

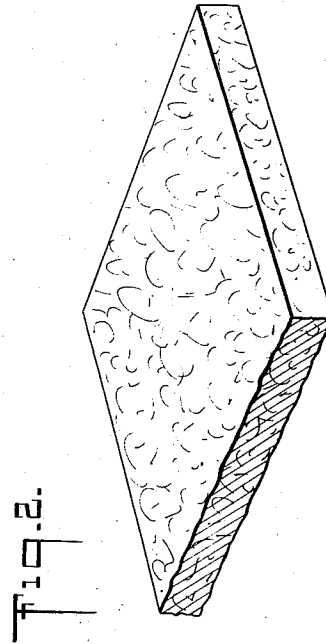
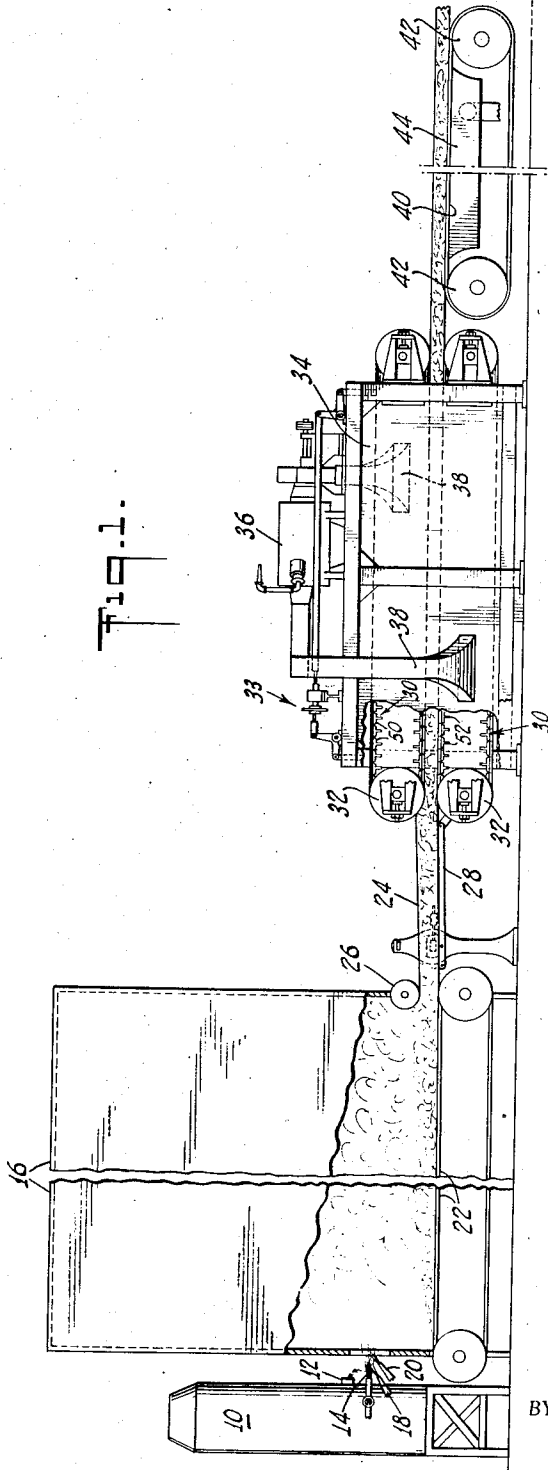
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METHOD OF MANUFACTURING MINERAL WOOL PRODUCTS

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METHOD OF MANUFACTURING MINERAL WOOL PRODUCTS

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The present invention relates to felted mineral wool products and to a method of making the same and, more particularly, to a process for the manufacture of semi-rigid and rigid mineral wool blankets, batts or blocks. It will be understood that the term "mineral wool" is employed herein in a generic sense to denote fibres formed from rock, slag, glass and other conventional raw materials and mixtures thereof.

In previously proposed methods for the manufacture of materials of the general type here under consideration, molten mineral wool forming material is disintegrated into a multiplicity of fine fibres by a suitable fiberizing means, for example, a steam blast, and the fibres are collected in a blow chamber or the like. A binder is sprayed or otherwise injected into the suspension of fibres adjacent their place of formation. The fibres gather on the floor of the blow chamber, suitably a conveyor, in interfelted relationship, with the binder particles uniformly disseminated therethrough. The felt thus formed is carried from the blow chamber and heated to soften the binder where, as is conventional, a thermo-plastic binder is employed, and the felt is then compressed to the desired density and maintained under compression until the binder has cooled and solidified. As will be readily understood, such previously proposed methods have required the use of a relatively expensive cooling and compressing means due to the fact that the felt must be held in its compressed state by external means during the relatively long interval required to cool the binder to solidifying temperatures. Also, when the finished material is subsequently warmed, as for example, when employed in a position exposed to heat or when hot coatings are applied, such as when the material is used in built-up roofs, exfoliation takes place due to the releasing of the adhesive bond and the consequent expansion of the compressed resilient structure.

An object of the instant invention is the provision of a method and product which will overcome the disadvantages of the previous proposals.

Another object of the invention is the provision of a method in which the blanket is compressed and a component of the binder takes a set sufficient to retain the felt in its compressed state within a relatively short time.

A further object of the invention is the provision of a method resulting in a product which will retain its form irrespective of temperature

changes within reasonable limits and which is not subject to exfoliation upon warming.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow and to the accompanying drawing, in which:

Fig. 1 is a diagrammatic elevational view of an apparatus employed in the method of the instant invention; and

Fig. 2 is a perspective view of a block or blanket section formed in accordance with the instant invention.

Referring now to the drawing and particularly to Fig. 1, there is diagrammatically shown an apparatus suitable for carrying out the method of the invention. As will be understood, conventional portions of the structure are not shown in detail and may take different forms. The apparatus generally comprises a melting furnace 10, which may be a cupola (as illustrated), a tank furnace, or the like, of any conventional design. The molten material issues from an orifice 12 to fall in the form of a stream into the path of a steam jet or the like 14, which shreds it into a great multiplicity of fibres which are carried by the force of the steam jet and in gaseous suspension into blow chamber 16.

In accordance with the instant invention, a binder is injected into the suspension of fibres adjacent their place of formation, the binder including two distinct components, namely, a thermo-setting material and a thermo-plastic material. The two materials may be separately injected into the suspension in any suitable manner, for example, as by atomizing binder jets 18 and 20. The thermo-setting material may suitably be in water solution or suspension, particularly if it is a resin, and the thermoplastic material is preferably in a heated fluid state.

The thermo-plastic component of the binder preferably is an asphalt or the like of a melting point to be determined by the particular qualities desired in the finished material. However, other relatively inexpensive conventional thermo-plastic binding materials, such as waxes, asphaltic fluxes or the like may be used.

The thermo-setting component of the binder suitably comprises a resin, such as a commercial phenol formaldehyde, lignin-furfural, or glyptol resin. However, it will be understood that the invention is in no way limited to the particular heat setting binder employed and that other materials than those specifically set forth may be

employed, for example, an emulsifiable oil varnish. The binder is employed in suitable proportions depending upon the type of material desired. Where a relatively rigid block or blanket is to be formed, it has been determined that the binder may comprise, for example, between 18 and 24% by weight of the product. However, the proportions of binder may vary between much wider limits, for example, the binder may be present in proportions of from 5% or less to 30% or more. The relatively inexpensive thermo-plastic material suitably constitutes the major constituent of the binder. For example, asphalt or the like may preferably comprise from 3 to 30% by weight of the final product and the resin, or other thermo-setting material, from 2 to 25%. Preferred proportions, which have been found to form a rigid block or blanket which exhibits good strength, waterproofness and low cost, comprise 2% of the resin and 15% of a 230° melting point asphalt.

When found desirable, the thermo-setting resin may be diluted with any conventional distending materials, as, for example, dried blood or starch. The thermo-plastic constituent of the binder may be rendered more fire retardent by incorporating therein small amounts of an aromatic chlorinated hydrocarbon material, such as the material sold under the name "Halowax." In lieu of the use of Halowax to prevent fires in the blow chamber, water may be employed as disclosed and claimed in the copending application of J. H. Zettel, Serial No. 414,484, filed October 10, 1941.

Blow chamber 16, which receives the suspension of fibres and minute binder particles includes a bottom wall, preferably comprising a continuously moving endless belt or conveyor 22, traveling in the direction indicated by the arrow, on which the fibres settle in felted relationship with the binder particles disseminated substantially uniformly throughout the felt. As will be understood, due to the relatively small volume of binder, the porosity of the felt will not be affected to any appreciable extent and the felt will retain its insulating function. The felted mass of fibres is carried from the blow chamber by the conveyor and preferably is compacted to some extent to form a relatively thick blanket 24 by press roll 26 at the exit end of the conveyor. The rate of the movement of the conveyor 20 may be correlated to the rate of deposition of the fibres to obtain a uniform and desired density of the product, for example, by means of a weighing scale 28, over which the felt passes. The scale is operatively connected to the drive of conveyor 22 by any suitable means whereby increase in the weight of the blanket increases the speed of movement of the conveyor and vice versa.

The blanket passes from scale 28 between endless conveyor belts 30 driven over suitable pulleys 32 in the direction indicated by the arrows. In the preferred form, conveyors 30 are made up of a plurality of relatively rigid hinged connected plates or flights 50 reinforced against yielding during the compressing operation as by flanges 52. The flights are perforated to permit the passage of a heating medium therethrough. It will be understood, however, that other types of conveyors may be employed which have sufficient open area to permit the circulation of heating mediums and which will not yield under the compressing action. The upper conveyor is arranged for adjustment relative to the lower conveyor by any conventional raising and lowering

device, as indicated at 33. The conveyors 30, or at least their adjacent reaches, are surrounded by a suitable housing 34 enclosing the greater proportion of the length of the belts and forming a heating oven. Air at a temperature say between 300 and 400° F., depending upon the setting temperature of the particular resin employed, is circulated from any suitable heating means, such as furnace 36 through ducts 38 opening into the housing above and below the adjacent reaches of the conveyor and is forced through the conveyors and the blankets held therebetween. The upper conveyor 30 is adjusted relatively to the lower conveyor by means 33 to compress the blanket to the desired finished thickness.

When the blanket leaves conveyors 30, the thermo-setting component of the binder has been set and, in consequence, the blanket retains its compressed state, although the thermo-plastic component is in a non-binding condition. The blanket then passes to a suitable cooling device which may be but a single foraminous conveyor 40 supported by pulleys 42. Preferably located below the conveyor is a suction box, as indicated at 44, connected to any suitable suction device (not shown) whereby air at room temperature is drawn through the felt to cool the same and harden the thermo-plastic component of the binder. The cooled blanket may be transferred from conveyor 40 to any suitable or conventional cutting and slitting means (not shown) to divide the same into units of the desired size.

It has been determined that blankets or blocks made by the process described above have a strength, waterproofness, and rigidity superior to those employing a heat setting binder alone, unless a prohibitively expensive amount of the amount of the binder is used, and have a resistance to softening and exfoliation under high temperatures far superior to products employing only asphalt, or other thermo-plastics, as the binder.

Having thus described my invention in rather full detail, it will be understood that the details need not be strictly adhered to but that various changes and modifications will suggest themselves to one skilled in the art, all falling within the scope of the invention as defined in the subjoined claims.

What I claim is:

1. The method comprising simultaneously forming a felt of mineral wool fibres and substantially uniformly distributing a binder there-through, said binder including a thermo-plastic material and a thermo-setting material, compressing the felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature to set said thermo-setting binder, and cooling said felt to set said thermo-plastic binder.

2. The method comprising forming a suspension of mineral wool fibres and a binder distributed there throughout, said binder including a major proportion of a thermo-plastic material and a minor proportion of a thermo-setting material, forming a felt from said fibres with the binder substantially uniformly disseminated therethrough, compressing the felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature to set said thermo-setting binder, and cooling said felt to set said thermo-plastic binder.

3. The method comprising simultaneously forming a felt of mineral wool fibres and sub-

stantially uniformly distributing a binder there-through, said binder including a major proportion of a thermo-plastic material and a minor proportion of a thermo-setting material, compressing the felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature to set said thermo-setting material by the circulation of heated air there-through, and cooling said felt to harden said plastic material.

4. The method comprising simultaneously forming a felt of mineral wool fibres and substantially uniformly distributing a binder there-through, said binder comprising, by weight of the felt, from 3 to 30 per cent of a thermo-plastic material and from 2 to 25 per cent of a thermo-setting resin, compressing said felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature to set said thermo-setting resin, and thereafter cooling said felt to harden said thermo-plastic material.

5. The method comprising simultaneously forming a felt of mineral wool fibres and substantially uniformly distributing a binder there-through, said binder comprising, by weight of the felt, from 3 to 30 per cent of an asphaltic material and 2 to 25 per cent of a lignin-furfural resin, compressing said felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature between 300° and 400° F. for a period sufficient to set said resin, and thereafter cooling said felt to substantially room temperature to harden said asphaltic material.

6. The method comprising simultaneously forming a felt of mineral wool fibres and substantially uniformly distributing a binder there-through, said binder comprising, by weight of the felt, from 3 to 30 per cent of a thermo-plastic material and from 2 to 25 per cent of a thermo-setting resin, diluted with a distending material, compressing said felt to substantially the desired finished thickness while simultaneously heating said felt to a temperature to set said thermo-setting resin, and thereafter cooling said felt to harden said thermo-plastic material.

7. An insulating material comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated there-through a hardened binder comprising a major proportion of a thermo-plastic material and a minor proportion of a thermo-set material, said binder being present in such proportion as to

preserve substantially the natural porosity of the felt.

8. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a binder comprising from 2 to 25 per cent by weight of the product of a thermo-set resin and from 3 to 30 per cent by weight of the product of a thermo-plastic material, the thermo-set resin constituting a minor proportion of the binder in each instance.

9. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a thermo-set resin in a proportion of the order of 2% by weight of the product and a thermo-plastic material in a proportion of the order of 15% by weight of the product.

10. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a binder comprising asphalt and a phenol formaldehyde resin, said binder being present in such proportion as to preserve substantially the natural porosity of the felt.

11. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a binder comprising asphalt and a lignin-furfural resin, said binder being present in such proportion as to preserve substantially the natural porosity of the felt.

12. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a binder comprising asphalt and a phenol formaldehyde resin in proportions by weight of the article of 3 to 30 per cent and 2 to 25 per cent respectively, the phenol-formaldehyde resin constituting a minor proportion of the binder in each instance.

13. An insulating article of manufacture comprising a felt of mineral wool fibres compressed into blanket or batt form, said felt having disseminated therethrough a binder comprising asphalt and a lignin-furfural resin in proportions by weight of the article of 3 to 30 per cent and 2 to 25 per cent respectively, the lignin-furfural resin constituting a minor proportion of the binder in each instance.

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