PLAINTIFF'S EXHIBIT
JM 1053

April 16, 1946. L. A. HAWTHORNE ET AL 2,398,707

FIBERIZING APPARATUS

Filed April 29, 1943

Fig. 1.

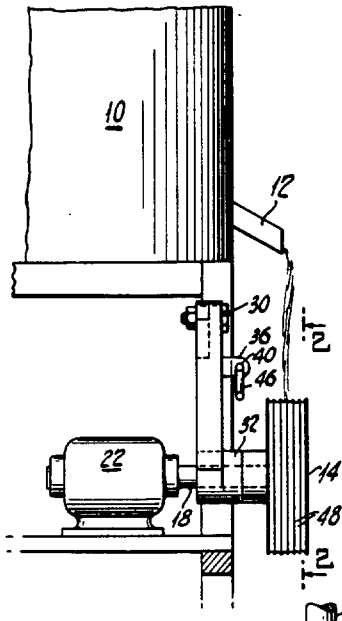


Fig. 2.

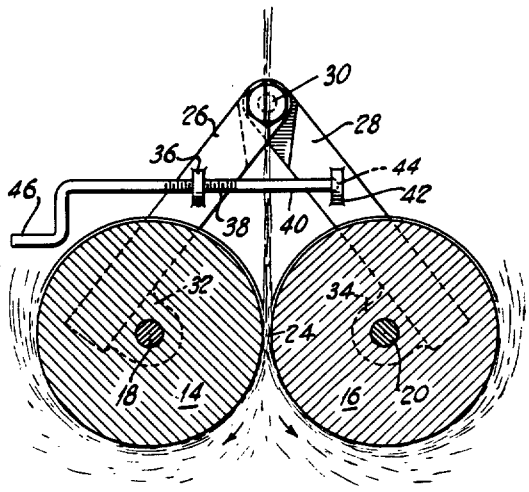


Fig. 3.

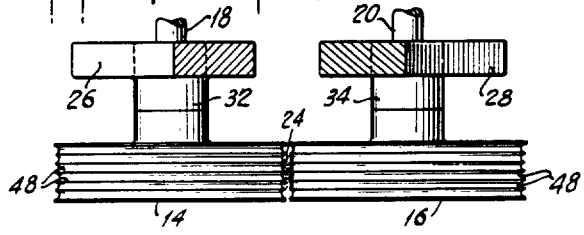
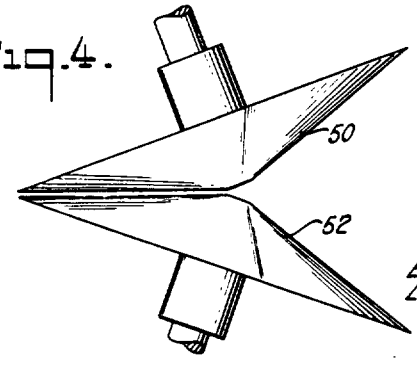


Fig. 4.



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FIBERIZING APPARATUS

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Application April 29, 1943, Serial No. 485,008

3 Claims. (Cl. 83—91)

Our present invention relates to the manufacture of mineral wool and the like and, more particularly, is directed to improved apparatus for converting the molten raw material into fibers. The term "mineral wool" is employed herein in a generic sense to include wool or fibers formed from rock, slag, glass mixtures thereof and like raw materials.

Conventionally raw materials of the type referred to above have been converted into fibers by subjecting a stream of the material in a molten state to the disintegrating action of a high pressure steam jet. It has also been proposed to fiberize the material by impinging the molten stream on a spinner or rotor rotated at high speed, which breaks the stream up into drops or masses which are thrown from the spinner by centrifugal force and drawn out into fiber or thread form. The principal object of the instant invention is the provision of an improved fiberizing apparatus of the latter type.

Another object of the invention is the provision of such improved apparatus which is adapted to give an increased fiber yield.

A further object of the invention is the provision of centrifugal or spinner type apparatus, including a plurality of rotors or spinners acting upon the stream of molten material.

A still further object of the invention is the provision of a fiberizing device in which the molten material is distributed over the peripheral surfaces of a plurality of rotors, whereby the fiberizing area is substantially increased.

Our 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 elevation view of an apparatus embodying the instant invention;

Fig. 2 is a front sectional view on an enlarged scale of the apparatus of Fig. 1, taken on the line 2—2;

Fig. 3 is a top plan view of the apparatus of Fig. 2; and

Fig. 4 is a view similar to Fig. 3 depicting a modification of the invention.

Referring now to the drawing, there is shown an apparatus comprising a melting furnace 10 of any suitable type. Furnace 10 may comprise a couple, tank furnace or the like, the particular means employed for melting the raw material not being critical in the instant invention. Furnace 10 includes a discharge orifice in communication with a trough 12, whereby the raw material melted in the furnace is discharged in the form of a stream from the end of the trough. The raw material may be rock, slag, glass, mixtures thereof or other suitable raw materials employed in the manufacture of mineral wool and like fibrous products.

Below the discharge end of trough 12 there is supported a fiberizing means, embodying our present invention. The fiberizing means comprises a pair of rotors 14 and 16 supported on shafts 18 and 20, respectively, for rotation in the directions as indicated by the arrows in Fig. 2. Shafts 18 and 20 are driven in any suitable manner, as for example, by individual motors, one such motor being shown at 22 for shaft 18. Alternatively the shafts may be driven by a single prime mover connected with the shafts by suitable power transmission means, as will be readily understood.

Rotors 14 and 16 are positioned to have their peripheral surfaces closely approach each other, as indicated at 24. Preferably the gap or bight 24 between the rotors is adjustable and, for this purpose, the rotor supporting means may include an adjusting device of a suitable type. In the example shown, the adjusting and supporting means includes arm 26 and 28 pivoted at 30 to any fixed member such as an element of th supporting frame. Arms 26 and 28 include ears 32 and 34 having bearings for received shafts 18 and 20, respectively. Secured to arm 26 in such a position that it will not interfere with the operation of rotor 14 is a lug 36 having a threaded opening to receive a threaded portion 38 of a rod 40. The other arm 28 includes a lug 42 opposite lug 36, and provided with a recessed seat 44, loosely receiving the end of rod 40. The other end of rod 40 is shaped to provide a crank 46.

As illustrated more particularly in Fig. 3, the peripheral surfaces of the rotors are provided with a plurality of contiguous annular grooves 48 providing means for receiving and temporarily retaining the molten material. Preferably the grooves are continued across the entire width of the peripheral surfaces of the drums.

In operation the fiberizing apparatus is positioned to receive the stream of molten material from trough 12 adjacent the gap or bight 24 between the rotors although the point of impact may be spaced somewhat therefrom, as illustrated in Fig. 2. The width of the gap or bight 24 between the rotors is adjusted so that the molten material is spread out by the squeezing or wringing action of the rotors as it passes therebetween to become distributed substantially uniformly over

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the rotor surfaces. The adjustment is secured by manipulation of crank arm 46, which, when turned in one direction, will cause movement of arms 28 and 28, and consequently of rotors 14 and 16, away from each other and, when turned in the opposite direction, will cause the rotors to move closer together.

Rotors 14 and 16 are preferably driven at substantially the same speed in the directions indicated by the arrows in Fig. 2 to have high peripheral velocities. The stream of molten material striking the rotors is distributed over a substantial portion of their peripheral surfaces as it passes therebetween. Upon continued rotation of the rotors the molten material is thrown off the rotors by centrifugal force in the form of drops or small masses moving at a high velocity which are drawn out into fiber or thread form as they travel through the air. The annular grooves 48 serve to retain, at least temporarily, substantial quantities of the molten material for a sufficient length of time to permit fiberization to take place over substantial sections of the circumferences of the rotors. Although but a single stream of molten material is shown, it will be understood that one or more additional streams may be employed, depending upon the widths of the rotors and other operating conditions.

In the event that particles or chunks in an unmelted state, such as pieces of coke or the like, are discharged with the molten material and reach the bight between rotors 14 and 16, the rotors are forced apart to allow the material to pass therebetween without injury to the apparatus, due to the manner in which the rotors are supported by arms 26 and 28. That is, movement of the rotors away from each other is restrained solely by the horizontal component of the gravitational forces on the rotors which may be overcome by the pressure of the solid particle or chunk. When the pressure is removed the rotors swing back into adjusted position.

Referring now to Fig. 4, there is illustrated a somewhat modified form of the invention. In this instance the rotors 50 and 52, each of conical or frusto-conical shape, are so positioned that portions of their surfaces lie in closely adjacent relationship to define a bight therebetween, similarly as in the case of the cylindrical rotors of the type previously described. The fiberizing action is performed in a similar manner to that described above. That is, the molten material is distributed over the surface areas of the rotors in rather thin layers from which particles or small masses are discharged, the particles or masses being drawn out into fibers as they move through the air at high velocity.

Having thus described our invention in rather full detail, it will be understood that these 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 by the subjoined claims.

What we claim is:

1. An apparatus for converting a stream of molten material into a multiplicity of fine fibers comprising a pair of rotatable drums of a character to withstand the heat of the molten stream and having surfaces including portions defining a bight therebetween of less width than the diameter of said stream to spread the molten material on said surfaces, means for positioning said drums to receive the molten material on said surfaces, annular grooves in said surfaces for retaining the molten material, and means to positively rotate each of said drums to cause said surfaces to travel in substantially the same directions at said bight and at substantially equal and sufficiently high velocities to discharge the molten material therefrom in fibrous form.

2. In a mineral wool forming apparatus including means for discharging a stream of molten material and means for converting said stream into a multiplicity of fine fibers, said last-named means comprising a pair of rotating drums of a character to withstand the heat of the molten stream and supported on substantially horizontal axes, said drums including surfaces having portions in closely adjacent relationship to define a bight therebetween of less width than the diameter of said stream to spread said molten material on said surfaces, the supporting means for said drums being yieldable and adjustable to permit variations in said bight, said surfaces of said drums having annular grooves for containing said molten material, and means to positively rotate each of said drums to cause said surfaces to travel in substantially the same directions at said bight and at substantially equal and sufficiently high velocities to discharge the molten material therefrom in fibrous form.

3. An apparatus for converting a stream of molten material into a multiplicity of fine fibers comprising means for discharging a stream of molten material, a pair of frusto-conical rotors of a character to withstand the heat of the molten stream with the coned surfaces thereof lying in closely adjacent, substantially parallel relationship at a narrow bight therebetween, means for supporting said rotors on intersecting axes to receive said stream adjacent said bight, and means for rotating said rotors to have said adjacent surfaces traveling in substantially the same direction at said bight, and at a sufficiently high speed to discharge the molten material therefrom in fibrous form.

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Certificate of Correction

Patent No. 2,398,707. April 16, 1946.

LOUIS A. HAWTHORNE ET AL.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 39, for "elevation" read *elevational*; line 51, for "couple" read *cupola*; and second column, line 27, for "arm" read *arms*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of July, A. D. 1946.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.