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APPARATUS FOR PRODUCING ROCK WOOL PRODUCTS

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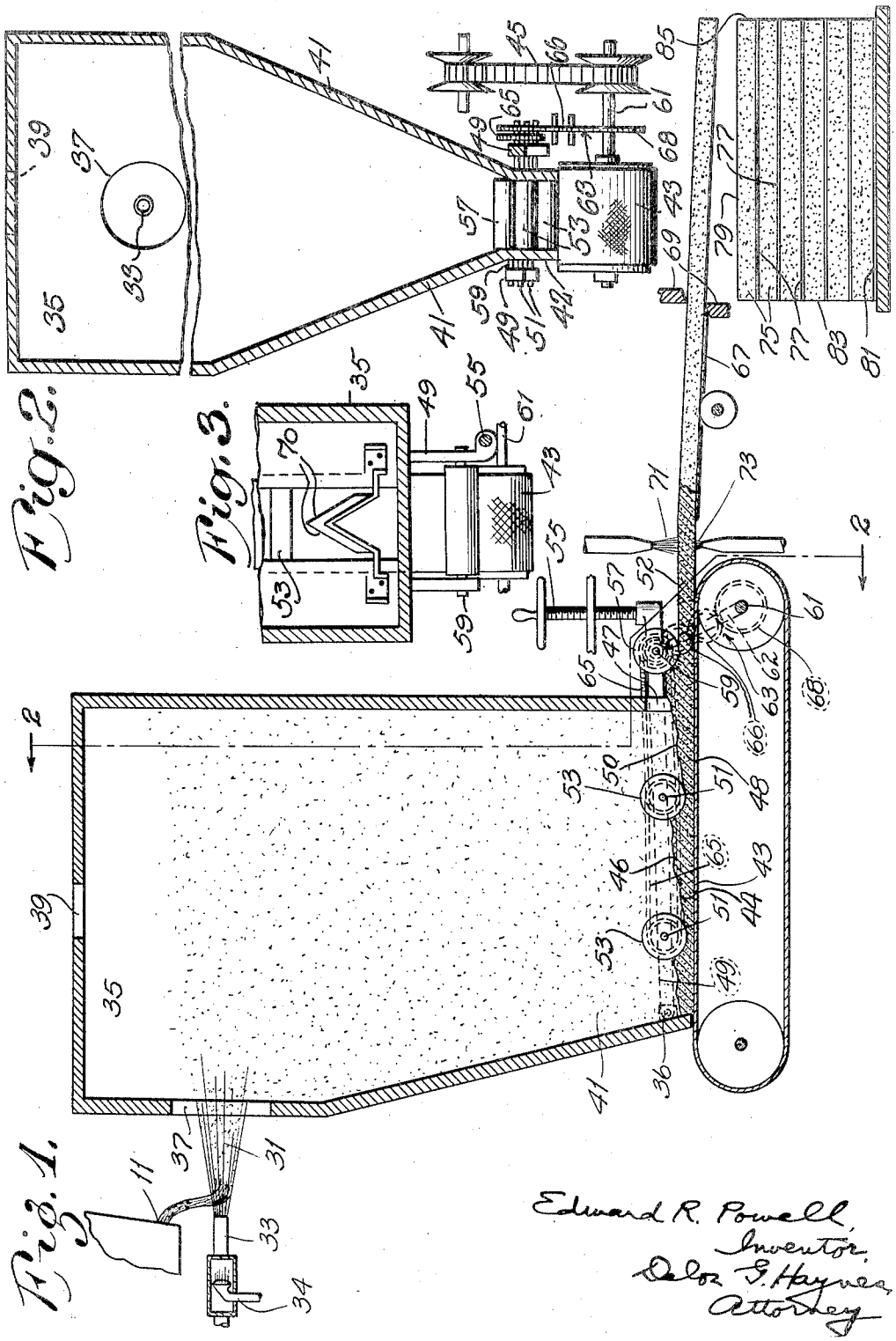


Fig. 2.

Fig. 3.

Fig. 1.

Edward R. Powell,
Inventor.
Odor G. Haynes
Attorney

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APPARATUS FOR PRODUCING ROCK WOOL PRODUCTS

Edward R. Powell, Alexandria, Ind., assignor to Banner Rock Corporation, Alexandria, Ind., a corporation of Delaware

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9 Claims. (Cl. 154—27)

This invention relates to a method of, and apparatus for producing an improved felted rock or mineral wool and also relates to a product composed of said improved wool.

This invention is a division of my patent No. 1,656,828, dated January 17, 1928.

Among the several objects of the invention may be noted the provision of improved means for blowing and subsequently felting said wool so as to obtain the strongest product possible and at the same time the maximum insulating efficiency which the material can maintain; and the provision of adjustable apparatus adapted to produce said improved wool quickly and cheaply in various thicknesses and textures and densities. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combination of elements, features of construction, arrangements of parts, and the steps and sequence of steps which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is illustrated one of the various possible embodiments of the invention,

Fig. 1 is a diagrammatic vertical section of a blow chamber and includes also an enlarged detail showing the preferred method of laminating the product;

Fig. 2 is a lateral section of said blow chamber taken on line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary plan view of a roller showing the application of side guides.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Referring now more particularly to Fig. 1, there is illustrated at numeral 11, the molten slag outlet from a mineral wool cupola of a conventional type.

As is illustrated in Fig. 1, the liquid rock, broadly of the kind disclosed in my Patent No. 1,656,828, trickles from the rock charge in the cupola and forms an efflux at the outlet 11.

In order to transform the liquid rock into the fluffy or wooly fibrous mass required for purposes of insulation, it is permitted to descend from the outlet 11 into the path of a rapidly moving steam (or air) jet 31 issuing from a nozzle 33. For purposes of improving the final product, under certain circumstances, a binder material is introduced into the nozzle 33 by means of a secondary jet 34 to be projected with the jet 31. The rapidly moving steam of the jet 31 draws the precipitating melted material out into innumerable fine atomized glassy threads at the forward end of many of which is formed a minute ball or drop. In settling down, most of the resulting fibers of rock or mineral wool lose the ball or drop; but whether attached or detached the small drops usually appear in the resulting mass of glassy threads, unless they are permitted to drop out.

It remains to felt down the rock wool and in the process permit the removal of many of the small drops.

The following method of felting is based on the fact that rock or mineral wool comprises a brittle fiber and will not permit of tearing, rending or reassembling, as is practicable in making textile and asbestos products. The strongest felt which can be made of rock wool is that which is naturally formed by the gentle and gradual pressure that the material exerts as it falls in the chamber into which it is blown by the steam jet.

By felting in the above manner the maximum insulating efficiency of which the material is capable is obtained. This is because a maximum number of the fibers lie with their lengths parallel to the horizontal planes of the material. Rock wool, when felted in this way, comprises a pliable material which may be formed to fit various surfaces or into various recesses.

Referring again to Fig. 1, the improved method of felting will be described:

A blow chamber 35 is provided with an inlet mouth 37 adapted to receive the steam jet 31 which carries the spray of melted, atomized and fast hardening fibrous materials. An outlet 39 for air and steam is provided at or near the top of said chamber 35.

It will be seen that the bottom portions 41 of the chamber 35 taper inwardly and downwardly in hopper form. These portions 41 have smooth sides and descend to regions in proximity to the upper reach of a moving conveyor belt 43. The portions 41 and the ends of the chamber 35 cooperate with said conveyor 43 in a manner such that the blown wool does not escape from the chamber before it is desired to have it do so. This is done by means of a narrow channel 42 of width equal to the width of the layer of finished wool, which may be from two to eight feet or so.

The conveyor 43 is driven from a conventional variable speed drive 45 and is adapted to carry

the rock wool from the blow chamber by way of an opening 47.

Just above the conveyor and outside of the chamber 35 is pivoted at 36 a roller-supporting frame 49 which supports a plurality of roller axles 51. These axles reach through suitable slots in the channel 42 and carry rollers 53 within the channel 42. The rollers 53 are approximately the width of said channel. At the end of the frame 49, opposite the pivot 36, the frame 49 is provided with an adjusting screw 55 for the purpose of raising and lowering said last-named end.

Another roller 57 is carried on the frame 49 outside of the opening 47.

The above described construction positions the rollers 53 inside of the channel 42 and above the conveyor 43; and the roller 57 outside of the chamber, above the conveyor. The arrangement of rollers with respect to the length of the channel 42 is such that the elevation of each of the plurality of rollers is greater than that of the preceding one (reading Fig. 1 from left to right). It is to be understood that any other suitable number of rollers may be used, three being shown by way of example.

The outside roller shaft 59 is driven from the conveyor drive 61 by means of a gear drive 63 (shown conventionally) and in turn drives the rollers 53, 53 by means of a sprocket-and-chain system 65. The gearing is such that the surface speeds of the rollers are about equal to the surface speed of the conveyor belt and preferably in the same direction. The idler wheels 66 thereof are movable upon a swing support 62 about the center of their driving gear 68, so as to accommodate adjustment from the screw 55.

From the above it may be seen that a large space is provided above for permitting the wool to fluff and feather out, to form fine particles and fibers. Then, as the wool settles, the hopper sides and the wool's own weight compress it gently until it rests on the moving conveyor 43. The conveyor is made of foraminous material of a rather fine mesh which permits dropping out of the fine beads or balls in the blown material. The left-hand roller compresses the wool deposited ahead of it as said wool is fed thereunder by the conveyor. This puts a lower strip or layer 44 of compressed wool between the two inner rollers upon which wool 46 deposits to be compressed into a second layer 48 on said first layer 44 by the second roll. Two contiguous layers of wool emerge from the second roller, upon which more wool 50 is deposited to be fed out of the blow chamber and beneath the last outside compressing roller 57 to form a top layer 52.

It is to be understood that the compression is light and does not provide distinct layers in the finished sheet, although a stratifying effect is had. The layers are merely referred to herein for convenience.

As stated before, as many rollers may be used as desired, depending upon the number of layers required. The slope of the line of rollers and distance apart govern the thickness and/or texture but this may be adjustably varied by varying the speed of the conveyor drive 45. The variation in texture and/or thickness is thus had because a different time is allowed for accretion of wool as the conveyor speed is changed.

The advantage in laying the wool down in layers instead of compressing it to the desired thickness in one operation, lies in the fact that the fibers lie in more parallel planes near the surfaces on which given accretions rest. Hence, by starting new accretions at intervals on flatter surfaces of the material itself, the most efficient felt having fibers running substantially perpendicular to the direction of heat flow is obtained. The breaking and mashing of upstanding fibers into folded and irregular positions is also reduced. The roll pressure being light, a substantially homogeneous sheet is the final result. The pressure used in laying down the stratum is transmitted to the preceding strata, and inasmuch as all strata are in direct contact, the contiguous fibers thereof are interlocked.

Sometimes it is desirable to have more dense edges on a strip and these may be obtained by introducing inwardly slanting guides 70 ahead of each roller as illustrated in Fig. 3. Thus the edges of the strata are compressed to a greater density than the interiors thereof. The more dense edges prevent fraying out of the material when it is handled.

From the conveyor the material is preferably fed to a cutting plate 67 and cut into suitable lengths by shears 69 or other means. Before the plate 67 is reached the sheet of wool is further impregnated with binder material issuing in jets 71, 73. The binders described herein may comprise such substances as asphalt, sodium silicate, casein, glue, wax or similar materials.

The improved product includes the advantages hereinbefore described. The cut sheets of material are assembled into an insulating block by laying down a sheet of wool, then applying a sheet 77 of less porous material such as tar or roofing paper, then a sheet 75 of wool material and so on, until a predetermined size of laminated block is formed. This block may be held in assembled position by wire stapling, sewing, gluing or wrapping. Its advantage is due to the fact that when the air in the block expands and contracts under thermal changes, the air breathing action thereof does not take moisture to the interior of the block so readily as when a non-laminated assembly is used.

It is evident that the moisture cannot enter the center of the block over the short paths from the sideward faces 79, 81 because it cannot pass through the non-porous sheets of tar paper or the like. In other words, the moisture is forced to take a long path from the edges 83, 85 of the block and for a given period of breating will not travel as far into the interior.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Apparatus for making rock and mineral wools comprising a blow chamber, means for blowing fibrous material into said chamber, a moving conveyor engaging the lower end of said blow chamber to continuously carry out said material and rollers cooperating with the conveyor within the chamber to stratify the wool.

2. Apparatus for making rock and mineral wools comprising a blow chamber, means for blowing fibrous material into said chamber, a moving conveyor engaging the lower end of said

blow chamber to carry out said material after it settles, and rollers cooperating with the conveyor to stratify said material, said rollers being placed in ascending elevations within the chamber.

3. Apparatus for making rock and mineral wools comprising a blow chamber, means for blowing fibrous material into said chamber, a moving conveyor engaging the lower end of said blow chamber to carry out said material after it settles, and rollers within the chamber cooperating with the conveyor to stratify said material, said rollers being placed in ascending elevations and being adjustable.

4. Apparatus for making rock and mineral wools comprising a blow chamber, means for blowing fibrous material into said chamber, a tapering lower region in said chamber including a channel, a conveyor in said channel adapted to receive settling wool and rollers in the chamber placed over said conveyor in ascending elevation in the direction of conveyor movement, the lower surfaces of said rollers being adapted to move in the direction of the conveyor.

5. In a machine of the class described the combination with a settling chamber, of means for forming mineral wool fibres and projecting them into said chamber, a conveyor arranged to receive the fibres as they fall in the chamber to form a layer, means for treating the fibres with a binder, and means to compact the layer of fibers during the advance of the latter to form a bat.

6. In a machine of the class described, the combination with a settling chamber of means for forming mineral wool fibers and projecting them into said chamber, a conveyor arranged to receive the fibers as they fall in the chamber, and a roller inside of said chamber and acting on the collected layer of fibers to compact them as they are advanced by said conveyor.

7. In a machine of the class described, the combination with a settling chamber of means for forming mineral wool fibers and projecting them into said chamber, a conveyor arranged to receive the fibers as they fall in the chamber, said conveyor extending outside of said chamber, and means outside of said chamber to compact the layer of fibers during the advance of the latter.

8. In a machine of the class described, the combination with a settling chamber of means for forming mineral wool fibers and projecting them into said chamber, a conveyor arranged to receive the fibers as they fall in the chamber, and a roller to compact the layer of fibers during the advance of the latter to form a bat.

9. In a machine of the class described, the combination with a settling chamber of means for forming mineral wool fibers and projecting them into said chamber, a conveyor arranged to receive the fibers as they fall in the chamber and to advance the produced layer, and a member engaging said layer to compact the latter to a bat of predetermined thickness and density.

EDWARD R. POWELL.