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METHOD OF MAKING ROCK WOOL ARTICLES AND APPARATUS THEREFOR

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2 Sheets-Sheet 1

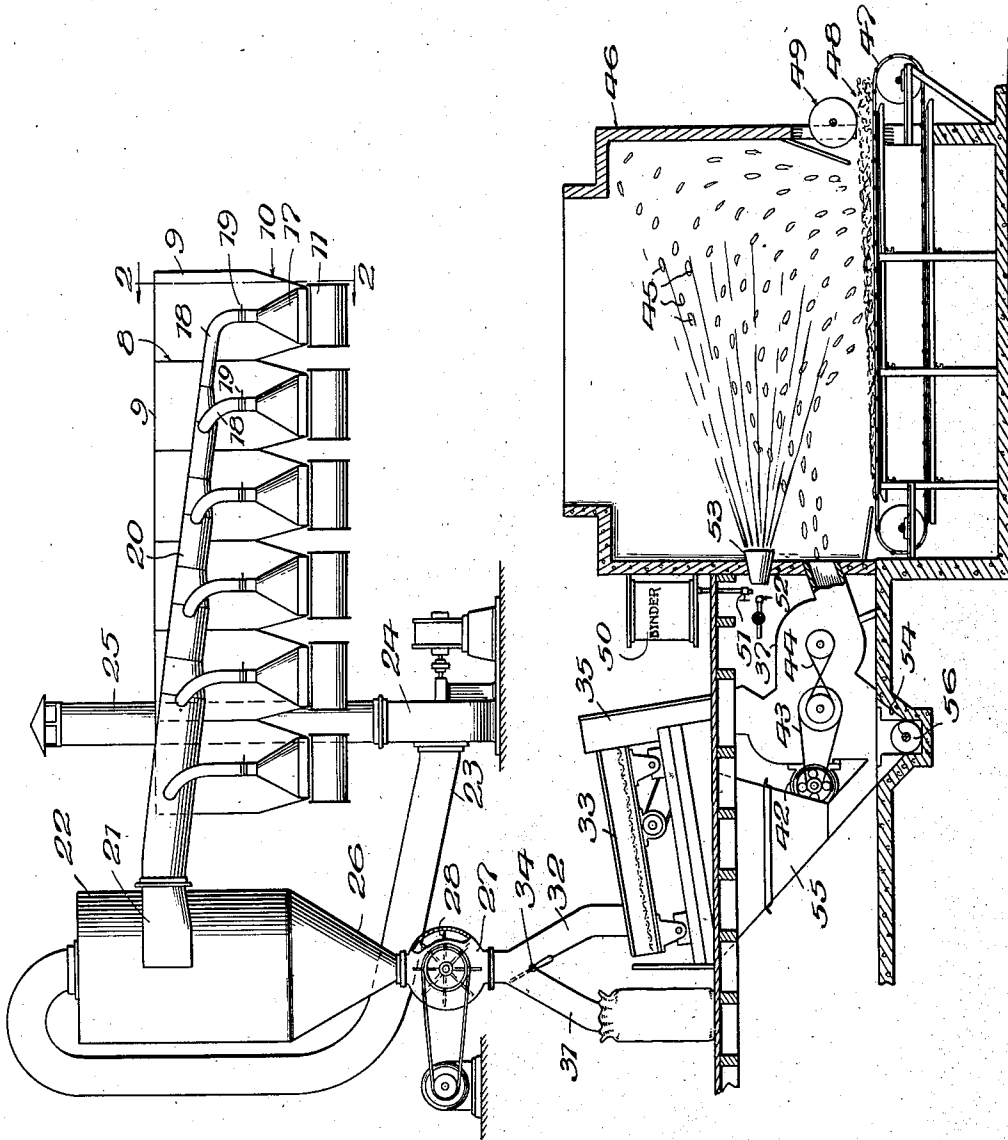


Fig. 1.

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Fig. 2

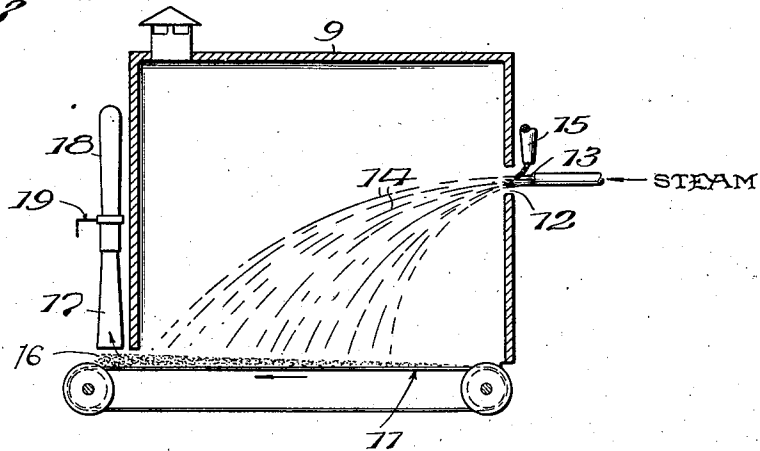
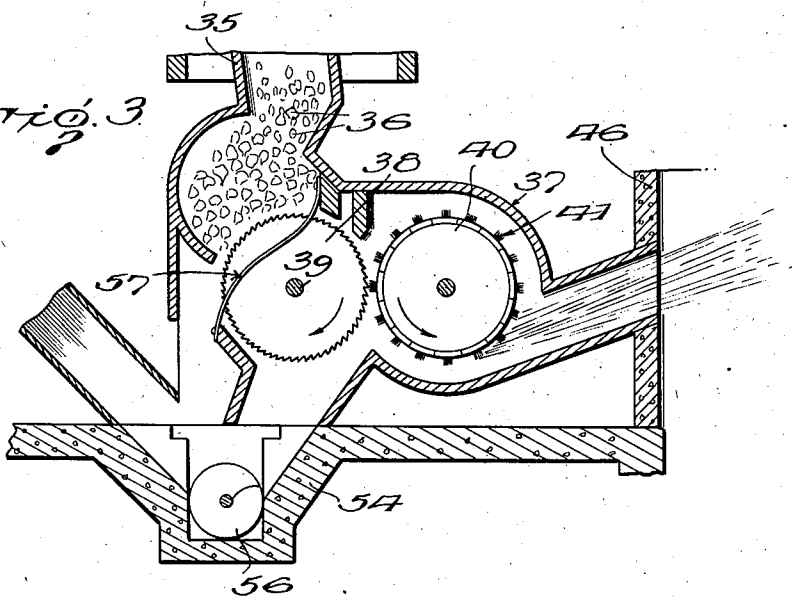


Fig. 3



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METHOD OF MAKING ROCK WOOL ARTICLES AND APPARATUS THEREFOR

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4 Claims. (Cl. 154—28)

This invention relates to methods of making rock wool articles and apparatus therefor; and it comprises a method of making rock wool articles in which molten rock is blown into loose fiber by steam or air blasts and the aerosol produced is settled as blankets in the usual manner in a plurality of quieting chambers, the settled fibers are collected from the several chambers as aerial streams by pneumatic suction and the streams are joined and transferred to a separating chamber wherein the combined fiber streams are subjected to centrifugal force to separate dust from fibers, the fibers are then shredded and disintegrated and collected on a traveling conveyor; and it further comprises apparatus for carrying out such method including a plurality of quieting chambers, means for blowing molten rock into fibers and projecting the blast into the chambers, pneumatic means for withdrawing settled fibers from the several chambers, a pneumatic centrifugal dust separating chamber arranged to receive the fibers from the several chambers and to discharge the fibers freed from dust, means for shredding and disintegrating the fibers and means for collecting the disintegrated fibers; all as more fully hereinafter set forth and as claimed.

Mineral wool or rock wool is ordinarily produced by melting a suitable rock mixture or a slag at high temperature and subjecting a molten stream to the action of a high pressure steam or air blast, to produce fibers dispersed in aerial suspension; as a sort of aerosol. The fibers, which are usually very fine, are allowed to settle in a quieting chamber maintained as free as possible from convection currents. In conventional operation, some at least of the fibers have "shot" at one end thereof; small solidified vitreous balls which have not been converted into fiber by the blast. With careful adjustment of the constituents of the rock mixture, temperatures, etc. the proportion of shot can be minimized. The settled fibers are withdrawn from the chamber as a sort of rough mat or blanket, which is subsequently formed into bats or other articles. Rock wool manufactures have found considerable use in the building arts, mostly as heat insulation. Rock wool at its best is an excellent material, being of good color, uniformity, and free of undesirable inclusions, shot crusts etc. However, to produce such high grade rock wool requires very careful attention at all times, as regards the components of rock mixture, the jet pressure, temperatures, etc. and even with the closest regulation it is found that the output of rock wool from a chamber varies; sometimes

minute by minute. It is often impractical to cull inferior masses of rock wool from the output. As a result, in rock wool as commercially produced there is an undesirable lack of uniformity, even with the most careful regulation.

Rock wool fibers do not have much felting ability, and moreover any tendency they may have to felt is counteracted by the peculiar conditions under which the fibers are collected. That is, the fine fibers produced by the blast are allowed to settle through the air falling on a conveyor. Bodies falling through a fluid such as air orientate themselves so as to present the greatest resistance to falling, hence the fibers tend to come down substantially horizontal in clumps and the blanket issuing from the chamber consists of laminated clumps of fibers very loosely held together. There is little interlocking. Not much structural strength is required of rock wool articles, but it has often been found necessary to use substantial amounts of adhesive to secure a bat which will hang together even under its own weight.

The present invention is directed to methods and means for obviating the difficulties mentioned, and for producing superior, coherent rock wool articles of great uniformity. These ends are achieved by provision of a system wherein the rock wool produced in a plurality of chambers is thoroughly intermingled so as to produce a product of averaged quality which does not change in spite of substantial variations in any one chamber. This averaged output is cleaned by suction and screening and is then subjected to a treatment adapted to rearrange the fibers so that they will cling together. The screened fibers, which exist as irregular clumps or masses, are subjected to the action of rotating saws and then to disintegrators which throw disintegrated fibers as a sort of rain on a conveyor. The deposited fibers can then be readily compacted into a blanket or other article and the resulting product is found to have superior coherence and regularity as compared with conventional products.

In the accompanying drawings, I have shown more or less diagrammatically an example of a specific embodiment of apparatus within the purview of the invention and useful in carrying out the method. In the drawings,

Fig. 1 is a view partly in elevation, partly in vertical section, of a complete apparatus,

Fig. 2 is a view in vertical section taken along line 2—2 of Fig. 1 and

Fig. 3 is a detail view of the disintegrator.

Referring to the drawings, the system comprises a plurality of rock wool chambers 9, each chamber having slanting walls 10 delivering to a traveling belt conveyor 11 and having an opening 12 through which is blown a jet of steam or air 13 forming fibers 14 from molten rock delivered by a spout 15 which runs from a cupola furnace (not shown). The fibers settle out as a rock wool layer 16 of laminated clumps urged outward by the conveyor. The chambers are shown as separated by dividing walls 8; these can be omitted if desired. For the sake of clarity of presentation of the added improvements the chambers of Fig. 1 are shown smaller than their actual relative size. A suction nozzle 17 is provided for each chamber, conveniently arranged to pick up the wool layer just outside the chamber as shown. This arrangement allows the output of each chamber to be readily inspected or sampled. The suction nozzles have outlet pipes 18 provided with control valves 19, the pipes being merged into a progressively expanding master conduit 20. The master conduit delivers at 21 into a centrifugal dust separator 22 of type known per se, connected by a suction pipe 23, with a motor-driven suction fan 24 exhausting through a stack 25. As shown, the fan 24 creates the suction by which the rock wool layers 16 are taken from the conveyors 11. The rock wool swirls around in the separator, being freed of dust therein, and issues from the conical separator bottom 26 as segregated clumps into a rotating discharge valve 27 having vanes 28. The separated dust passes out through stack 25 with exhausted air. This valve holds the vacuum in the suction system. The pneumatic removal and cleaning operations destroy the initial stratification of the fibers as collected on the conveyor.

The valve outlet has two branches. One branch, 31 provides a means for collecting and bagging the wool directly and the other branch, 32, leads to an agitating screen 33. A valve 34 allows the rock wool to be diverted to either of branches 31 and 32. The wool in passing over the agitating screen is freed of any shot which may be present therein and is delivered to a chute 35, whence it falls, in the form of irregular clumps or flocs indicated at 36, into a disintegrator (shown in detail in Fig. 3). The disintegrator comprises a housing 37 in which are provided a plurality of rotary saws 38 on an axle 39, and a rotary disintegrator drum 40 having brushes 41 thereon. The saws and the disintegrator rotate in the directions indicated by arrows and are driven by a motor 42 and belts 43 and 44 as shown. The brushes act to remove or "doff" the wool from the same. A series of springy prongs 57, arranged between adjacent saws, prevents the rock wool from falling down between the saws. The saws break up the variously sized clumps into uniform clumps or masses, and the disintegrator brushes tear these clumps apart and project the fibers as smaller groups or clumps indicated roughly at 45. The delineation of the rock wool clumps at the various stages is merely diagrammatic, to give an approximate idea of the actions taking place.

The small fiber clumps 45 are projected by the disintegrator at high velocity into a collecting chamber 46, and fall as a sort of rain on a conveyor 47. The conveyor is run at such speed as to deliver a blanket of desired thickness at 48. A roll 49 is arranged to smooth the fibers and compact them somewhat. Means are provided for spraying adhesive on the fibers if desired,

comprising a tank 50 containing water glass, certain oils or other suitable liquid adhesive, and arranged to drip liquid through a nozzle 51 into a jet of steam or air from a pipe 52. The spray of adhesive enters the chamber through a funnel-like orifice 53 and thoroughly coats the fibers.

Waste from the saw-disintegrator unit falls into a sump 54, which also receives shot, etc., from the screen through a hopper 55. Waste is withdrawn by a screw conveyor 56, and can be returned to the cupolas.

The blanket issuing from the collecting chamber is of surprising uniformity, coherence and strength, and is usually simply sawed into slabs to make bats for insertion between walls, etc. With reasonably careful operation blankets of practically unchanging characteristics can be produced continuously for any desired period of time.

What I claim is:

1. A method of making rock wool in blanket form, comprising the steps of forming rock wool fibers in a plurality of collecting chambers as laminated clumps, withdrawing the fibers from the several chambers as aerial streams by pneumatic suction, combining the streams of airborne fibers from the several chambers, transferring the combined streams to a dust-separating chamber and subjecting the combined stream therein to centrifugal action for removal of dust, removing dust-free fibers from said chamber, disintegrating the dust-free fibers by saws, projecting the disintegrated fibers into a collecting chamber and forming them into a blanket.

2. Apparatus for making blown rock wool in blanket form comprising a plurality of blowing jets and chambers for collecting the blown fibers, a traveling conveyor and pneumatic suction nozzle arranged for withdrawing the collected fibers from each chamber, suction conduits connected to the nozzles, a common conduit arranged to receive the fibers from the several suction conduits, a centrifugal dust separator connected to receive the wool under suction from said common conduit, exhauster means in communication with the dust separator and constructed and arranged to discharge therefrom exhaust air and separated dust, a valved outlet discharging the wool, a disintegrator comprising a plurality of saws with doffing brushes receiving wool discharged through said separator outlet and arranged to project disintegrated wool and a collecting chamber for receiving the projected disintegrated wool and forming it into a blanket.

3. In apparatus for manufacturing rock wool, the combination of a plurality of settling chambers each having a usual traveling conveyor for removing rock wool as formed, with a suction nozzle for each chamber arranged to withdraw rock wool as an aerial stream from the conveyor, conduit means for receiving and joining the combined streams from the suction nozzles, a centrifugal dust separating chamber connected to said conduit means and adapted to subject the joined streams of air-borne fibers therein to whirling action for removal of dust, means for sucking streams of air through said nozzles and the dust separating chamber, and means for withdrawing dust-free fibers from the dust separating chamber.

4. An apparatus for making rock wool comprising a plurality of settling chambers, jet means for forming fibers in aerial suspension

from molten rock and projecting them into the chambers, a traveling conveyor in each chamber and a pneumatic suction conduit arranged to withdraw fibers from the conveyor, a main conduit receiving the output of the several conduits, a screen arranged to agitate the fibers and free

them from solid inclusions, means for delivering fibers to the screen, a plurality of saws for shredding and disintegrating the screened fibers and means for collecting the fibers leaving said means and forming them into a blanket.

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