PLAINTIFF'S EXHIBIT
JM 1052

Nov. 13, 1945. E. R. POWELL 2,388,935

MINERAL WOOL MANUFACTURE

Filed April 29, 1943

Fig. 1.

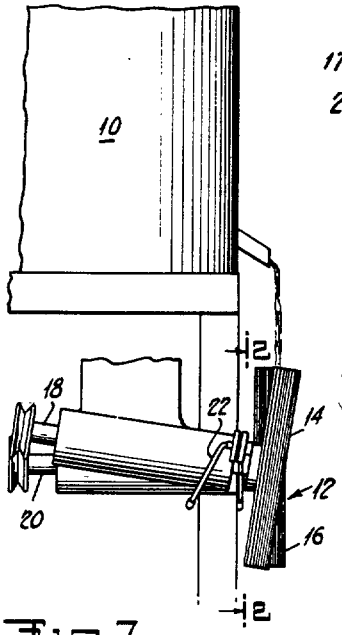


Fig. 3.

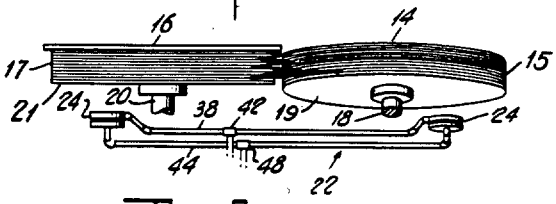


Fig. 2.

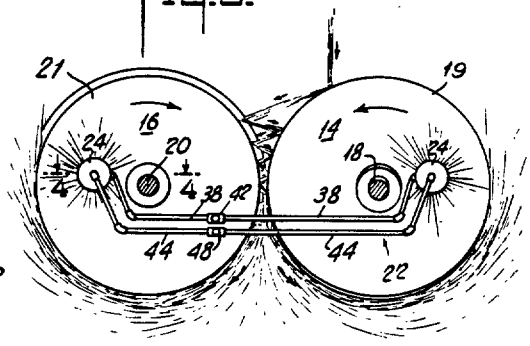


Fig. 4.

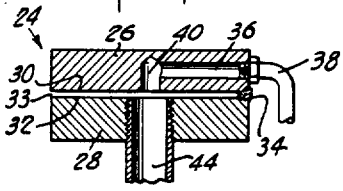


Fig. 7.

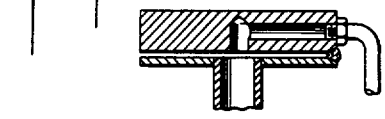


Fig. 5.

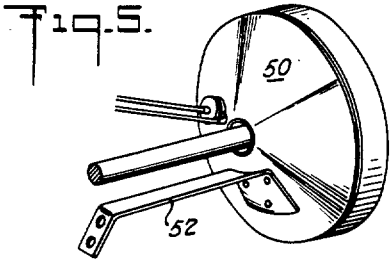
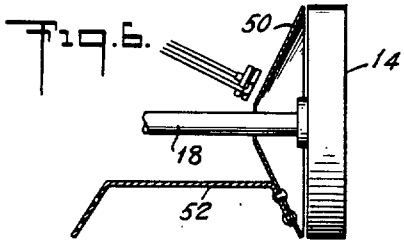


Fig. 6.



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MTC 017098

Patented Nov. 13, 1945 2,388,935

UNITED STATES PATENT OFFICE

2,388,935

MINERAL WOOL MANUFACTURE

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Application April 29, 1943, Serial No. 485,010

7 Claims. (Cl. 49—1)

My present invention relates to the manufacture of mineral wool and like products and more particularly to improved means for applying a binder to mineral wool fibers substantially at the time of their formation. It will be understood that the term "mineral wool" is employed herein in a generic sense to include wool or fibers formed from rock, slag, glass, mixtures thereof and other suitable raw materials.

Heretofore mineral wool has been manufactured in several ways, for example, by subjecting a stream of the molten material to the action of a high pressure steam jet. More recently it has been proposed to disintegrate the molten material by the use of one or more spinners or rotors rotated at high speed and upon which the material impinges and by which it is broken up into drops or masses which are thrown from the rotor by centrifugal force and drawn into thread or fiber form. The principal object of the instant invention is the provision of a binder addition means for use in conjunction with apparatus of the latter type and which will provide a relatively uniform distribution of the binder in fine droplet form throughout the newly formed fibers.

Another object of the invention is the provision of such binder addition means which will deliver the binder throughout substantially the entire area of fiberization.

Another object of the invention is the provision of an atomizing type binder spray head adapted to form a cloud of minute droplets of binder adjacent the peripheries of the fiberizing rotors, and further to provide a spray head of this type which may be adjusted to control the binder concentration to provide a larger amount of binder adjacent the places of maximum fiber production.

A still further object of the invention in one form thereof is the provision of means to be employed in conjunction with a binder applicator of the type referred to above, to eliminate or substantially reduce whipping and eddying the cloud of binder droplets by the windage effects produced by the rotor.

My 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 elevational view of a mineral wool apparatus illustrating the arrangement of the fiberization and binder applying apparatus in accordance with the invention;

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

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

Fig. 4 is an enlarged sectional view of the spray head shown in Fig. 2, the view being taken on the line 4—4 of Fig. 2;

Fig. 5 is a perspective view of an apparatus embodying a further feature of the invention;

Fig. 6 is an elevational view of the apparatus of Fig. 5 with parts in section; and

Fig. 7 is a view similar to Fig. 4 illustrating a modified form of the spray head.

Referring now to the drawing and more particularly to Figs. 1–4 inclusive, there is shown an apparatus for melting and fiberizing suitable raw materials such as rock, slag, glass and mixtures thereof. The fiber forming elements of the apparatus may take different forms but, as illustrated, the same comprise a melting furnace 10 of the cupola or tank furnace type and a fiberizing means indicated generally at 12. Fiberizing means 12 includes one or more rotors. In the form illustrated, two cylindrical rotors 14 and 16 are employed having, respectively, cylindrical surfaces 15 and 17 and end surfaces 19 and 21, whose peripheries define the cylindrical surfaces. The rotors are carried by shafts 18 and 20, respectively, and are adapted for rotation at high speed in opposite directions. The rotors are positioned so that rotor 14 receives the stream of molten material on its cylindrical surface, the molten material being partially converted into fibers by rotor 14 and partially discharged onto the cylindrical surface of rotor 16 where further fiberization takes place. Fiberization is caused, for the most part, by small drops of the material thrown from the rotors by centrifugal force and drawn into fibers. As will be understood, the fiber formation occurs adjacent the peripheries of the rotors, and to some extent, substantially throughout their circumferences, but is heaviest near the outer and top portion of the rotors. It will be understood that the two-rotor fiberizing system is shown only for purposes of illustration and that the invention is not limited to the particular number of rotors to be employed.

Behind the rotors there is provided means indicated generally at 22 for delivering a binder in finely divided form to the fibers as, or shortly after, they are formed. The binder applying device includes a spray head 24 for each rotor supported in any suitable manner behind the rotor adjacent one of its end surfaces and somewhat off center but preferably within the space defined by the

MTC 017099

extended cylindrical surface of the rotor, as indicated. Each spray head 24 comprises a pair of members or disks 26 and 28 (see Fig. 4) suitably circular in contour and having flat opposed faces 30 and 32 forming between them a relatively narrow space and defining an annular port 33 at the edges of the members. The disks or members 26 and 28 may be secured in this relationship as by weld or the like 34. It will be understood that the weld 34 takes up only a relatively small portion of the marginal area of the members and is located opposite the shaft of the rotor where no binder spray is required. Member 26 is provided with an internal channel 36 into which a binder supply line 38 is connected. Channel 36 terminates in a mouth 40 opening into the space between the members and substantially at the center of the space. Where multiple rotors are employed, as shown in Figs. 1 to 3, the binder supply line 38 for each of the spray heads may be joined to a main binder supply line 42, which in turn is connected to any suitable source of binder supply (not shown).

Member 28 is provided with a perforation or opening opposite mouth 40 into which a pipe 44 is threaded or otherwise secured. Pipe 44 is connected to a suitable supply of a fluid medium under pressure and, where multiple rotors are employed, may form branches of a main pressure line 48 leading from a high pressure steam line, compressed air line or the like.

Supply lines 38, 44, 42 and 48 may serve as the support for the spray heads.

In the operation of the apparatus described above, fluid under pressure, such as high pressure steam, is supplied through lines 48 and 44. The fluid enters the space between members 26 and 28 and escapes from said space at high velocity through the annular port 33. At the same time the binder material is supplied by lines 42 and 38, preferably under pressure, and enters through mouth 40 into the space between the members 26 and 28. Entry of the binder into the space will be aided by the aspirating action of the steam or other fluid escaping through port 33. The binder is atomized and driven through the orifice in the form of fine droplets or particles by the escaping steam. Due to the fact that the binder is sprayed out through a substantially circular orifice it will be directed adjacent the periphery of the end surface of the rotor and will contact the newly formed fibers throughout the entire fiberizing area. Where it is found that the fiber yield is higher at certain points than at others, as is usually the case, the amount of binder may be increased at these points and correspondingly decreased at others by localized adjustment of the width of the annular orifice. This may be accomplished in any suitable manner. For example, as shown in Fig. 7, at least one of the members or discs defining the orifice may be made of relatively light weight material, whereby the orifice may be varied at desired locations by forcing the edges of the members closer together or farther apart, as the case requires.

Referring now to Figs. 5 and 6, a further feature of the invention is disclosed for use in conjunction with the binder applying device and rotors described above. This feature comprises a baffle 50 preferably of somewhat conical shape located behind the rotor and between it and the binder applying device and supported as by bracket 52 secured to any suitable fixed portion of the apparatus. A baffle has been shown mounted behind rotor 14, but it will be understood that it is equally applicable to rotor 16. As will be understood, rotors of the type of 14 and 16, when driven at the high speeds employed, say, 3800 to 4600 R. P. M., create a windage which tends to whip the cloud of binder particles and set up eddy currents therein which interfere to a considerable extent with the proper distribution of the binder. Also a portion of the binder is whipped into contact with the rotor where it has an undesirable cooling effect. In the case of certain types of binders, contact with the rotors causes rapid burning or flashing of the binder. If a heat-setting binder is employed it tends to be set up by contact with the rotors and to build up thereon to an undesirable extent.

These various difficulties are avoided by baffle 50 which does not attain a temperature comparable with that of the rotor, as it is not contacted by the molten material and hence has no harmful effect on the binder. Also the baffle prevents interference with the binder distribution.

The apparatus of the instant invention may be employed with any suitable binding material. For example, heat-setting binders such as Bakelite resins, drying oils and the like have been found to be suitable. Thermoplastic binders such as thermoplastic resins, asphalts, waxes and the like may also be employed.

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 will 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 mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, and means for applying a binder to said fibers, said last-named means comprising a spray head supported adjacent one end surface of the rotor and having a substantially continuous annular port positioned for directing a binder spray adjacent the periphery of said one end surface.

2. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, and means for applying a binder to said fibers, said last-named means comprising a spray head adjacent one end surface of the rotor and within the space defined by the extended cylindrical surface of the rotor and having a substantially continuous annular port for directing a binder spray adjacent the periphery of said one end surface.

3. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, and means for applying a binder to said fibers, said last-named means comprising members having spaced, substantially flat surfaces defining an annular port within the space defined by the extended cylindrical surface of the rotor, means for supplying a binder material to the space between said flat surfaces and

MTC 017100

means for supplying fluid under pressure to said last-named space whereby said fluid escaping through said port draws the binder therewith and sprays the binder onto said fibers.

4. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, and means for applying a binder to said fibers, said last-named means comprising a pair of circular plates, each having a cylindrical surface and a substantially flat end face with said end faces of said plates in adjacent relationship to define a circular port, a passageway within one of said plates extending from the cylindrical surface thereof to a mouth substantially centrally of its said end face, means connecting said passageway to a binder supply, a passageway in the other of said plates terminating in a mouth in its said end face substantially opposite to said mouth in the first-mentioned plate, and means for supplying a fluid under pressure to said passageway in said second-mentioned plate.

5. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a pair of rotors in substantial tangential relationship, each having a cylindrical surface and end surfaces including peripheries defining said cylindrical surface, and means for applying a binder to said fibers adjacent the periphery of an end surface of each of said rotors, said last-named means comprising spray heads supported adjacent one end surface of each rotor and within the space defined by the extended cylindrical surface thereof and having a substantially continuous annular port, and a binder supply line and a supply line for a fluid under pressure connected into each of said spray heads.

6. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, a fixed baffle plate overlying one end surface of the rotor and substantially co-extensive therewith, and means for applying a binder to the fibers substantially as they are formed by said rotor, said last-named means comprising a spray head supported adjacent said baffle plate and within the space defined by the extended cylindrical surface of the rotor and having a substantially continuous annular port.

7. In a mineral wool apparatus, means for disintegrating a stream of molten material into fibers, said means comprising a rotor having a cylindrical surface on which said stream impinges and end surfaces having peripheries defining said cylindrical surface, a conical baffle plate, means for supporting said baffle plate adjacent one end surface of the rotor, said baffle plate being substantially co-extensive therewith, and means for applying a binder to the fibers substantially as they are formed by said rotor, said last-named means comprising a spray head supported adjacent said baffle plate and within the space defined by the extended cylindrical surface of the rotor and having a substantially continuous annular port, and a binder supply line and a supply line for a fluid under pressure connected to said spray head.

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