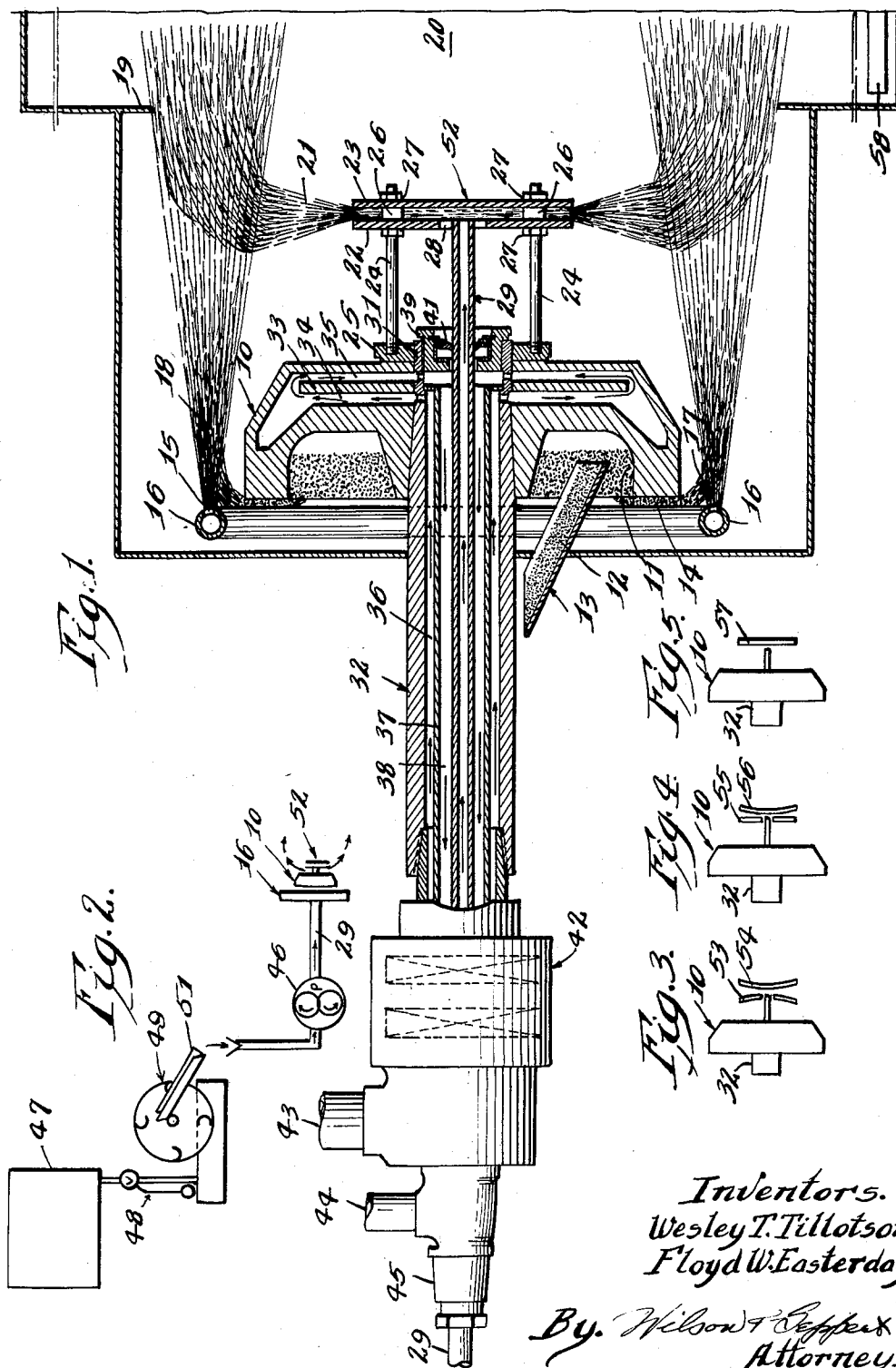


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FOR FIBERIZING APPARATUS
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BINDER DISTRIBUTION AND ATOMIZING SYSTEM FOR FIBERIZING APPARATUS

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The present invention relates to apparatus for producing mineral wool and more particularly to a novel system for atomizing, distributing and applying to the formed fibers a binder and/or treating material, such as an annealing oil, waterproofing composition or any combination thereof.

Among the objects of the present invention is the provision of a novel means and manner of subjecting the formed fibers of mineral wool to an atomized spray of the binder solution or treating material whereby to assure uniformity in the application of the treating or coating composition to the fibers immediately after such fibers are formed and prior to their collection as a batt or felt in a collecting chamber.

Another object of the present invention is the provision of a novel slinger unit for atomizing and distributing a binder or treating substance in combination with a rotary divider or distributing rotor and a steam fiberizing means, whereby the fibers immediately after they are formed are coated or impregnated with an atomized spray of the binder solution centrifugally ejected and sprayed upon the encompassing individual or separated fibers carried in a high velocity stream of steam and air prior to such individual fibers being collected or compacted.

By means of the present novel manner of spraying the fibers by the novel slinger unit mounted upon and rapidly rotated with the distributing rotor or rotary divider immediately after the molten slag is attenuated or drawn into the formed fibers, the binder is most effectively applied to the loose and separated fibers of the encompassing stream, whereby these fibers are uniformly coated or impregnated with the binder solution.

The present invention further comprehends a novel slinger assembly for a mineral wool fiberizing unit in which the binder solution is discharged against and centrifugally and forcibly ejected from a rapidly rotating plate or disk in the form of an atomized spray or mist and with the minute particles of spray solution forcibly projected into and through the moving stream of formed fibers to thereby uniformly coat the individual or separated fibers before such fibers have an opportunity to become compacted or matted together.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

Figure 1 is a fragmentary view, part in side elevation and part in vertical cross section through a fiberizing unit for the fiberizing of the molten slag or fiber-forming material and in which assembly is embodied the novel system for atomizing, distributing and applying a binder and/or treating materials to the mineral wool fibers immediately after formation.

Fig. 2 is a diagrammatic or schematic view of the novel system for supplying, atomizing and applying the binder

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and/or treating material to the formed fibers prior to collection.

Fig. 3 is a schematic view of an alternate construction of a rotating slinger for atomizing and distributing the binder.

Fig. 4 is a view similar to Fig. 3 but of a further modification.

Fig. 5 is a view similar to Figs. 3 and 4 but of another embodiment of the rotating slinger.

Referring more particularly to the disclosure in the drawing and to the novel illustrative embodiment shown in Figs. 1 and 2, the fiberizing unit includes a cup-shaped distributing rotor 10 for receiving on its inner or cupped surface 11 the molten slag or fiber-forming material 12 discharged from a furnace or cupola (not shown) onto a guide trough 13 which directs this molten fiber-forming material upon the inner surface 11 of the distributing rotor 10.

As the distributing rotor 10 is revolved at high speed about a substantially horizontal axis, the film or layer of molten fiber-forming material collected on the inner surface 11 thereof is centrifugally ejected outwardly and over the peripheral edge 14 of the rotor in an annular pattern and in a substantially vertical plane. This centrifugally discharged molten fiber-forming material is intercepted by a multiplicity of steam jets issuing from a plurality of closely spaced apertures or orifices 15 in the forward or outer face of a fiberizing steam ring 16.

The steam jets issuing under pressure from these small discharge orifices 15 of the fiberizing ring 16 forcibly impinge upon the centrifugally ejected molten material at 17 and abruptly alter the direction of travel of this ejected material from a substantially vertical to an approximately horizontal path and draw or attenuate this molten material into a multitude of mineral wool fibers 18. The attenuated fibers are projected forwardly in an approximately conical pattern of high velocity steam and air and are drawn by the applied suction through an aligned opening in a portal 19 and collected in a wool room 20.

In the present invention novel means are provided for centrifugally ejecting an atomized spray 21 of a binder and/or treating material for coating the individual fibers as they are formed and prior to their collection in the wool room 20. Such means comprises an inner slinger plate 22 and an outer slinger plate 23 carried by multiple spaced studs 24. Each stud 24 is threadedly mounted at its inner end in an enlarged nut 25 and with its other or outer end receiving and adjustably mounting the slinger plates 22 and 23 and retaining these plates in spaced relation by means of spacers 26 and nuts 27. The inner slinger plate 22 is provided with an opening 28 into which projects the outer or discharge end of a stationary binder tube 29. The outer slinger plate 23 is imperforate except for the openings through which project the studs 24.

The enlarged nut 25 is threaded or otherwise anchored to the outer, open end 31 of a hollow shaft 32 rotatable about a horizontal axis and upon which is secured the distributing rotor or rotary divider 10. The interior of this rotor is hollow and provided with a divider plate 33 to separate the incoming water or coolant entering the space 34 from the discharged coolant passing out through the space 35.

The hollow shaft 32 is provided with one or more ports through which the coolant enters from the annular space 36 between the inner wall of the shaft 32 and the encompassed, concentric tube 37, and with one or more ports for discharge of the coolant into the annular space 38 between the inlet pipe or binder tube 29 and the encompassing or concentric tube 37. A housing forming a closure 39 for the open end 31 of the hollow shaft 32

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is conformably received in this open end and provided with a sealing ring 41 encompassing the binder tube 29.

As shown in Fig. 1, the other or inner end of the hollow shaft 32 is provided with a commercial or conventional form of rotary union 42, an inlet 43 for the coolant, an outlet 44 for the coolant, and a tube seal 45 through which projects the inner end of the binder tube 29 shown connected to a supply pump 46 in Fig. 2.

As shown in Fig. 2, the binder is dispensed from a storage tank 47 through a float valve 48 for controlling the level of the binder in the receptacle of a suitable binder proportioning device 49. This binder proportioning device which may be of the cup-type as shown, supplies the binder through a guide trough 51 to a gear-type positive displacement pump 46 which in turn supplies the binder through the tube 29 to the slinger plates 22 and 23 of the slinger unit designated by the reference character 52.

These slinger plates 22 and 23 may be flat disks as in Fig. 2, both plates 53 and 54 may be flared or contoured as in Fig. 3, the inner plate 55 may be flat or straight as in Fig. 1 and the outer plate 56 flared as in Fig. 4, or the binder may be ejected, atomized and distributed by means of a single plate 57 against which the binder is discharged from the binder tube 29.

The shaft 32, the distributing rotor or rotary divider 10 and the slinger plates 22 and 23 are rapidly rotated by means of a motor or other power source (not shown), while the concentric binder tube 29 and the encompassing tube 37 are maintained stationary during operation of the fiberizing unit. The binder or treating solution is pumped or forced through the inner concentric tube 29 and is centrifugally ejected from between the slinger plates 22 and 23 in the form of a vertically projected atomized spray 21 that is discharged in a radial pattern against the encompassing fibers 18 as they are formed with the binder uniformly dispersed throughout these formed fibers and the fibers coated therewith before such fibers are drawn by suction means 58 through the opening in the portal 19 and collected in the wool room or collecting chamber 20.

The distributing rotor or rotary divider 10 is preferably supplied with water or other coolant from any suitable source and in a well known manner. This rotor supplied with the molten slag or fiber-forming material, such as blast furnace slag, wool rock, etc., which may be of the order of 2700° F., is preferably of a diameter of the order of 14 inches and rotates at a speed of the order of 1300 to 1400 r.p.m.

The binder for coating or impregnating the formed fibers may be a conventional water solution of a quick-setting, water-soluble phenol-formaldehyde resin, an annealing oil or a waterproofing composition, or a combination thereof, which are commercially available and suitable for use in treating mineral wool fibers and giving to such fibers the characteristics desired in the collected mat or felt of fibers.

To prevent the pump 46 from air-binding, water may be added to the binder mix or treating solution with the float valve controlling the level of the binder in the receptacle of the binder proportioning device 48.

With respect to the rotating slinger unit 52, the contour, diameter and spacing of the plates from the rotary distributor 10 and the spacing of the plates or disks relative to each other may be varied to obtain the desired results. As one example, excellent results have been obtained by spacing the plates or disks approximately 1/8 inch apart.

The disclosed binder distributing and atomizing system provides a most effective means and manner of distributing, atomizing and applying the binder to the mineral fibers, such as rock wool. In the process of forming rock wool or other inorganic fibers by a fiberizing process employing steam in combination with a rotating distributor or slag divider, difficulty is encountered in trying to obtain uniform and complete distribution of the binder or

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treating material upon the fibers as they are formed, since the bulk of the fiber is within a cone of high velocity steam and air which is difficult to penetrate from the exterior by any conventional spraying equipment.

By means of the present system, the binder or treating material is introduced into the center of and atomized within this encompassing cone of high velocity steam and air and the atomized spray of such binder is centrifugally projected in such manner that it contacts all of the fibers produced immediately after formation and while they are still separated and not matted or roped together. This is a most effective means and manner of spraying the fibers uniformly, gives most effective use of the binder employed and enables the production of a batt or felt of mineral fibers having less weight and greater uniformity of product, through more efficient and uniform distribution of the binder or treating materials, hereinafter referred to generally as a binder.

Having thus disclosed the invention, we claim:

1. In a fiberizing unit, a rotary divider for receiving an annulus of molten fiber-forming slag and centrifugally ejecting the slag from the edge of said divider in an annular pattern and about a horizontal axis, a shaft for rapidly rotating said divider to centrifugally eject the slag from the edge of said divider, a steam fiberizing ring encompassing but spaced forwardly from said edge, said steam ring having multiple orifices for projecting jets of steam rearwardly about the edge of said divider which intercept and abruptly change the path of travel of the ejected molten slag, draw this molten slag into a multitude of separate fibers and project these formed fibers rearwardly in a cone of high velocity steam and air, and spaced plates carried by and spaced from the rear of and rotatable with the rotary divider for atomizing and centrifugally and vertically ejecting and distributing an atomized spray of a binder solution to the formed fibers attenuated and projected rearwardly by said jets of steam prior to such fibers being collected and compacted into a mat.

2. In a fiberizing unit, a cup-shaped rotary divider for receiving an annulus of molten fiber-forming slag upon its inner surface and centrifugally ejecting the slag from the peripheral edge of said divider in an annular pattern and about a horizontal axis, a hollow shaft for rapidly rotating said divider to centrifugally eject the slag from the peripheral edge of said divider, a binder tube projecting through said shaft and divider and held stationary in said shaft, a pair of spaced plates mounted upon and rotatable with said shaft and rotary divider and in spaced relation with the latter, means for supplying a binder to said binder tube and from said binder tube to the space between said plates whereby when said shaft is rotated said plates centrifugally eject the binder outwardly in a substantially vertical plane and in a radial pattern, a steam fiberizing ring encompassing but spaced forwardly from said peripheral edge, said steam ring having multiple orifices for projecting jets of steam which intercept the ejected molten slag, abruptly change its direction of travel and draw this molten slag into a multitude of separate fibers and project these formed fibers in a cone of high velocity steam and air rearwardly from said rotor where the fibers are coated with the binder, and suction means for withdrawing and collecting the formed fibers after they have been coated with the binder.

3. In a fiberizing unit, a distributing rotor rotating about a horizontal axis for receiving and centrifugally ejecting therefrom molten fiber-forming material in an annular pattern and in a substantially vertical plane, a fiberizing steam ring for intercepting and drawing the ejected molten fiber-forming material into individual fibers and projecting these fibers rearwardly from the rotor in a cone of high-velocity steam and air, a pair of spaced plates carried by, spaced rearwardly from and rotatable with said rotor, and a stationary tube for discharging the binder solution into the space between said plates, said

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plates when rotated by said rotor atomizing and centrifugally ejecting said binder solution from the center of said cone outwardly in a substantially vertical plane and in a radial pattern into and through the encompassing cone of fibers after such fibers have been formed and projected by the high velocity steam and air from the steam ring for uniformly coating the individual fibers with the binder.

4. In a fiberizing unit, a distributing rotor rotatable about a horizontal axis for receiving and centrifugally ejecting therefrom molten fiber-forming material in an annular pattern and in a substantially vertical plane, a fiberizing steam ring for intercepting and drawing the ejected molten fiber-forming material into individual fibers and projecting these fibers rearwardly from the rotor in a cone of substantially horizontally moving high-velocity steam and air, distributor means carried by and rotatable with said rotor, means for supplying a binder solution to said distributor means, said distributor means spaced a substantial distance rearwardly of said rotor for centrifugally distributing and projecting said binder solution from the center of said cone outwardly in a substantially vertical plane into and through the encompassing cone of fibers downstream from the area of formation and projection of said fibers by said high-velocity steam and air for uniformly coating the individual fibers with the binder.

5. In a fiberizing unit, a distributing rotor rotatable about a horizontal axis for receiving and centrifugally ejecting therefrom molten fiber-forming material in an annular pattern and in a substantially vertical plane, a fiberizing steam ring for intercepting and drawing the ejected molten fiber-forming material into individual fibers and projecting these fibers rearwardly from the rotor in a cone of high-velocity fluid, rapidly rotatable distributor means spaced rearwardly from and horizontally aligned with said rotor for centrifugally distributing a treating solution from the center of said cone outwardly in a radial pattern into and through the encompassing cone of fibers and fluid for treating the individual fibers with said treating material subsequent to the formation of said fibers and while said fibers are suspended in said cone of high-velocity gas.

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6. The method of forming and treating mineral wool fibers comprising the steps of centrifugally forming molten mineral slag into an annular pattern of outwardly moving molten slag, attenuating and abruptly altering the direction of movement of said outwardly moving slag by impinging an annular jet of high-speed fluid thereagainst, forming an annulus of loose and separated mineral fibers moving at a high speed in the direction of application of said jet, and centrifugally distributing and projecting slag-treating material outwardly into said annulus from a point located centrally thereof, said treating material contacting said fibers while the latter are in a loose and separated state and moving at a high speed in the direction of application of said jet whereby said fibers are substantially uniformly treated.

7. The method of forming mineral wool fibers from molten mineral slag and treating said fibers comprising depositing said slag upon a rapidly rotating annular surface rotating about a horizontal axis, centrifugally forming a substantially vertical annular pattern of outwardly moving slag issuing from one end of said annular surface, attenuating and abruptly altering the direction of travel of said outwardly moving slag by impinging an annularly arranged plurality of jets of high-speed fluid horizontally thereagainst, forming an annulus of loose and separated mineral fibers and said fluid moving substantially horizontally at a high speed, centrifugally projecting a spray of treating material outwardly in a substantially vertical plane from a point within said annulus, said spray contacting said fibers subsequent to their formation and while said fibers are in a loose and separated state and moving at a high speed in said annulus whereby said fibers are substantially uniformly treated.

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