

UNITED STATES PATENT OFFICE

2,493,845

METHOD OF WATERPROOFING MINERAL WOOL

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No Drawing. Application July 2, 1945,
Serial No. 602,929

2 Claims. (Cl. 117—126)

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The instant invention relates to improvements in the production of mineral wool, particularly that to be employed in the form of nodules or other fibrous aggregates, or as loose wool and the like for thermal insulation and other purposes and, more particularly, to methods of treating the mineral wool to increase its resistance to moisture penetration. The term "mineral wool" is used herein in a generic sense to include wool or fibers formed from rock, slag, glass, mixtures thereof or other suitable raw materials.

As is well recognized in the art, where mineral wool is employed for its conventional purposes, for example, as a thermal insulating material, it is a matter of primary importance to protect the material against the entry of moisture, as moisture reduces its insulating efficiency, decreases its resistance to compaction and may have other deleterious effects. Heretofore, it has been proposed to overcome these obstacles by, for example, admixing with the wool a liquid waterproofing material such as a solution or suspension of a metallic stearate in oil, or the stearate in a molten state, preferably dissolved in a molten wax base. Such prior treatments, however, have themselves presented numerous disadvantages, particularly with respect to the difficulty of accurately controlling the amount of waterproofing material employed, the difficulty of handling and storing the hot solutions required, the adverse effects that they have had on the coverage properties of the mineral wool, and the like.

The principal object of the instant invention is the provision of an improved method of incorporating treating materials, such as water-repellent materials with mineral wool fibers, the method substantially reducing, if not eliminating, the disadvantages of the prior methods.

Another object of the invention is the provision of such method in which the water-repellent or other treating material is handled and admixed with the wool in a dry state, whereby the making and storing of hot solutions is not required. The method of the invention, furthermore, is one which imparts maximum moisture-resistance to the wool with minimum amounts of the treating material.

A further object of the invention is the provision of a method which gives mineral wool increased coverage properties.

A further object of the invention is the provision of an improved nodulated mineral wool as formed by the method attaining the foregoing objects of the invention.

The method of the instant invention may be incorporated in known processes of manufacturing mineral wool such, for example, as the procedure involving the disintegrating of the molten

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stream of the selected raw material, such as, rock, slag, glass or mixtures thereof, by subjecting the molten stream to the action of a high pressure jet of steam or air. The invention is particularly adapted, however, for use in conjunction with the more recently developed process involving the use of one or more spinners or rotors which are rotated at high speed and upon which the molten material impinges to be broken up into drops or masses which are thrown from the rotor by centrifugal force and thereby drawn out into filament or fiber form, as disclosed, for example, in the copending applications, S. N. 466,067, filed November 18, 1942, now U. S. Patent No. 2,399,383, and S. N. 485,009, filed April 29, 1943, now U. S. Patent No. 2,428,810, of Edward R. Powell. The fibers produced by such operations are collected in suitable ways and, thereafter, utilized as loose mineral wool or converted into nodules, aggregates, mats, blankets or the like by further operations.

A feature commonly used with the prior conventional methods, especially where the wool is to be employed in nodulated form for filling wall spaces in buildings and the like, consists in admixing a suitable, oleaginous material, such as petroleum oil, preferably fuel oil or paraffin oil in limited quantities with the fibers. The oil serves as a medium for preventing excessive dustiness, this feature being of particular importance where the wool in loose or nodulated form is to be pneumatically conveyed into wall spaces. The oil is added at a suitable point during the fiber forming operations to become broken up into fine particles and distributed among the newly formed fibers.

The instant invention includes a similar operation, the oleaginous liquid, preferably of the type of the oils previously employed having, however, important functions in addition to that of dust control. If the blowing system is employed for the production of the mineral wool filaments the oil is preferably added at the steam jet in the conventional manner. In the spinning process of wool formation, the oil may be sprayed in finely divided or atomized form onto the fibers as they are formed or after their collection in the form of a relatively loose, fluffy layer. In both cases substantially uniform distribution of the fine oil particles is attained. The oil performs its conventional dust-control function as stated above, but in accordance with the instant invention, performs the further important function of serving as a retaining means for a suitable water-repellent material in a dry, finely powdered form and the oil is employed in sufficient amounts for this purpose.

A preferred water-repellent material is zinc stearate but other materials which impart water resistance to the wool, such as aluminum

stearate, aluminum palmitate or other metallic soaps, waxes and other fatty acid compounds, having water-repellent characteristics such as stearic acid or palmitic acid may be used. The types and classes of materials mentioned are particularly adapted to impart moisture resistance to the mineral wool as only a relatively small quantity of the material is required to form a permanent and effective water resistant coating on the fibers.

The water-repellent material in a dry, finely powdered state may be admixed with the oil-treated fibers at a suitable stage in the operations, preferably after the collection of the fibers. Admixing is accomplished in an apparatus comprising, for example, a rotating chamber into which the collected wool is conveyed, the chamber having rotating paddles or the like whereby the powdered material is distributed on the fibers. Other mechanical or air suspension type mixers may be employed. On the other hand, if the fiber production follows conventional practice, including the collection of the fibers from an air suspension thereof in a blowchamber, the powdered, water repellent may be distributed throughout such suspension whereby it becomes intermixed with the mass of fibers which settle on the blowchamber floor. In any event, the powdered water repellent is supplied in metered, predetermined amounts by suitable pneumatic or other feeding means to the previously oil-treated wool and thoroughly intermixed therewith. Due to the presence of the oil and its tendency to coat the individual fibers, the water-repellent material in its finely powdered state is picked up by the oil and retained thereby on the fibers to exert its water-repellent action.

The water-repellent material may be employed in relatively small amounts, say, in proportions of about 0.1% or less of the fibrous admixture. It has been determined that this small proportion of a water-repellent material such as zinc stearate, admixed with the oil-treated fibers in the manner described, will impart a high degree of moisture resistance to the fibrous mass. Furthermore, the resultant mineral wool has higher coverage properties than mineral wool materials waterproofed by prior methods and does not exhibit the sogginess found where such prior methods are used. Also it has been found that mineral wool treated by the instant method has a higher insulating efficiency than wool waterproofed by other methods. For example, thermal conductivity tests were made on two samples of spun wool. Both samples were the same except that the first was treated with a wax solution and the second was treated by the instant method. The first sample gave a k value of .385 at a density of 2.9 lbs. per cu. ft. The other sample had k values of .33 at a density of 3.2 lbs. per cu. ft. and .34 at a density of 2.6 lbs. per cu. ft., exhibiting about a 10% increase in insulating value.

The method of the instant invention has the further advantage that the quantity of waterproofing material may be controlled as desired. Also, in contrast to the prior methods where the waterproofing agent, such as zinc stearate, was necessarily dissolved in relatively large quantities of a molten wax to enable it to be applied to the fibers, no such large amount of a carrier liquid is required. In addition, the method eliminates both the necessity of making solutions and of

melting and hot storing waxes, and requires less manufacturing attention and maintenance.

As an example of the instant invention, in the production of waterproofed nodulated wool for use particularly in the insulating of wall spaces by pneumatic or blowing methods, a conventional oleaginous liquid such as fuel oil is applied to the fiber in amounts sufficient to provide about 0.10 to 0.80% of oil by weight of the admixture of oil and fiber. The oil serves its conventional function of controlling dustiness and, in addition, serves to collect and hold the waterproofing material on the fibers. The powdered water repellent, particularly zinc stearate, is employed in amounts sufficient to constitute about 0.05% to 0.50% by weight of the admixture of fibers. Application of the waterproofing material is preferably accomplished as previously stated, by suitable mechanical or air suspension mixers to which the wool is supplied in bulk form. The resulting treated wool then may be subjected to such further conventional steps necessary to produce nodulated or granulated mineral wool of the desired type. The product thus obtained exhibits the desirable properties of high coverage, resistance to moisture, absence of sogginess and resistance to loss of coverage after prolonged storage, unobtainable by prior known methods.

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

What I claim is:

1. The method of treating newly formed mineral wool fibers comprising, admixing with the fibers an oleaginous liquid coating material adjacent the point of formation of said fibers to coat the fibers, and thereafter distributing onto said coated fibers a minor proportion of a powdered, water-repellent material selected from the group consisting of waxes, soap-forming fatty acids and metallic salts of soap-forming fatty acids whereby said powdered, water-repellent material is adhesively secured to the fibers by said oleaginous material.

2. The method of claim 1 in which the oleaginous liquid is applied in amounts of the order of 0.10 to 0.80% by weight of the admixture, and the powdered, water-repellent material is applied in amounts of the order of 0.05 to 0.50% by weight of the admixture.

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