Jan. 20, 1959 J. A. EBBINGHOUSE 2,869,175

FIBERIZING STEAM RING

Filed Sept. 3, 1957

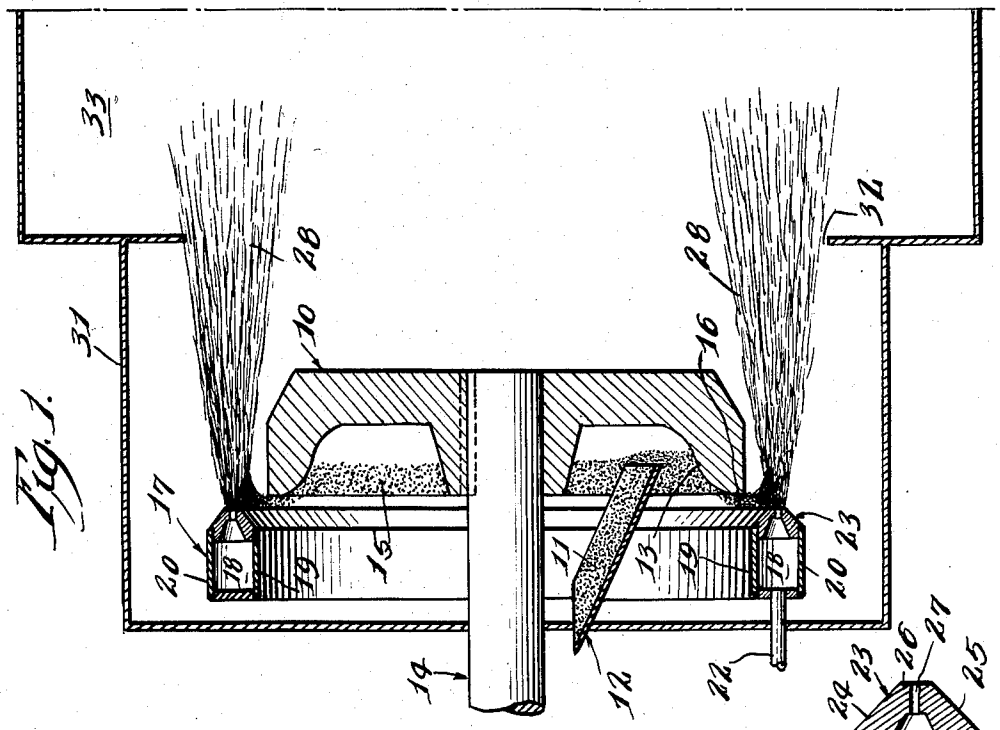


Fig. 1.

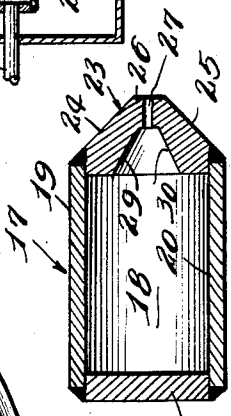


Fig. 3.

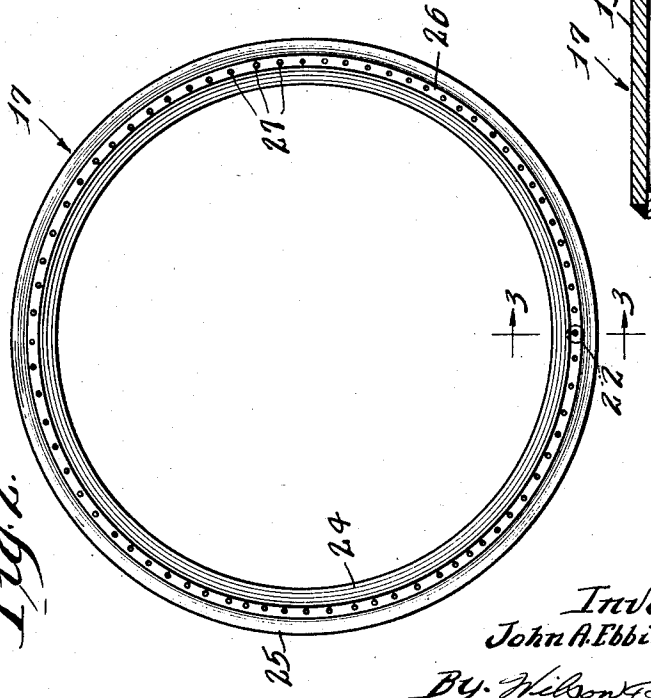


Fig. 2.

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FIBERIZING STEAM RING

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3 Claims. (Cl. 18—2.5)

The present invention relates to the production of mineral wool and more particularly to a novel construction of steam ring for use in the fiberization of mineral wool from fiber-forming material including blast furnace slag, wool rock, vitreous materials, etc.

It is an important object of the present invention to provide a novel construction and contour of a steam ring for fiberizing the molten fiber-forming material.

A further object of the present invention is the provision of a novel construction of a fiberizing steam ring encompassing a distributing means from which molten slag or fiber-forming material is centrifugally ejected in an annular pattern and intercepted by encompassing steam jets for attenuating the ejected material into mineral wool fibers.

In the disclosed embodiment, the novel steam ring is provided with an annular steam chest of rectangular shape in cross section, and an outwardly tapered face or end wall having converging flat surfaces that merge into a narrow, annular leading edge containing a plurality of closely spaced orifices. This end wall at its interior is provided with converging inner surfaces that channel and direct the steam under pressure through a constricted passage to and through the discharge orifices in the leading edge of the tapered end wall. By means of the tapered exterior of this end wall the air is permitted to pass over and about the ring with a minimum of turbulence whereby the quality and quantity of the formed fibers is greatly enhanced.

Another object of the present invention is the provision of a novel fiberizing steam ring so designed, constructed and arranged as to greatly increase the rate of recovery of the finished product from the raw materials employed; to increase the production rates and to improve the quality of the finished product by producing fibers of more uniform size than obtainable with steam rings that have a flat or curved face containing the discharge ports. Furthermore, in the employment of the present novel fiberizing steam ring operational problems in the operation of other component parts of the fiberizing apparatus are minimized or obviated.

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 drawing:

Figure 1 is a fragmentary vertical cross sectional view of a fiberizing apparatus for producing mineral wool fibers embodying the novel fiberizing steam ring of the present invention, the apparatus being shown associated with a suitable collection chamber.

Fig. 2 is a view in front elevation of the novel fiberizing steam ring.

Fig. 3 is an enlarged view in vertical cross section of the steam ring, the view being taken on approximately the line 3—3 of Fig. 2 and viewed in the direction of the arrows.

Referring more particularly to the disclosure in the drawing, Fig. 1 discloses a fiberizing unit or apparatus for producing mineral wool fibers from blast furnace slag, wool rock, vitreous materials, etc. In the illustrative embodiment, there is shown a cup-shaped rotor or distributor 10 for receiving molten slag or fiber-forming material 11 discharged as a stream onto a guide trough or directing plate 12 from a cupola or furnace and from the trough onto the inner cup-shaped surface 13 of the rotor 10.

The rotor or distributor 10 is rotated at a high speed by means of a horizontally disposed drive shaft 14 driven from a motor or other power source in any suitable manner. Due to the high speed of the rotor the molten slag or fiber-forming material collects as a relatively thin layer 15 upon the inner surface 13 of the rotor and is centrifugally and tangentially ejected therefrom in an annular pattern and in a substantially vertical plane over the annular peripheral edge 16 of the rotor.

Encompassing but spaced radially and laterally from the peripheral edge 16 of the rotor 10 is the novel steam fiberizing ring 17 of the present invention mounted and retained in any suitable manner. It comprises a circular or annular steam chest 18 having concentrically arranged but spaced walls 19 and 20, an annular end wall 21 providing a closure for the rear of the chest except for one or more inlet pipes 22 for the entry of steam under pressure into the steam chest 18. At its forward or discharge end the steam ring is provided with an annular end wall 23 having its forwardly projecting exterior surfaces 24 and 25 converging to form a narrow leading edge 26 containing a plurality of small and closely spaced discharge orifices 27 for discharge of jets of steam under pressure. The issuing jets of steam issuing through the plural orifices 27 provide the force necessary to draw the molten slag or fiber-forming material centrifugally ejected over the peripheral edge 16 of the distributing rotor 10 into attenuated mineral wool fibers 28.

The steam chest 18 of the novel fiberizing ring 17 as shown in Fig. 3 is substantially rectangular in cross section with the tapered end wall or face 23 formed by the converging exterior surfaces 24 and 25 providing a very important feature of the present invention in that the contour of this face permits the passage of air about the ring without the usual turbulence inherent in steam rings having a flat or curved face containing the discharge orifices. The walls 19 and 20, the end wall 21 and the end wall 23 of the ring 17 are welded or otherwise rigidly connected into an integral assembly.

The steam emerging from the steam chest 18 under pressure is directed to the orifices or ports 27 through the annular constricted passage formed by the converging inner surfaces 29 and 30 and opening into the orifices 27.

The fiberizing assembly is shown mounted for operation in an encompassing collecting hood 31 through a portal or opening 32 into a collection chamber or wool room 33 preferably by suction.

The present novel fiberizing steam ring, in addition to the above noted advantages, accomplishes the following objectives in the manufacture of mineral wool fibers:

(1) It greatly increases recovery of the finished mineral wool fibers from the raw materials.

(2) It increases production rates.

(3) It improves the quality of the finished products in that it produces a more uniform fiber size and reduces the quantity of resulting shot.

(4) It reduces operating problems in conjunction with other equipment or component parts of the fiberizing unit.

As but illustrative of the disclosed embodiment and not to be taken as limiting the present invention, excellent results have been obtained employing a fiberizing steam

ring for intercepting the molten fiber-forming material or slag centrifugally ejected by the distributing rotor **10** into the path of the steam jets having an external diameter of approximately 13¼ inches, an internal diameter of approximately 11¼ inches and a diameter to the center of the orifices **27** of approximately 12¼ inches. The narrow, annular leading edge **26** is approximately ¼ inch in width with the orifices uniformly spaced apart approximately 5/32 inch between centers, the orifices being approximately 0.1 inch in diameter. These orifices are spaced axially approximately ⅞ inch from the edge of the distributing rotor **10** with an open area or radial spacing between the peripheral edge of the rotor and the steam fiberizing ring of approximately 1.75 inches.

The fiberizing steam ring **17** shown in greater detail in Fig. 3 has a depth of approximately 2 5/16 inches from the exterior of the end wall or plate **21** to the leading edge **26**, with the inclination of the tapered or converging exterior surfaces **24** and **25** of the outer face being disposed at an angle of approximately 45° to the vertical and the inclination of the converging interior surfaces **29** and **30** forming a constricted passage to the orifices **27** being disposed at an angle of approximately 60° to the vertical. The steam pressures employed are of the order of approximately 60 pounds per square inch.

Having thus disclosed the invention, I claim:

1. Apparatus for converting molten slag into fibers comprising a cup-shaped distributing rotor, means for rapidly rotating said distributing rotor about a horizontal axis, means for feeding the molten slag onto the inner surface of said rotor as the latter is rapidly rotated whereby the molten slag is centrifugally ejected over the peripheral edge of the rotor in a substantially vertical plane, and a fiberizing steam ring spaced axially and radially outward from the peripheral edge of the rotor, said steam ring comprising an annular steam chest having an end wall provided with outer converging surfaces disposed at an angle of approximately 45° to the vertical, the forward constricted end of said end wall having a plurality of small, uniformly spaced and circumferentially arranged orifices for discharging jets of steam in an annular pattern about the circumference of the rotor and normal to the path of travel of the molten slag leaving the peripheral edge of the rotor to intercept and fiberize the centrifugally ejected molten fiber-forming material.

2. Apparatus for converting molten slag into fibers comprising a cup-shaped distributing rotor, means for rapidly rotating said distributing motor about a horizontal axis, means for feeding the molten slag onto the inner surface of said rotor as the latter is rapidly rotated whereby to centrifugally eject the molten slag over the peripheral edge of the rotor in a substantially vertical plane, and an annular steam chest for intercepting the ejected molten slag and attenuating this slag into fibers, said chest being of substantially rectangular cross section and provided with a tapered end wall in which the external and internal surfaces converge toward the front of said end wall with said internal converging surfaces forming a constricted passage and said external converging surfaces forming an annular leading edge provided with a plurality of small and uniformly spaced apertures therethrough disposed about but spaced outwardly and axially of the peripheral edge of the rotor for the discharge of jets of steam under pressure from the steam chest, through said orifices in a direction normal to the path of travel of the centrifugally ejected slag for attenuating this slag into mineral wool fibers.

3. Apparatus for converting molten slag into fibers as set forth in claim 2, in which the opposite sides of the tapered end wall converge to provide a narrow annular and vertically disposed leading edge through which said apertures open to discharge jets of steam about and axially of said rotor.

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Certificate of Correction

Patent No. 2,869,175 January 20, 1959

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below

Column 4, line 3, for "distributing motor" read —distributing rotor—.

Signed and sealed this 28th day of April 1959.

[SEAL]

Attest:
T. B. MORROW,
Attesting Officer.

ROBERT C. WATSON,
Commissioner of Patents.