

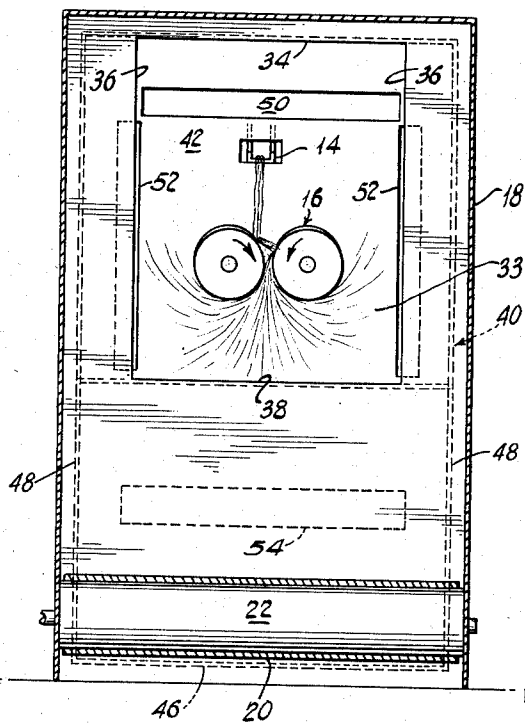
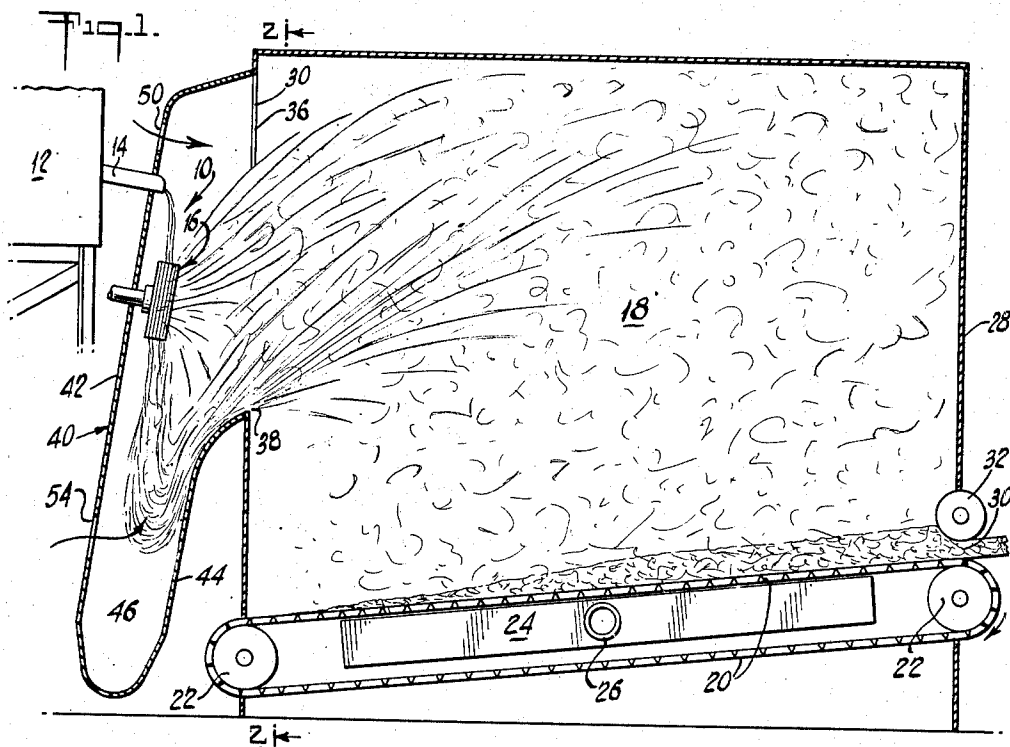
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APPARATUS FOR FIBER COLLECTION

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APPARATUS FOR FIBER COLLECTION

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The present invention relates to the manufacture of artificial fibers and, more particularly, to an improved apparatus for converting a material, such as a molten raw material, into fibers and for forming a mat or felt therefrom. The invention is particularly concerned with the production of mineral wool by which term is meant wool or fibers formed from rock, slag, glass, mixtures thereof and like raw materials, and will be specifically described in that connection. However, it will be appreciated that the invention may be employed in the manufacture of fibers of other thermoplastic materials.

Heretofore, mineral wool has been made in a number of ways including the conventional method of disintegrating a molten raw material into a multiplicity of fibers by the action of a high pressure steam jet and gathering the fibers on a conveyor forming the floor of a blowchamber positioned forwardly of the fiberizing means. More recently it has been proposed to fiberize the molten material by spinners or rotors rotated at high speed. Under the centrifugal force set up by the high speed rotation of the rotors, portions of the molten material carried by the rotors are drawn out into fine fibers or threads. The principal object of the invention is the provision of an improved apparatus for collecting the fibers from operations of the latter type.

Another object of the invention is the provision of an improved apparatus which diverts the fibers from their normal paths of movement from the rotor surfaces and carries them to a collection chamber to be deposited therein in the form of a relatively uniform mat or felt. The invention also provides for the separation of shot and other unfiberized particles from the fibers.

Briefly stated, my invention resides in an apparatus including a collection chamber having an entrance opposite the fiberizing device, the entrance being defined in part by a threshold, preferably spaced from the bottom of the collection chamber. A housing surrounds the entrance and fiberizing device, the housing extending substantially below the threshold. Means are provided to set up air currents passing through the housing and then into the collection chamber, the air currents forming, in effect, aeriform walls on each side of the fiberizing device to limit the outward movement of the fibers and to re-direct them into the collection chamber. At the same time unfiberized particles or shot, due to their greater inertia, pass through the airstreams out of the fiber collecting zone.

My invention will be more fully understood

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and further objects and advantages will become apparent when reference is made to the more detailed description of a preferred embodiment of the invention which is to follow and to the accompanying drawings in which:

Fig. 1 is a longitudinal, sectional view, taken through an apparatus embodying the instant invention; and,

Fig. 2 is a sectional view, taken on the line 2—2 of Fig. 1.

Referring now to the drawings, there is shown an apparatus including fiber producing means indicated generally at 10 and which may include a melting furnace 12 of any suitable type, such as a cupola, as illustrated. The furnace includes a discharge trough 14 through which a stream of molten slag, rock, glass or other fiber forming material is drawn from the furnace and discharged in position to be contacted by a rotor fiberizing device, indicated generally at 16. The latter is of the type employing, preferably, a plurality of rotors supported to have their peripheral edges in position to be contacted by the molten material discharged from trough 14. The molten material is discharged onto the peripheral surfaces of the rotors and fibers are drawn from the material by centrifugal force upon high speed rotation of the rotors. The particular construction of the rotary fiberizing device may vary but typical constructions are shown in patent to Powell, #2,428,810, issued October 14, 1947, and in the co-pending application of Edward R. Powell, S. N. 742,064, filed April 17, 1947, now abandoned.

In accordance with the instant invention a fiber collection chamber 18 is located adjacent and forwardly of the fiberization device 16. Collection chamber 18, which is relatively airtight, except for the openings to be described, includes a bottom wall suitably comprising a conveyor 20 adapted to be supported on rolls 22 and to be driven in the direction indicated by the arrow (see Fig. 1) by any suitable means (not shown). A suction box 24 is located intermediate the upper and lower reaches of the conveyor with its open side adjacent the upper reach of the conveyor. The suction box may be connected to any suitable air-exhausting device (not shown) as by means of duct 26.

The forward wall 28 of the collection chamber is provided with an exit port 30 through which the accumulated fibers are delivered by the conveyor to any suitable re-handling apparatus. Port 30 is preferably defined in part by a roll 32

adapted to compress and consolidate the fibrous mass to some extent.

The rear wall of the collection chamber (see particularly Fig. 2) includes an entrance opening 33 opposite the fiberizing device. This opening is defined by a top edge 34, side edges 36 and a bottom edge or threshold 38.

Surrounding entrance 33 and the fiberizing device is a housing, indicated generally at 40, the housing including a rear wall 42 lying behind the fiberizing device 16 and extending upwardly and forwardly to join the rear wall of the collection chamber, and downwardly and rearwardly to a point remote from the fiberizer. Also extending downwardly, and preferably rearwardly from threshold 38, is a front wall 44. Walls 42 and 44 form a pocket 46 in which suitable means (not shown) may be provided to remove unfiberized particles and shot collected in the pocket. The sides of the housing are closed by side walls of any suitable type, indicated at 48 in Fig. 2.

Rear wall 42 is provided with openings to receive the shafts and other elements of fiberizing device 16 and also to receive trough 14 to permit these elements to extend into the interior of the housing.

Rear wall 42 is also provided with air inlet openings adapted to coact with suction device 24 to set up airstreams surrounding the fiberizing device, and of a character to control the movement of the fibers formed by the fiberizing device and carry them into the collection chamber. These air inlets include an upper inlet 50 comprising a relatively narrow slit extending substantially horizontally above the fiberizing device, side inlets comprising slots 52 on opposite sides of the fiberizing device, and a lower air inlet 54 remote from the rotors and preferably adjacent the lower end of pocket 46. Air inlet 54 comprises a horizontally extending slit of preferably greater width than the other inlets to permit the entry of a greater quantity of air. It will be appreciated that, although continuous slits are shown, this is not necessary and that any or all of the air inlets may be made up of a series of slits or openings of other shapes, if desired.

In the operation of the apparatus described above and in carrying out the method of the invention thereon, molten material is discharged from trough 14 onto the peripheral edges of the rotors of fiberizing device 16. The rotors are rotated at high speed to cause portions of the molten material to be thrown or drawn off into long fine fibers under the centrifugal forces created. As will be readily understood, the fibers are drawn substantially tangentially to the rotors and in the planes of the rotors and normally tend to continue movement in such paths.

To control the movement of the fibers and divert them into the collection chamber, the air-exhausting means is operated to cause air flow from the collection chamber into the suction box 24. The withdrawal of air from the collection chamber in turn sets up air currents flowing through the several air inlet ports 50, 52 and 54 and into the collection chamber. These air currents, flowing through ports 50 and 52, create what is, in effect, aeriform walls which block the upward and outward movements of the fibers and divert them from their normal paths and lead them into the collection chamber.

It has been found that, in the use of a fiberization device of the kind referred to, the highest

proportion of the fibers are drawn from the rotor surfaces as they pass through their lower and adjacent arcs of revolution. This condition, combined with the tendency of the fibers to sink under the influence of gravity, causes the greater mass of the fibers to be discharged downwardly below the rotors. In order to overcome this movement and to lift the fibers and distribute them in the collection chamber, the threshold 38 and air inlet 54, previously described, are employed. Air entering port 54 sets up an airstream which sweeps inwardly and upwardly of pocket 46 adjacent wall 44 and over threshold 38. In this way sufficient downward movement of the fibers is permitted to avoid interference with the fiberizing operation and to prevent undue entanglement and, at the same time, an airstream of sufficient velocity is created to reverse the direction of movement of the fibers and carry them into the collection chamber.

The fibers entering the collection chamber in aeriform suspension are drawn downwardly by gravity and by the flow of air into suction box 24 and deposited on the conveyor in the form of an interfelted or matted layer. The layer continually formed in this manner is carried from the collection chamber by the conveyor and may thereafter be subjected to any further operations necessary to convert it into a final product.

It will be appreciated that where a modified product is desired, a treating material may be sprayed into the suspension of fibers by suitable means (not shown.)

The method and apparatus in accordance with the instant invention insures collection of the greater portion of all the relatively fine fibers. On the other hand, unfiberized particles, i. e., shot and many coarse fibers, due to their greater inertia, pass through the airstreams to strike the walls of the housing and fall to the bottom of pocket 46 from which they may be removed in any suitable way. Hence, efficient collection of the usable fibers and separation of the unusable materials is attained.

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. In a fiber forming and collecting apparatus including rotor means for converting a molten raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers formed by said rotor means, an entrance opening in the chamber opposite the rotor means and the plane of discharge of the fibers, said entrance opening including a threshold defining the lower edge thereof, a housing surrounding the rotor means and entrance opening and extending below said threshold, and means for setting up an air current flowing from the lower part of the housing upwardly and over said threshold to carry fibers into the collecting chamber.

2. In a fiber forming and collecting apparatus including rotor means for converting a molten raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers, an entrance opening in the chamber opposite said rotor means and

the plane of discharge of the fibers, said entrance opening including a threshold defining the lower boundary thereof, a housing surrounding said rotor means and entrance opening and extending below said threshold, and means for setting up airstreams flowing laterally past said rotor means and over said rotor means and for setting up an airstream flowing from the lower part of the housing upwardly and over said threshold to confine the paths of movement of fibers formed by said rotor means and to direct the fibers into the collecting chamber.

3. In a fiber forming and collecting apparatus including rotor means for converting a molten raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers, an entrance opening in the chamber opposite said rotor means and the plane of discharge of the fibers, said entrance opening including a threshold defining the lower edge thereof, a housing surrounding said rotor means and entrance opening and extending below said threshold, an air port in a wall of the housing below said threshold, and means for setting up a current of air flowing through said port and upwardly and over said threshold to carry said fibers to said collecting chamber.

4. In a fiber forming and collecting apparatus including rotor means for converting a molten raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers, an entrance opening in said chamber opposite said rotor means and the plane of discharge of the fibers, said entrance opening including a threshold defining the lower edge thereof, a housing surrounding said rotor means and entrance opening and extending below said threshold, means extending through said housing to deliver molten material to said rotor means air ports in a wall of said housing on opposite sides of said rotor means, an airport in said wall above said rotor means and molten material delivery means an airport in the wall of said housing below said threshold, and means for setting up air currents flowing through said air ports and through the chamber to direct the fibers into the collecting chamber.

5. In a fiber forming and collecting apparatus including rotor means for converting a molten

raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers, an entrance opening in the chamber opposite said rotor means and the plane of discharge of the fibers, said entrance opening including a threshold defining the lower edge thereof, an air-pervious floor in said collecting chamber, means for withdrawing air through said floor, a housing surrounding said rotor means and entrance opening and extending below said threshold, and an air port in the wall of the housing below said threshold whereby, upon withdrawal of air through said floor, an air current flows through said port and upwardly and over said threshold to carry fibers therewith.

6. In a fiber forming and collecting apparatus including rotor means for converting a molten raw material into fibers and discharging the fibers substantially tangentially therefrom, the improvement comprising, a fiber collecting chamber to receive the fibers, an entrance opening in the chamber opposite said rotor means and the plane of discharge of the fibers, said entrance opening including a threshold defining the lower edge thereof, an air-pervious floor in said collecting chamber, means for withdrawing air through said floor, a housing surrounding said rotor means and entrance and extending below said threshold, means extending through said housing to deliver molten material to said rotor means air ports in a wall of said housing on opposite sides of said rotor means, an airport in said wall above said rotor means and said molten material delivery means and an airport in a wall of said housing below said threshold whereby airstreams defining fiber confining aeriform walls flow past said rotor means and direct the fibers into the collecting chamber.

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