

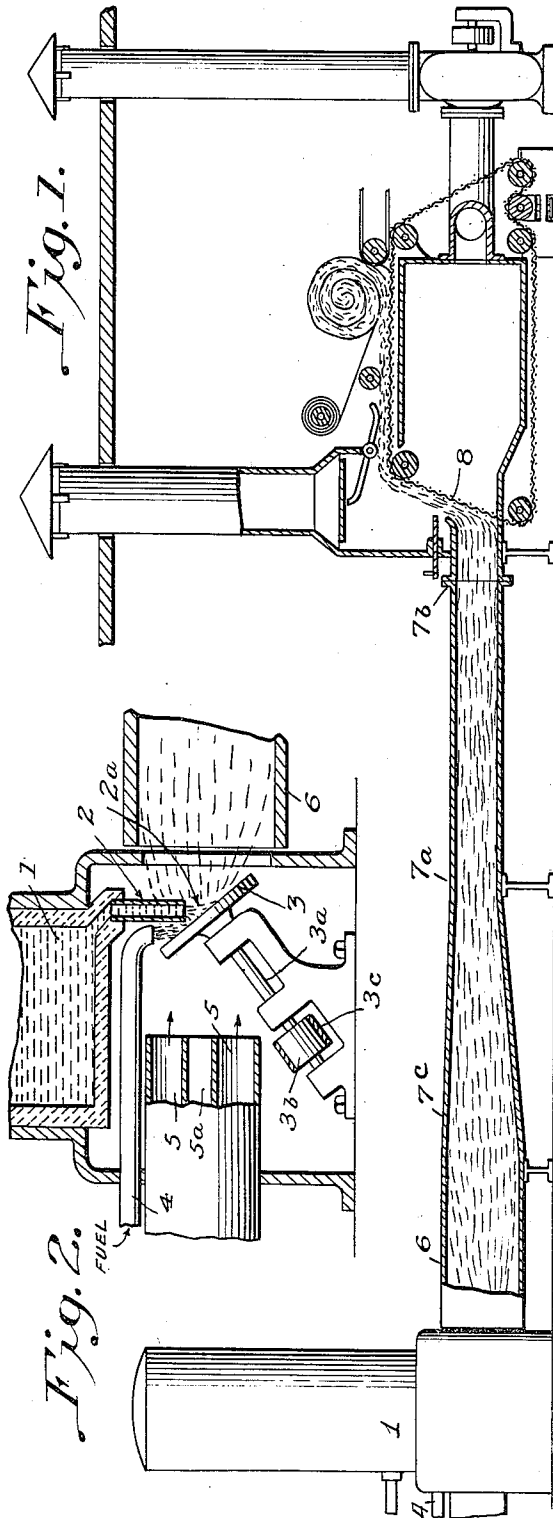
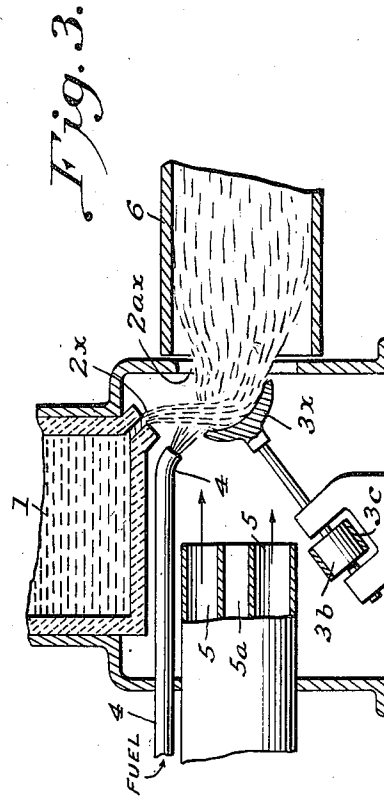
May 4, 1943.

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2,318,244

FIBERIZING MINERAL SUBSTANCES BY CENTRIFUGE AND BLAST

Filed Aug. 21, 1939



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## UNITED STATES PATENT OFFICE

2,318,244

FIBERIZING MINERAL SUBSTANCES BY  
CENTRIFUGE AND BLASTBenjamin C. McClure, Chicago, Ill., assignor to  
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Application August 21, 1939, Serial No. 291,237

4 Claims. (Cl. 83—91)

This application is a continuation-in-part of United States patent application, Serial No. 672,234, filed May 22, 1933 (Letters Patent No. 2,172,153) and relates to a process of and an apparatus for fiberizing fusible mineral substances and positively driving the resultant fibers into a bat. In the practice of the invention it is preferable to use for the material to be treated, a formula which, upon cooling from molten state, and in the form of felted fibers, leaves the fabric with a high order of resiliency that maintains the interstices in the fabric and greatly increases the insulating and other functions of the product. But the process and apparatus are not limited in their application to such superior materials. They are applicable to the fiberizing of fusible inorganic substances in general.

In my aforesaid Letters Patent No. 2,172,153, I have disclosed the art of fiberizing fusible inorganic or mineral substances by flowing a stream of such a substance in molten state, into the path of a gaseous blast having the capacity to attenuate the material into long fine fibers and provide a projected gaseous vehicle therefor, which with the fibers in suspension therein, and at sufficiently high temperature to continue growth of the fibers, enters into a barrel that confines the fibers and their impelled vehicle in the form of a constricted and directed beam; promotes development and commingling of the fibers by continuation of its constricted confinement; and causes the vehicular beam and its lading of fibers, with a sectional area and in a direction determined by the barrel, to impinge upon an arresting and felting surface, as a direct and positive step in the procedure. The said Letters Patent also discloses certain preferential and alternative features of novelty, among which is the alternative feature of prefiberizing the molten substance and transferring it to the blasting and vehicular gaseous finishing beam and barrel, by means of a centrifuge; and to this alternative the present application is directed.

Heretofore it has been proposed in British Patent No. 373,972, to form threads of glass and the like by centrifugal force by causing a hot liquid glass to flow in a continuous and uniform thin stream upon a disk rapidly rotating about a fixed axis, in coincidence with which the stream flowed and to cause the liquid glass to scatter radially into minute drops thrown off by the centrifugal force and simultaneously formed into thin threads which sank down into a space defined by an annular wall around the disk that produced them, and were there collected as a

fibrous web. It has also been pointed out in British Patent No. 385,927, that this procedure involved the disadvantage of too low a velocity in the falling of the finer fibers into the annular space, and even a tendency of these fibers to rise under the high temperatures prevailing around the disk; for which reason it was proposed to blow a circular current of air, coaxially with the stream of glass and rotation of the disk, down toward the disk and thereby drive the fibers down toward the discharge end of the web-forming space; the function of the said current being stated to be to make the path free for the succeeding fibers; to permit continuous production of fibers without hindrance; and facilitate carrying off the resultant web, which however, being in the form of a sleeve, had to be slit with shears as it developed.

It has been the practice, before the present invention, in the production of slag and mineral wools to fiberize molten mineral substances through means of a jet of steam or air directed transversely against a gravitating stream of the material, and discharge the resultant fibers through an opening in the wall of a settling room with or without a tubular conduit reaching from the point of fiberization into the settling room, where the fibers were permitted to settle by gravity, superinduced by suction, upon a foraminous conveyor.

The present invention relates to the fiberizing and felting of fusible inorganic substances through means of a vehicular gaseous beam that generates fibers and drives them into, intermingles them within and positively discharges them at a felting surface from a confining and directing barrel; and the invention resides in a new procedure as well as a new combination of instrumentalities through which to realize a procedure, characterized by the underlying novelty of presenting the molten substance to the gaseous blast by means of a centrifuge, after the special preparation which the substance undergoes in passing through the centrifuge, that is to say, having the molten substance continuously reach the blasting beam under the condition of having been preliminarily fiberized; radially spread out in the centrifuging plane; and actually under centrifugal force when picked up by the blasting beam and driven into the barrel; in the course of which further and complete fiberization of the still fluid substance takes place (fluidity being continued by additionally supplied heat if necessary) and fibers of superior quality and commingling and felting into a

better structure result. The centrifuging element is a disk, the plane of rotation of which, while positioned to receive the molten stream by gravity, is nevertheless inclined at a large angle to the vertical direction of feed, and the stream of molten substance meeting the disk at its center, where speed of rotation is theoretically zero, immediately gravitates under the inclination, to a point away from the center where centrifugal force is more effective. The vehicular gaseous beam to which also the disk is presented at an angle, is substantially horizontal. Its blast impinges against the face of the disk opposite to the centrifuging surface, so that the centrifuging process is independent of and undisturbed by the blast and the fibers encounter the blast only after their centrifugal force carries them beyond the periphery of the disk, where the action of the blast upon the now preformed fibers is backward rather than forward and downward, and the combined horizontal and centrifugal forces set up as the fibers enter the barrel, produces the superior commingling effect referred to.

From the foregoing it will be seen that the present invention contemplates, inter alia, the process of fiberizing inorganic substances, by delivering the substance in the form of a molten liquid upon a rapidly rotating surface presented by a centrifuging element, on one side of a predetermined plane of centrifuging; centrifuging the liquid at the periphery of said surface, in the said plane; directing a gaseous blast through the plane of centrifuging from a position on the side of said plane that is behind said surface, thereby taking into suspension the fibers generated by the centrifuging and causing the said fibers to be continually conveyed away from that side of the plane at which the centrifuging surface is presented, and in an uninterrupted beam that causes the fibers to be matted into a fibrous mass. The invention further contemplates heat treatment when deemed desirable, of the fibers delivered by the centrifuge and taken up by the blast.

In the accompanying drawing,

Figure 1 is a sectional elevation of an apparatus adapted to perform the process of the invention;

Figure 2 is a detail view showing the feeding end of the apparatus in vertical section, on an enlarged scale, according to one embodiment of combined centrifuging and blasting means; and

Figure 3 is a detail view similar to Figure 2, showing a concave form of centrifuging element.

1 represents a furnace or other source of molten substance the selected formula of which renders it capable of taking the form of fine fibers under the centrifuging and blasting forces herein described. 2 is a delivery tube directing a stream 2a of molten material to, or a sufficient distance toward the center of a centrifuging disk 3, and shields the stream until it reaches said disk; said disk is mounted upon a rotary shaft 3a and is driven at a high rate of rotation by suitable means, typified by pulley 3b and belt 3c. While disk 3 presents its centrifuging surface in position to receive the molten stream 2a by gravity, it is inclined to the vertical so that should the stream reach its center, it can gravitate towards more rapidly moving points on the disk, remote from the center, where it picks up gradually increasing centrifugal force and so that it will escape from the

periphery of the disk largely in the form of partially or wholly complete fibers. 4 represents a fuel supply and burner that may be employed, and which may have a heating capacity sufficient to compensate heat lost in centrifuging, or restore at least so much thereof as may be necessary to keep in or restore to the fibers and material issuing from the centrifuge, a fluidity that will respond to the finishing effect of the blasting beam now to be described.

5 represents a conduit delivering a (preferably hot) gaseous medium under sufficient pressure to develop a fiberizing blast; said conduit discharging immediately behind the centrifuge and picking up prefiberized or partially fiberized material in fluid state and fiberizing, refining the fiber of, or increasing the fiberized proportion of such material, and delivering it into and positively driving it through a fiber confining and mingling, beam-shaping and fiber-depositing barrel 6, the receiving end of which is presented to receive both the blast 5 and the substance in the physical condition characteristic of centrifuge 3, as fast as said material escapes past the periphery of said centrifuge. The presentation of blast 5 is so masked by disk 3 that it does not disturb the functioning of the centrifuge. Annular blast conduit 5 may have in ejector relation thereto, a central auxiliary gaseous vehicle conduit 5a that may depend for its force largely or wholly upon, and lend volume and lasting quality to the gaseous beam from conduit 5. For instance, if steam issues from conduit 5, air from conduit 5a will be mingled with such steam; air conduit 5a will be in position to avoid vacuum behind the centrifuge; leave the steam blast free to trim the fibrous and other material from the periphery of disk 3; build up a non-condensing volume in the vehicular gaseous beam within the barrel; prolong cooling and tempering of the fibers, and maintain ample volume of vehicular beam for any of the special functions of the felting steps; for instance the variations in the sectional area of the barrel; deflection of portions of the fiber conveying beam into parallelism with the felting bed et cetera, as set forth in my copending divisional application of even date herewith, and claimed in my aforesaid method Patent No. 2,172,153.

The centrifuging disk may be either flat as shown at 3 in Figure 2, or dished as shown at 3x in Figure 3. As also shown in Figure 3, the delivery tube 2 may be omitted and the molten material permitted to gravitate from the port 2x without the protecting tube 2.

The barrel 6 preferably has its section varied in form along its length, as indicated at 7a, 7b, 7c, for the influence which those changes exercise over the vehicular gaseous beam as set forth in the process of my before-mentioned Letters Patent, and as described in connection with the apparatus constituting the subject matter of my copending application Serial No. 291,236 of even date herewith.

I claim:

1. In the art of fiberizing fusible inorganic substances, the improvement which comprises feeding a stream of the substance in molten state upon the surface and at an angle to the axis of rotation of a centrifuging element rotating at such a speed as to radially disperse and fiberize the substance and release it at the periphery of said surface; and thereupon, continually, while the substance is still fluid, subjecting it to suspension within and distending action of a

vehicular blast in enveloping relation to said element from the rear thereof and at an angle to the axis of rotation thereof and which vehicular blast is of such velocity as to cause said substance to receive a second fiberization, separate and apart from the centrifuge fiberization.

2. In fiberizing apparatus the combination of a blast-delivering-member, a barrel member, said members being substantially aligned with a space between them, feeding means positioned to deliver molten substance into said space and a centrifuge member having a centrifuging surface presented in said space, angularly toward both the barrel member and said feeding means, and away from said blast-delivering member.

3. In an apparatus for generating and conditioning fibers from fusible inorganic material, the combination of means generating and directing an approximately horizontal vehicular gaseous blast, means feeding a stream of the molten material from a source thereof and substantially perpendicularly to the direction of said blast, and a centrifuging member having means rapidly rotating it about an axis at a large

angle to both said directions and being constructed with its centrifuging surface in a plane inclined to both said directions, said centrifuging member being positioned in the line of the blast and said blast having an effective area that causes it to envelop said centrifuge member.

4. In an apparatus for generating and conditioning fibers from fusible inorganic material, the combination of means generating and directing a vehicular gaseous blast, means feeding a stream of the molten material from a source thereof, substantially perpendicularly to the direction of said blast, a centrifuging member having means rapidly rotating it about an axis at a large angle to both said directions, the direction of the blast, the direction of the molten metal feed, and the axis of centrifuge rotation all being approximately in one and the same vertical plane and the position of said axis approximately bisecting the angle between the direction of molten metal feed and direction of blast.

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