess is passed through the felt. For instance, the felt is confined between screen or other air-permeable members 2 and 3, disposed on opposite faces of the felt and, suitably, pressed thereagainst by pressure applied between the skeleton supports 4 and 5 whereby the thickness of the fibrous layer is established during the setting operation. Preheated hot air is supplied through the line 6, and is passed through the portion of the felt to the right in the drawing, the air being mixed with a predetermined amount of additional hot air in the blower 7, and returned through line 8 to the drier proper and then passed through the portion of the felt at the left in the drawing. Finally, the air is removed from the system through the vent 9. The felt moves to the right in the assembly shown in the drawing.

The temperature of the air passed through the felt is made high, so that the setting of the binder is quickly and relatively evenly effected and obnoxious odors are removed from the binder. Thus, the temperature of the air admitted through line 6 may be about 500 to 600°

F. In a typical operation, the additional air admitted, as at blower 7, adjusts the temperature to about 400 to 600° F.

These temperatures obviously may be varied within limits, so long as the temperature is, at all times, sufficiently high to initiate quick setting of the binder and at no time is so high as to produce substantial scorching of the binder, by which term is meant thermal decomposition with objectionable loss of strength, toughness, or resiliency of the binder.

Because these temperatures are dangerously near the temperature of scorching of the binder composition, it is important that some means be provided for rapid cooling to offset the heat developed by the reactions accompanying the setting. For this purpose, there is used an amount of air largely in excess of that required to oxidize the drying oil binder. Advantageously, the amount of air admitted through line 6 diluted somewhat by leaks around the edges of the equipment, is such that there is no large rise in temperature of the air passing through the felt. For instance, there have been used linear velocities of air through the felt, in the direction from face to back thereof, of the order of 30 to 100 feet a minute. Air at such a velocity effects the desired cooling and, on the other hand, does not cause blowing or fibres from the felt or roughening of it to an objectionable extent. In general, the temperature used and the amount of air blown through should be such as to give a quick oxidation and/or polymerization of the drying oil, with the elimination of compounds of objectionable odor. Thus, there are used to advantage a total setting time of the order of 1 to 10 minutes. Due to the shortness of this time period, the possibility of undesired side reactions occurring at the prevailing high temperatures is minimized.

There may be used, for instance, about 1,000 to 4,000 cubic feet of air (measured at standard pressure and temperature conditions, namely, 760 mm. of mercury and °C.) for each pound of drying oil in the binder.

There may be used various drying oils, as, for example, linseed, perilla, oiticica, and hempseed. However, perilla oil, either alone or mixed with moderate proportions of one of the other drying oils, has been found to give outstanding results.

In making a mineral wool product that is to be relatively rigid and resilient, such as a felt for lining automobile bodies or the metal cases of electric refrigerators, the drying oil is preferably mixed with a hardening agent. On the other hand, a plasticizing agent may be used to make a softer or more flexible felt. As a matter of economy, there may be used, in many cases, a hardening and a softening agent; in this way the amount of the rather expensive drying oil may be decreased by substitution of cheaper materials, without development of either special hardness or special softness.

Hardening agents that may be used include gilsonite, oil-soluble resinous phenol aldehyde condensation products, rosin, ester gum, or the like.

Plasticizing agents that may be used are a semidrying oil, such as fish oil or soya bean oil, asphaltic fluxes characterized by relatively low temperature of softening and high penetration, and/or a petroleum oil that is miscible in all proportions with the drying oil, is a liquid at normal temperatures, and is practically non-volatile at 500° F. Such a petroleum plasticizer is the fraction of Pennsylvania oil from which

kerosene has been separated and which remains as stock for the manufacturing of lubricating oil.

In general, the hardening and the plasticizing agent selected should be freely soluble in the drying oil used, water-repellent, practically non-volatile under all conditions of use, and resistant to decomposition at all temperatures to which the mineral wool is exposed during the manufacture of the product of the present invention.

The binder composition, suitably, includes a conventional drier for the drying oil that is oil-soluble, as, for instance, lead, manganese, cobalt, or iron naphthenates or resinates. The proportion of drier may be varied within limits but is preferably about 0.3 to 1 part to 100 parts of the drying oil. Preferably, also, the drier as used is a mixture of two or more of the individual driers above.

Following are illustrative formulae for the binder composition, the proportions being given as parts by weight:

Example I

Drying oil	80
Plasticizer	30
Driers	0.5

Example II

Drying oil	80
Gilsonite	8
Plasticizer	4
Driers	0.3

The proportion of drying oil is usually about half or more of the total composition, the other ingredients being varied to give the hardness, rate of oxidation, or waterproofness desired.

While the drying oil itself is somewhat water-repellent, greater resistance to wetting by water is imparted by the hardening or plasticizing agent used.

Mineral wool products including a small proportion of the binder compositions recited above, say, in the proportions of 1 to 6 parts binder to 100 parts total weight of the products, not only permit setting of the binder without overheating but also are not readily combustible in the finished form. In fact, products so made do not carry a flame and do not continue to smoulder after being exposed for a short time to the flame of a gas burner.

On the other hand, the products are coherent, somewhat springy and resilient, and of very low density, the density varying somewhat with the amount of pressure, if any, applied to the layer of matted fibres during the step of setting the binder.

When the drying oil is introduced into the blast of steam before the steam strikes the molten mineral wool composition and fiberizes it, a particular effect of the drying oil is noted. The application of the drying oil in this manner, for some unexplained reason, promotes the formation of longer fibres, less dust, and better matting or felting than is the case if other binder is used or if the drying oil is applied subsequent to the fiberization of the mineral wool composition.

It is believed that the drying oil binder composition applied in dispersed form in the steam blast becomes distributed over a large part of the total surface of the mineral wool fibres. However, the term "coating" or "coated," as applied to the binder composition is intended to include a film extending either continuously or discontinuously over the exterior portions of the fibres.

It will be understood that the details given are for the purpose of illustration, not restriction, and that variations within the spirit of the invention are intended to be included in the scope of the appended claims.

What I claim is:

1. The method of making a mineral wool product which comprises forming a thick layer, including matted mineral wool fibres, a drying oil binder distributed thereover, and a drying agent, and then passing, through the said layer, heated air in amount largely in excess of the quantity required to set the drying oil, the temperature within the said layer being maintained during the passage of the air at a maximum temperature above 500° F. and below the temperature of substantial scorching of the drying oil.

2. The method of making a mineral wool product which comprises forming a thick layer, including matted mineral wool fibres and a drying oil binder distributed thereover, and passing a large excess of warm air through the said layer, while maintaining therein a temperature of the order of 500° F.

3. The method of making a mineral wool product which comprises forming a thick layer, including matted mineral wool fibres and a drying oil binder distributed thereover, and passing preheated air through the said layer at an average linear velocity of the order of 30 to 100 feet per minute, the maximum temperature within the layer being maintained above 500° F. and below the temperature of substantial scorching of the drying oil binder.

4. The method of making a mineral wool product which comprises forming a thick layer, including matted mineral wool fibres and a drying oil binder distributed thereover, and passing a large excess of preheated air through the layer, the said layer being maintained during the treatment with air at a maximum temperature of the order of 600° F. and the treatment at approximately the maximum temperature being continued for a period of time adequate to set the

drying oil substantially completely but not in excess of 20 minutes.

5. An article of manufacture comprising a layer of matted mineral wool fibres and a binder distributed thereover, the binder consisting chiefly of perilla oil in set condition and being in the proportion of 1 to 6 parts to 100 parts total weight of the article.

6. An article of manufacture comprising a layer of matted mineral wool fibres and a binder distributed thereover, the binder consisting chiefly of oiticica oil in set condition and being in the proportion of 1 to 6 parts to 100 parts total weight of the article.

7. An article of manufacture comprising a layer of mineral wool fibres and a binder distributed throughout said layer, the binder comprising perilla oil in set condition and a hardening agent, the proportion of the binder composition being 1 to 6 parts to 100 parts total weight of the article.

8. An article of manufacture comprising a layer of mineral wool fibres and a binder distributed throughout said layer, the binder comprising perilla oil in set condition and a plasticizing agent, the proportion of the binder composition being 1 to 6 parts to 100 parts total weight of the article.

9. The method of making a mineral wool product comprising forming a felted layer including mineral wool fibres and a binder composed principally of perilla oil distributed thereover, and passing a large excess of warm air through said layer while maintaining therein a temperature to rapidly harden said oil.

10. The method of making a mineral wool product which comprises forming a thick layer, including felted mineral wool fibres and a drying oil binder distributed thereon, and passing air through said layer in an amount greatly in excess of that required to set the drying oil, while maintaining in said layer a temperature of the order of 400° to 600° F.

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