# United States Patent [19]

**Reese**

[11] **3,920,431**

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[54] **BINDER APPLICATOR FOR GLASS FIBER COATING AND METHOD OF USING**


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[52] **U.S. Cl.** ..... **65/3;** 65/11 W; 118/257; 427/178

[51] **Int. Cl.²** ..... **C03B 37/02**

[58] **Field of Search** ..... 65/3, 11 W, 11 R; 117/112; 118/257



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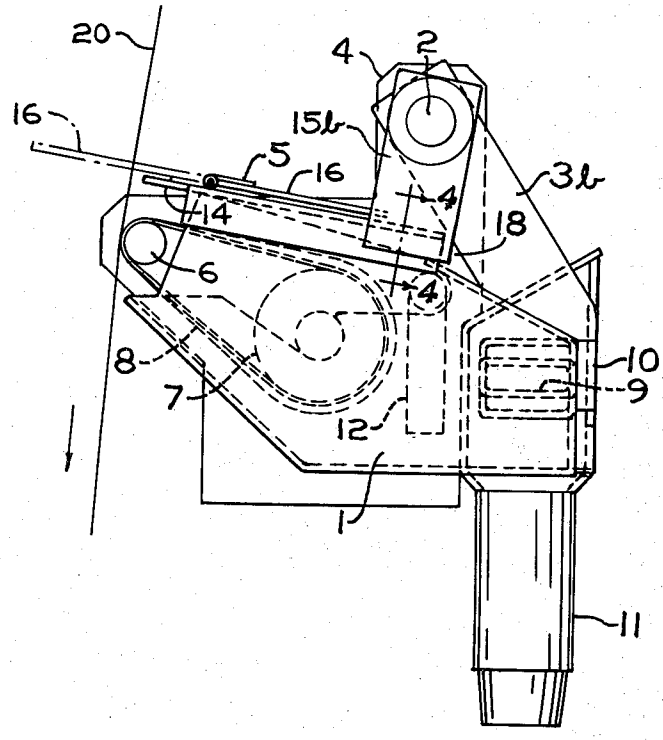
*Primary Examiner*—Robert L. Lindsay, Jr.
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[57] **ABSTRACT**

An applicator for use in applying binders and sizes to textile fibers is described which utilizes an endless belt as the applicator surface. The belt is rotated continuously during application in a housing on an inclined plane by running the belt over rollers spaced from each other in the housing. One roller is placed in close proximity to the top of the housing adjacent an opening in the front thereof and the second roller is positioned adjacent the mid to lower portion of the housing. In operation the endless belt contacts textile strands as it passes over the small roller located adjacent the front opening in the housing and contacts the binder or size solution as it passes over the lower roller positioned near the middle lower part of the housing by being immersed in binder or size solution maintained in that part of the housing by a sump arrangement. The positioning of the two rollers is such to insure that the endless belt continuously is drawn through the binder solution prior to contact with textile strands drawn over and in contact therewith. An elongated slot is provided in the housing preferably in the back wall thereof to provide for free flow of ambient air therethrough during operation to prevent binder blow back at the point of contact of the belt and the textile fibers.


**9 Claims, 4 Drawing Figures**



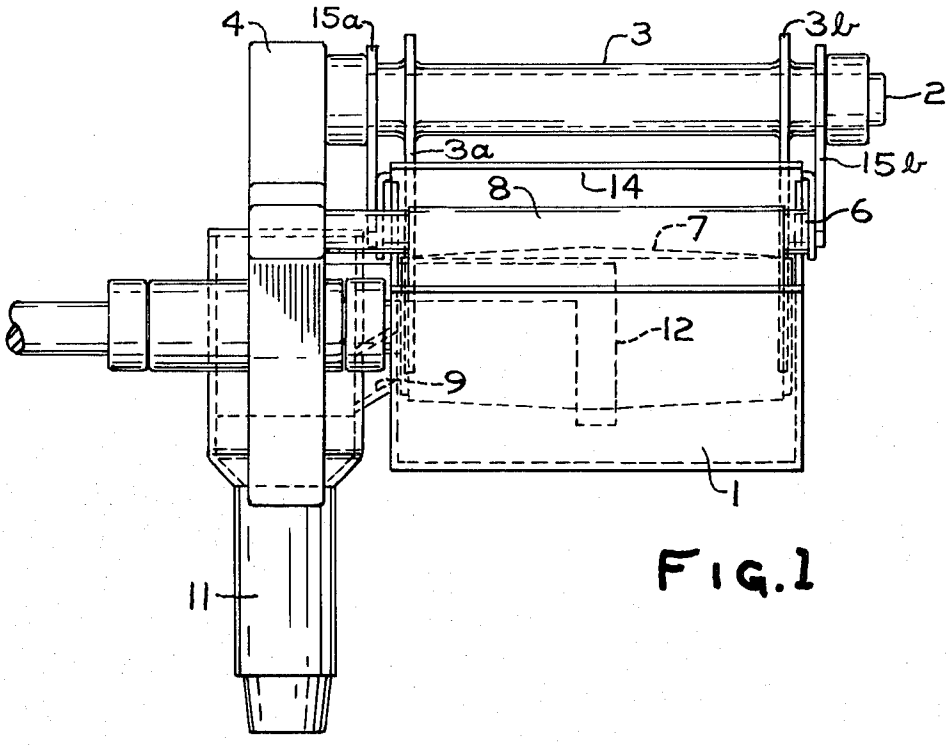



FIG. 1

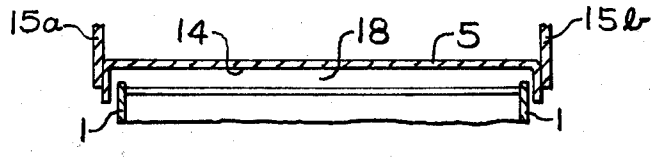



FIG. 4

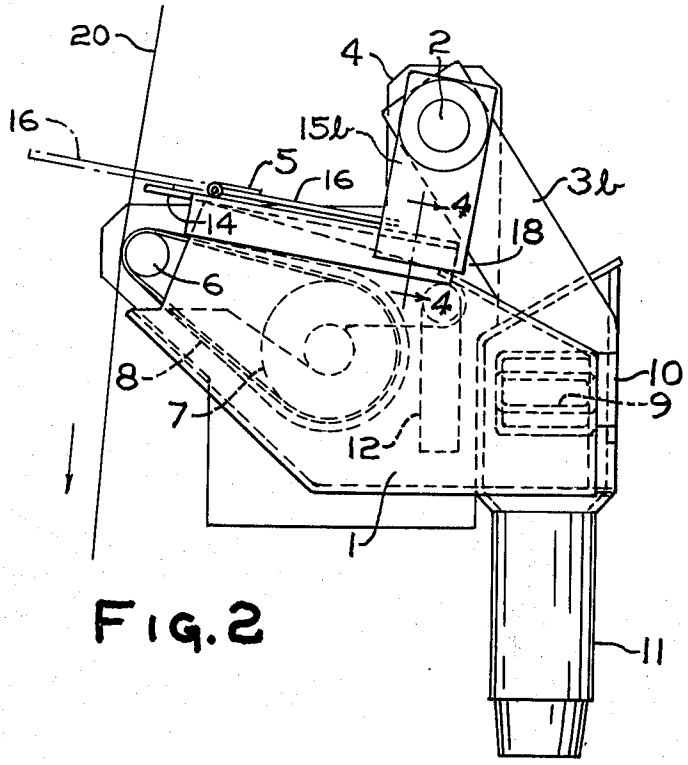

20
4
2
16
15b
5
16
3b
14
4
18
6
4
10
8
9
7
12
1
11

FIG. 2

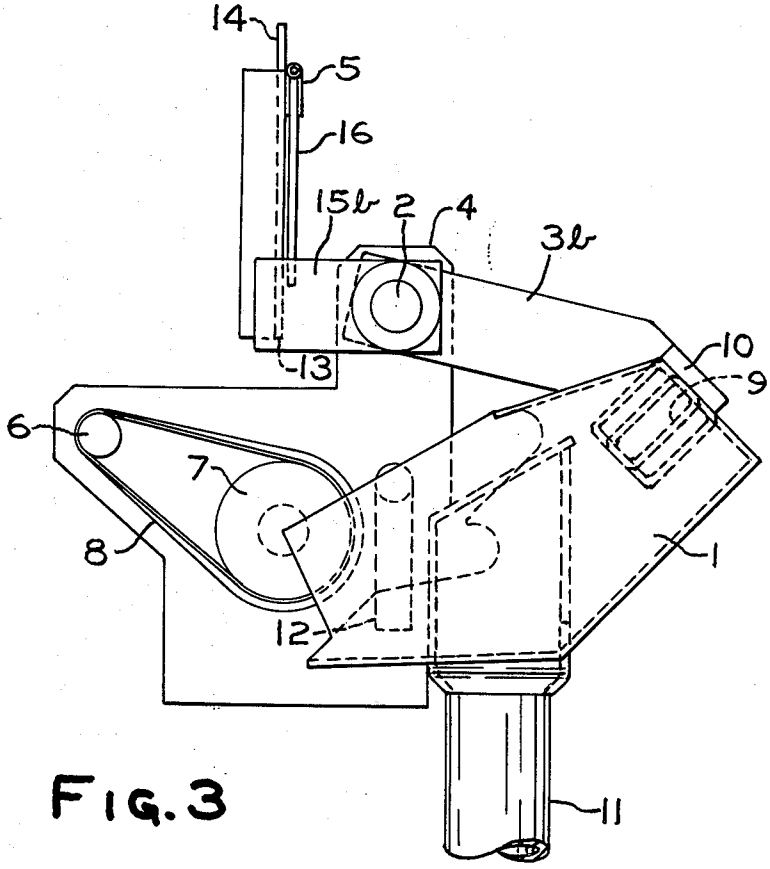

14
5
16
15b
2
4
3b
10
13
9
6
7
8
1
12
11

FIG. 3

# BINDER APPLICATOR FOR GLASS FIBER COATING AND METHOD OF USING

## BACKGROUND OF THE INVENTION

In the manufacture of textiles it is common practice to utilize various solutions of binders, sizes and dyes and apply them to the surface of the fibers during manufacture. The binders and sizes are applied to textiles for various purposes. Thus, often size materials are applied to the textile fibers to render them receptive to the application of other substances such as elastomers, organic polymer materials, coatings and the like for a particular use, i.e., rubber or plastic reinforcement, dyeing and the like.

The binders and sizes are conventionally applied using pads, rollers, sprays and belt applicators. In the manufacture of glass fibers the use of belt type applicators is quite common and they have enjoyed considerable success. Typical of applicators of the belt type used to apply binders and sizes to textile fibers and to glass fibers in particular are the applicators shown in U.S. Pat. Nos. 3,331,353, 3,067,719, 3,494,753 and 2,723,215. The applicators shown use belts to apply the size and/or binder to the textile fibers. In those instances where the binder solution is applied to the belts from a sump located in the housing for the belts, the housing is totally enclosed on all sides except for the front of the applicator which is open to permit the textiles to contact the belt for the application of size and/or binder thereto from the belt.

In any continuous filament production process, the filaments typically travel at high speeds during their passage over the applicator. Thus, for example, in a glass fiber production system the filaments passing over the applicator surface are travelling at linear speeds usually on the order of 2438.4 to 6096 meters per minute or more, usually 2682.24 to 5486.4 meters per minute. This high speed travel of the filaments passing over the belt applicator creates high velocity air currents in a downward direction and air is blown constantly into the housing of the applicator creating pressures therein. While the housing tends to relieve itself of pressure buildup at the front opening thereof, this tends to occur intermittently so that the belt containing binder thereon does not contain uniform quantities of binder as it contacts the filaments passing over it. Further, the high velocity of the air entering the housing at the applicator opening tends to blow binder back into the housing between the pulsing pressure relieving cycles which are created during these operations by the high velocity air entering and leaving the housing at the applicator opening.

## THE PRESENT INVENTION

In accordance with the present invention a novel binder applicator is provided which reduces binder blow back, contributes significantly to more even distribution of binder solution on applicator surfaces and by virtue of its novel construction permits rapid and efficient removal and replacement of applicator parts located in the binder applicator housing.

Thus a binder applicator is provided which includes a housing containing a sump or reservoir for a binder or size solution, at least a pair of rolls having an endless belt constructed and arranged to ride over the surface of the rolls. The applicator is provided with an elongated opening at the front thereof to allow one roll to be positioned adjacent that opening and allow for the passage of filaments over and in contact with the surface of the belt carried by that roll at the opening. The second roller is positioned in a lower plane than the roller in the opening so that the belt passing over the second roller is immersed in the binder or size solution contained in the reservoir or sump. Pressure relieving means, preferably in the form of a slot positioned in the back wall of the housing is provided to permit the free passage of ambient air entering the front of the housing through the applicator housing and out at a point removed from the front opening. The side walls and back of the housing are hinged to permit them to be moved away from the front opening to thereby expose the internal parts of the applicator located in the housing. The housing lid is similarly hinged so that it can be moved away from the front opening and permit access to the internal parts of the housing.

For a more complete understanding of the instant invention, reference is made to the accompanying drawing in which:

FIG. 1 is a front view of the binder applicator of the instant invention;

FIG. 2 is a side view of the applicator of FIG. 1;

FIG. 3 is a side view of the applicator of FIG. 1 with the top and bottom moved away to expose the internal parts of the applicator; and

FIG. 4 is a cross section of a portion of the applicator of FIG. 2 taken along lnes 4—4 of FIG. 2 to illustrate the preferred pressure relieving slot.

Turning to the drawing and FIG. 1 in particular there is shown an applicator housing **1** having a unitary bottom and side walls forming an enclosure open at the top. Located in the applicator is a first roller **7**, and a second roller **6**. A top member **14** is shown forming the lid of the applicator housing **1**. Endless belt **8** rides over the surface of rollers **7** and **6**. The tube **12** serves to introduce binder and/or size solutions into the housing **1**. An overflow chute **9** is provided to maintain a constant level of solution in the housing **1** during operation.

Stud **2** is mounted in support **4** and has positioned on it a sleeve **3** which is rotatable on stud **2** and is secured by arms **3***a* and **3***b* to the housing **1**. Arms **15** and **15***a* are secured to top member **14** and rotate on sleeve **3** to permit the top member to be moved upwardly by raising arms **15***b* and **15***a*. Line **11** is a binder overflow line which is in communication with and removes binder solution from chute **9** to maintain a constant level of binder in housing **1**. Top member **14** is provided with a plate extension **16** shown in FIG. **2** which is rotated by a hinge member **5**. This plate **16** is shown retracted in FIG. **2** as the strand **20** passes over the belt **8**. When strand **20** is not being coated, the plate **16** is rotated 180° to cover the belt **8**.

Turning to FIG. **3**, the applicator is shown with the top **14** of the applicator moved upwardly on arms **15***b* and **15***a* to expose a portion of the interior of the applicator. The main portion of the housing **1**, i.e., the side walls, back wall and bottom are shown moved away from the applicator internals on arms **3***a* and **3***b* to expose the belt **8** and rollers **6** and **7**.

As can be readily seen in FIGS. **2** and **4**, the top **14** and housing **1** are so constructed that an elongated slot **18** is provided between them at the back of the applicator. This is an important feature of the instant invention since it provides a means for preventing internal pressures building up in housing **1** during operation by providing an adequate escape route for high velocity air

entering the housing **1** at the entrance to the applicator. The counter weight **10** is provided on the back wall of housing **1** to maintain the housing **1** in the position shown in FIG. **2** during normal operation but can be overcome by a manual pulling on the housing **1** to move it into a position such as depicted in FIG. **3.**

In operation of the applicator of the instant invention, the unit is closed as shown in FIG. **2.** The binder solution is pumped into the housing **1** through the inlet pipe **12** and allowed to overflow into pipe **11** through the chute **9.** Counter weight **10** is of sufficient weight to hold the housing containing the binder firmly in place as shown in FIG. **2.** The drive roll **7** is actuated by a suitable motor (not shown) and revolves between 60 to 180 revolutions per minute preferably at 60 to 160 revolutions per minute. This roll is 5.08 centimeters in diameter and endless belt **8** rides around its surface and the surface of roll **6** which is rotating freely. Roll **6** is 1.5875 centimeters in diameter. Strands or filaments **20** pass over the surface of the belt **8** as it passes over the roll **6.** The binder solution is maintained at a level from the bottom of housing **1** up to the level of the top of chute **9** and constant feed of solution via pipe **12** and overflow into chute **9** maintains this level constant during operation. Strands or filaments **20** are being attenuated from a fiber glass manufacturing bushing (not shown) at winding speeds of 2438.4 to 6096 meters per minute or more and typically at speeds of 2682.24 to 5486.4 meters per minute. The endless belt **8** passing over roll **7** passes through the binder solution. maintained in housing **1** picking up solution on its surface and delivering it to the front of the applicator. As the solution laden belt **8** passes over roller **6,** it is contacted by the strands **20** as they contact the belt **8** and the solution is picked up by the strands.

Since the strands **20** are traveling at high velocities in modern commercial installations usually 2438.4 meters per minute or more, considerable air turbulence is created at the entrance to the housing **1.** The high air currents at this point enter the applicator housing **1** but are prevented from accumulating any pressure build up in the housing **1** since the air is permitted to pass freely across the top **14** of the housing between the belt **8** and the undersurface of top **14** and exits through the elongated slot **18** provided in the housing.

It is observed in the operation of this applicator that the normal pulsing action on the surface of the belt **8** at or near the point of contact with the strands **20,** observed when strands are passing this point at high velocities, 2438.4 meters per minute or more, is substantially avoided. Binder blow back from the surface of the belt **8** at the front of the applicator and its attendant creation of uneven binder distribution across the width of the belt is substantially minimized by the operation of the instant applicator.

The slot **18** which provides for a constant passage of air through the applicator during operation does not allow the applicator to build up internal pressures in the housing. In a conventional binder housing, closed except for the front roller opening, it is typical at high velocity strand speeds to experience considerable binder blow back from the surface of the belt passing over the front roll and to see a pulsing of binder on the surface of the belt as the applicator housing is pressure relieved through the front opening.

## EXAMPLE

In one typical operation of the applicator of the instant invention a 800 hole fiber glass bushing was provided having molten glass continuously fed thereto from a forehearth. The bushing was operated to produce glass filaments having a diameter of 0.000635 centimeter. The filaments were drawn at a rate of 4876.8 meters per minute and the fan of filaments so drawn were passed over the belt **8** on applicator roller **6** shown in FIGS. **1–4.** The applicator housing **1** contained a solution of an amylose starch binder. The roller **7** was partially immersed in the starch solution and was driven at 130 to 140 revolutions per minute. The filaments were gathered and wound on a forming package. No binder blow back was observed during the run and the belt appeared to have a uniform quantity of binder across the surface at the point of contact with the fan of filaments. The air passing through the applicator from the opening at roller **6** to the slot **18** did not appear to cause any pulsation of binder on the belt surface. The strand produced had excellent quality in terms of binder uniformity.

Thus, in the utilization of the instant invention, strands or filaments drawn at high velocity over the applicator roll, i.e., at 2438.4 meters per minute or more, create considerable air velocities at the entrance of the applicator. The high velocity air entering the applicator is provided with a passage through the applicator by virtue of the slot arrangement shown so that the difficulties normally associated with pressure build up in the applicator housing are readily avoided.

In the embodiment shown, the applicator is constructed of separate pieces to form the entire unit, i.e., the hinged top and the hinged side, bottom and back wall. If desired, the housing **1** can be constructed of a cast metal provided with a slot in the back or side walls to provide the necessary pressure relieving means. As will be readily understood, the slot shown in the drawing is provided by the straight cover resting on the housing **1,** side walls and the sloping back member of the housing **1** thereby providing ready egress for high velocity air passing into the housing over the roller **6** and its associated belt **8.**

While the invention has been described with reference to certain specific embodiments, it will be understood that it should not be limited thereby except insofar as appears in the accompanying claims:

I claim:

**1.** An applicator for use in applying solutions of binders and/or sizes to filaments comprising a housing having side walls, a bottom and a top spaced above at least one of said side walls, an endless belt constructed to ride around at least two rollers positioned within said housing, an opening at the front of said housing through which the belt protrudes as it passes over one roller, an elongated slot inside of said housing and formed by spacing said top above one of said side walls, said slot being located at a point inside of said housing remote from said opening at the front of said housing, and means to pass said belt in contact with fluid in said housing to apply fluid to the surface thereof.

**2.** A method of applying a solution to one or more filaments being drawn from a filament forming process comprising passing said filaments at a speed of at least 2,438.4 meters per minute in contact with an endless belt having the desired solution thereon to thereby apply fluid to the surface of said filaments, said solution

being placed on said blet by passing the belt through the solution in an enclosed container which is open at the point of contact of the filaments with said belt, passing high velocity air from the opening of said enclosed container at the point of contact of the filaments and the belt through the container and continuously removing said high velocity air from the interior of said container and passing it to the exterior thereof continuously at a point in the container remote from the point of contact of the filaments with the said belt.

3. The applicator of claim 1 wherein the top member rests on two side walls and the back wall is sloped upwardly to a point ending below the surface of the top member.

4. The applicator of claim 1 wherein the bottom and side walls of said applicator housing are hinged.

5. The applicator of claim 4 wherein said top member is hinged.

6. An applicator for use in applying solution to a moving strand or filament comprising a housing, said housing being open at one end and having a roller positioned in said opening, a second roller located in said housing in a lower portion thereof, an endless belt positioned over said rollers and driven by at least one of said rollers, means to feed solution to said housing, means to maintain the solution fed to the housing at a level in the housing sufficient to contact the solution with said belt during movement thereof, pressure relieving means positioned in said housing at a point remote from the open end thereof and of a size sufficient to provide for the exhausting of all high velocity air entering said roller opening.

7. An applicator for applying solution to strands or filaments comprising an enclosed housing having an endless belt therein, at least two rollers positioned in said housing and constructed and arranged to rotate said belt around each roller, one of said rollers being positioned adjacent the top of said housing in an elongated opening provided therein, a second roller positioned near the bottom of said housing, a means to feed the solution to the housing, means to maintain the level of solution in said housing at a depth sufficient to insure contact of said belt therewith during rotation of the belt around said rollers, a pressure relieving slot located in the back of said housing between the top and bottom thereof and in said back wall, said opening being of sufficient size to vent all air introduced into the housing during operation of said applicator through the opening located in the front thereof.

8. The applicator of claim 7 including means to move said housing away from the said rollers.

9. The apparatus of claim 7 wherein said housing is hinged for movement away from said rollers and include means to maintain the housing in a position covering said rollers during operation.

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