April 5, 1966 W. H. EWING 3,244,143

APPLICATOR FOR COATING FILAMENTS

Filed Nov. 14, 1962 2 Sheets-Sheet 1

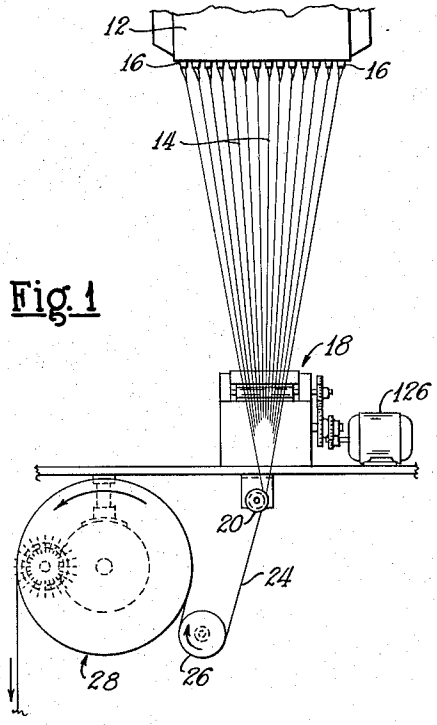


Fig. 1

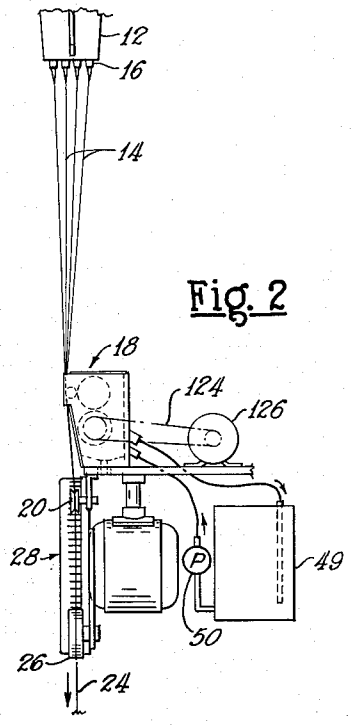


Fig. 2

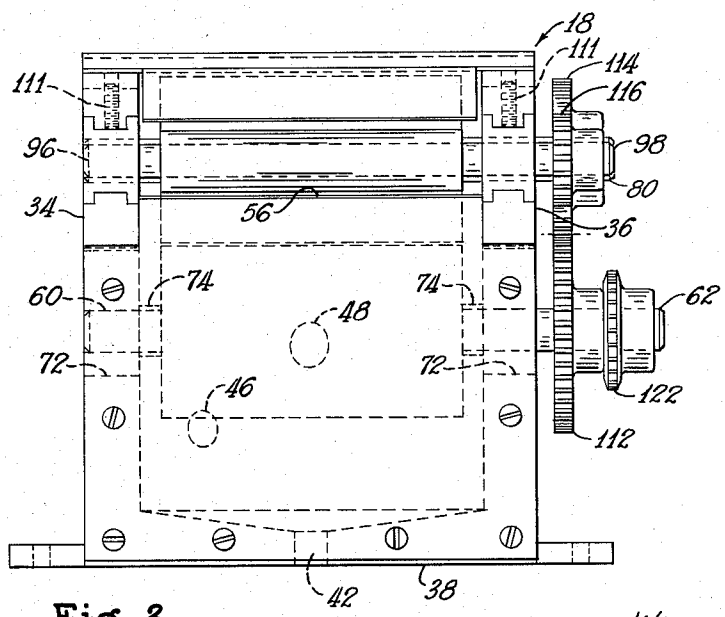


Fig. 3

INVENTOR
WILLIAM H. EWING
BY
Stuhlin & Dallman
ATTORNEYS

April 5, 1966 W. H. EWING 3,244,143

APPLICATOR FOR COATING FILAMENTS

Filed Nov. 14, 1962 2 Sheets-Sheet 2

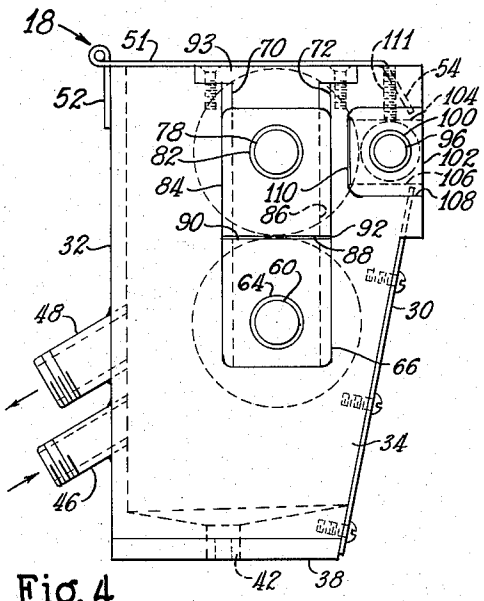


Fig. 4

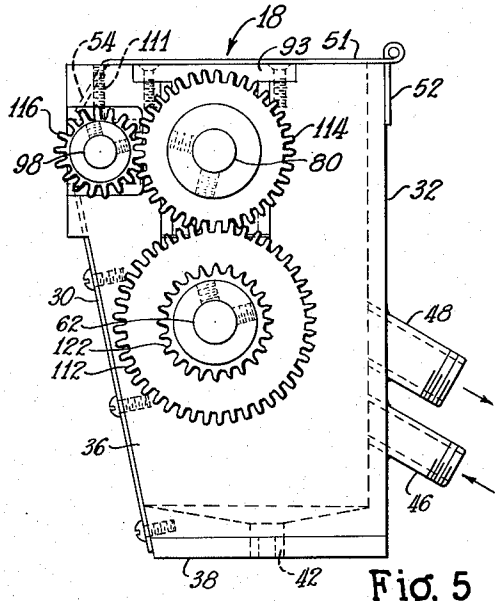


Fig. 5

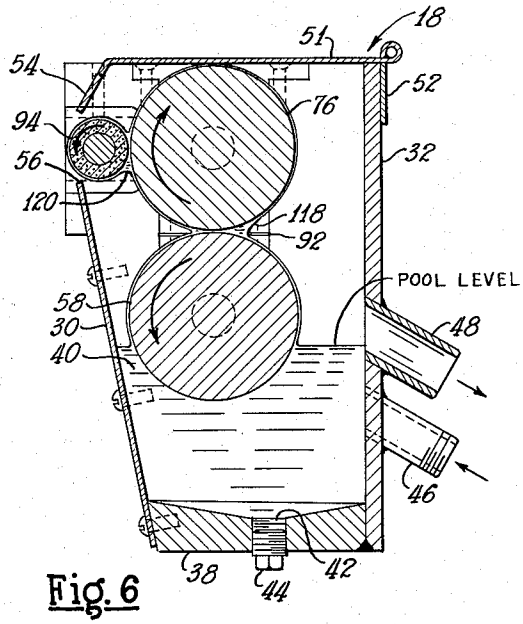


Fig. 6

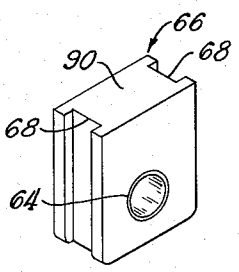


Fig. 7

INVENTOR
WILLIAM H. EWING
BY
Stachie & Querman
ATTORNEYS

United States Patent Office 3,244,143 Patented Apr. 5, 1966

3,244,143

APPLICATOR FOR COATING FILAMENTS

William H. Ewing, Newark, Ohio, assignor to Owens-Corning Fiberglas Corporation, a corporation of Delaware

Filed Nov. 14, 1962, Ser. No. 237,687
4 Claims. (Cl. 118—262)

This invention relates to an applicator for coating filaments and particularly for coating glass filaments during a forming operation.

Applying a coating material to filaments during a forming operation is somewhat difficult, and if not done properly will cause the filaments to break. If one or more of the filaments break, the forming operation is interrupted and the filaments must be restarted from the bushing. This is a time consuming operation and results in substantial lost production time. In addition, the package of strand being formed when the break-out occurred must be disposed of or used for a lesser purpose than that for which it was intended. Filament breaks often result because part of the applicator which the filaments contact becomes dry. This might be caused, for example, by an irregular or insufficient flow of the coating material to that part of the applicator. If the coating material flow is insufficient to even a minute part of the applicator for a short period of time, that part may become dry and a break-out result. Many applicators are known in the art for applying coating material to filaments but they have all had one or more deficiencies and, in particular, have caused an excessive number of break-outs.

The present invention relates to an improved coating material applicator for applying a size or other coating to filaments shortly after they are formed. The new applicator supplies coating material in such a manner that dry portions very seldom, if ever, occur on that part of the applicator which the filaments contact. The new applicator also agitates the coating material shortly before it is supplied to the portion contacted by the filaments and thereby both mixes the material and eliminates any lumps formed therein. In addition, the applicator can be easily disassembled for cleaning, which has heretofore been a difficult task.

It is, therefore, a principal object of the present invention to provide an improved applicator for applying coating material to filaments with fewer break-outs.

Another object of the invention is to provide a coating material applicator which can be cleaned easily.

Many other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a somewhat schematic front view in elevation of apparatus for forming filaments, coating the filaments in accordance with the invention, and gathering the filaments into a strand;

FIG. 2 is a somewhat schematic side view in elevation of the apparatus shown in FIG. 1;

FIG. 3 is an enlarged front view in elevation of the coating material applicator shown in FIG. 1;

FIG. 4 is a left-end view of the applicator;

FIG. 5 is a right-end view of the applicator;

FIG. 6 is a view in vertical, transverse cross section of the applicator; and

FIG. 7 is a detailed view in perspective of an element of the applicator.

Referring to the drawings, and more particularly to FIG. 1, a bushing 12 containing molten glass constitutes a molten glass source from which filaments 14 are attenuated through tips 16. The filaments 14 are then pulled past a coating material applicator 18 embodying the invention which coats them with a size. The size, covering the individual filaments, holds them together and prevents them from rubbing in glass-to-glass contact with other filaments and causing breakage through abrasion. The size frequenly is removed in a subsequent operation but in some instances is left permanently on the filaments. After the filaments are coated, they are collected by a gathering shoe 20 into a strand 24 which can be wound around an idler wheel 26 and a pulling wheel 28 which supplies the attenuating force. The strand 24 is subsequently ejected from the pulling wheel 28 and formed into a strand package by any suitable apparatus. Rather than the idler wheel 26 and the pulling wheel 28, the strand can be wound directly on a rotating collet which thereby forms a package and also provides the attenuating force.

Referring more particularly to FIGS. 3–6, the applicator 18 includes front and back walls 30 and 32, left and right end walls 34 and 36, and a bottom wall 38. These walls thereby form a receptacle for a pool 40 (FIG. 6) of coating material, with the bottom 38 being sloped toward a central drain opening 42 in which a pipe plug 44 is threadedly engaged. The plug 44 can be unscrewed occasionally to drain the receptacle and remove any sediment collected therein, including any short lengths of broken filaments which may be deposited from the filament forming operation.

The rear wall 32 has an inlet 46 through which coating material is supplied and a drain line 48 by means of which coating material is removed from the applicator, with the position of the drain line 48 also determining the level of the pool 40. The excess coating material drains into a supply tank 49 (FIG. 2) and is supplied to the applicator 18 by a pump 50. A lid 51 is connected to the rear wall 32 by a hinge 52 and has a front lip 54 extending downwardly to form an elongate opening 56 with the upper edge of the front wall 30.

A first or supply roll 58 extends substantially across the applicator 18 between the side walls 34 and 36 and is immersed in the pool 40 with the level of the pool being approximately half way between the lower extremity of the roll 58 and the axis thereof (FIG. 6). The roll 58 has a short axle 60 (FIG. 3) and a drive axle 62 rotatably supported in bushings 64 which are held in first bearing blocks 66. The blocks 66 have grooves 68 (FIG. 7) extending longitudinally of the side edges thereof which receive cooperating ridges 70 of elongate vertical notches or openings 72 in each of the side walls 34 and 36. With this arrangement, the supply roll 58 can be removed periodically for cleaning because the blocks 68 are slidable with respect to the ridges 70. The elongate notches 72 are carefully machined in the side walls 34 and 36 so that the roll 58 will be accurately located in a predetermined position in the applicator when the blocks 66 are at the bottom of the notches. The bushings 64 preferably are of the oilless type, and are made of a material which is not subject to attack by the sizes ordinarily used with the applicator 18. Excellent results have been had with a bearing material that is commercially available under the name "Arguto" from Arguto Oilless Bearing Company of Philadelphia, Pennsylvania. The roll 58 is spaced from the bearings 64 by suitable spacers 74 (FIG. 3).

The applicator 18 also includes an intermediate roll 76 which is journalled above and, in the embodiment shown, vertically above the supply roll 58, and above the pool 40. The roll 76 has axles 78 and 80 which are rotatable in bushings 82 mounted in bearing blocks 84. The blocks 84 also have grooves 86 cooperating with the ridges 70 of the notches 72. Each of the blocks 84 has a lower flat end 88 confronting an upper flat end 90 of the bearing block 66, and spaced slightly there-

from by a shim 92. Ordinarily, the ends 90 and 88 of the bearing blocks 66 and 84 are formed so that the rolls 58 and 76 are barely in contact when the ends 88 and 90 are abutting. With this arrangement, the spacing between the rolls 58 and 76 then can be simply and accurately determined because it will be equal to the thickness of the shims 92. The blocks 66 and 84 are firmly held in the notches 72 by T-blocks 93 screwed into the upper edges of the end walls 34 and 36.

A third or applicator roll 94 is located to one side of the intermediate roll 76 with an extremity of the roll 94 being to one side of any part of either the intermediate roll 76 or the supply roll 58, so that the roll 94 can contact the filaments 14 without interference. The same portion of the roll 94 also extends beyond the front wall 30 and the lip 54 of the lid 51. The applicator roll 94 has axles 96 and 98 rotatably held in bushings 100 which are similar to the bushings 64 and 82. The bushings 100 are mounted in bearing blocks 102 having grooves 104 which cooperate with ridges 106 of horizontally-extending notches 108 in the side walls 34 and 36. This enables the roll 94 to be removed for cleaning in the same manner as the rolls 58 and 76. The bearing block 102 and the horizontal notches 108 are carefully made so that the roll 94 ordinarily will be in contact will the intermediate roll 76 when the bearing block 102 is inserted into the horizontal notch 108. However, a spacer or shim 110 is located between the block 102 and the end of the notch 108 so that the spacing between the roll 94 and the intermediate roll 76 can be simply and accurately determined by the thickness of the shim 110. The blocks 102 are held firmly in the notches 108 by set-screws 111.

The removable bearing blocks 68, 84 and 102 enable the applicator 18 to be cleaned easily since all three of the rolls 58, 76 and 94 can be removed. This enables the rolls to be cleaned separately and also leaves the receptacle unobstructed for easy cleaning. The feature also makes it easier to change from one size to another.

The first roll 58 and the intermediate roll 76 preferably are made of cold rolled steel and are subsequently chrome plated to provide a smooth surface. The rolls are also ground and polished to establish a concentricity within 0.0001 inch. In this manner, a thin, uniform coating is always assured on the rolls. The applicator roll 94 can be either chrome plated in a manner similar to the rolls 58 and 76 or can be made of graphite, as shown, preferably #580 graphite obtainable from the Speer Carbon Company of St. Marys, Pennsylvania. Which of these is employed depends upon the type of size used. For starch-based sizes, the roll 94 is preferably of graphite while for plastic sizes, a chrome plated steel roll is preferred. As to spacing, a distance of 0.004–0.030 inch is used between the first and second rolls 58 and 76 while a distance of 0.002–0.015 inch is used between the second and third rolls 76 and 94, the latter spacing being more critical with the preferred distance being 0.004–0.012 inch. While the spacing will vary for different coating materials and for the amount desired on the filaments, a definite predetermined distance is required in all instances. The overall speed of the rolls also affects the amount of material applied to the filaments.

The long axles 62, 80 and 98 of the three rolls 58, 76 and 94 have gears 112, 114 and 116 suitably fastened thereto by setscrews or keys, for example. The speed of the respective rolls is very important to feed the size to the applicator roll 94 properly in a quantity which will virtually assure that dry spots or portions will not occur, and yet not be excessive. In a specific example, the supply roll 58 is rotated with a peripheral velocity of 69 feet per minute, the intermediate roll 76 is rotated with a peripheral velocity of 84 feet per minute, and the applicator roll 94 is rotated with a peripheral velocity of 60 feet per minute. The second roll 76 is preferably rotated at a peripheral velocity from approximately 10 to approximately 30 percent in excess of the peripheral velocity of the first roll 58. This speed differential maintains a pool of the size at the bite of the rolls 58 and 76, as indicated at 118 in FIG. 6. The pool 118 assures that the size carried from the supply pool 40 will be thoroughly mixed and that any lumps therein will tend to be dissolved. The peripheral velocity of the applicator roller 94 is from approximately 20 to approximately 35 percent less than that of the intermediate roll 76 so that a pool is formed at the bite of these rolls, as indicated at 120 in FIG. 6. In this instance, the supply roll 58 is rotating in a counterclockwise direction, the intermediate roll 76 is rotating in a clockwise direction, and the applicator roll 94 is rotating in a counterclockwise direction, as shown by the arrows in FIG. 6, to establish the pools 118 and 120. If the difference in velocities of the latter two rollers is less than roughly 20 percent, portions of the applicator roll 94 will occasionally be starved and dry and cause break-outs of the filaments. With a velocity difference in excess of roughly 35 percent, the pool of size will be excessive and will remain for an excessive period of time, whereby the material will be churned and foaming will frequently result. The axle 62 can be driven by a sprocket 122 connected through a chain 124 (FIG. 2) to a motor 126.

Various modifications of the above described embodiment of the invention will be apparent to those skilled in the art, and it is to be understood that such modifications can be made without departing from the scope of the invention, if they are within the spirit and the tenor of the accompanying claims.

I claim:

1. An applicator for applying coating material to filaments, said applicator comprising means forming a receptacle for a pool of coating material, a first roll positioned to be partly immersed in the pool, a second roll having an axis above an axis of the first roll, said second roll being spaced from the pool and spaced from said first roll by a predetermined amount, a third roll having an axis above the axis of said first roll, said third roll spaced from the pool and spaced from said second roll by a predetermined amount, said third roll having a portion lying in a vertical plane which is to one side of all of said first and second rolls, a first gear connected to said first roll, a second gear connected to said second roll and meshing with said first gear, a third gear connected to said third roll and meshing with said second gear, said gears being sized so that said third roll has a peripheral velocity from 20 to 35 percent less than that of said second roll and said second roll has a peripheral velocity from approximately 10 to approximately 30 percent in excess of that of said first roll, means for driving one of said gears, and means for circulating coating material through said receptacle.

2. An applicator for applying a coating material to filaments, said applicator comprising wall means including end walls forming a receptacle for a pool of coating material, said end walls each having a first upwardly extending elongate opening and a second opening located to one side of and extending toward said first opening, a first roll, means for rotatably supporting said first roll in said first opening of said end walls and positioning said first roll to be partly immersed in the pool, a second roll, second means for rotatably supporting said second roll in said first opening of said end walls with the axis of said second roll being above said first roll, said second means spacing said second roll from said pool and spacing said second roll from said first roll by a predetermined amount, a third roll, third means rotatably supporting said third roll in said second openings of said end walls with the axis of said third roll above the axis of said first roll, said third means spacing said third roll from the pool and spacing said third roll from said second roll by a predetermined amount, said third means being movable in said second openings to enable said third

roll to be removed from said applicator in a direction away from said second roll, said third means also positioning said third roll so that a portion lies in a vertical plane which is located to one side of said first and second rolls, and means for driving said first, second, and third rolls with the peripheral velocity of said third roll being less than that of said second roll and with the peripheral velocity of said second roll exceeding that of said first roll.

3. An applicator for applying a coating material to filaments, said applicator comprising means including end walls forming a receptacle for a pool of coating material, said end walls having a first pair of elongate notches and a second pair of notches located to one side of and extending toward said elongate notches, means for establishing a pool of coating material of predetermined depth within said receptacle, a first roll, a pair of first bearing blocks supporting said first roll for rotation about its longitudinal axis and for partial immersion in the pool of coating material in said receptacle, said first bearing blocks being slidably supported in said first pair of elongate notches in said end walls, a second roll, a pair of second bearing blocks supporting said second roll for rotation about its longitudinal axis, with such axis above and substantially parallel to the axis of said first roll, and with the periphery of said second roll being spaced from the pool and spaced from the periphery of said first roll by a small, predetermined distance, said second bearing blocks being slidably supported in the same elongate notches in said end walls as said first bearing blocks, a third roll, a pair of third bearing blocks supporting said third roll for rotation about its longitudinal axis, with such axis above and substantially parallel to the axis of said first roll, with the periphery of said third roll above the pool and spaced from the periphery of said second roll by a small, predetermined distance, and with a portion of the periphery of the third roll lying to one side of the peripheries of said first and second rolls, said third bearing blocks being slidably supported in the second pair of notches in said end walls, and means for driving said rolls at different peripheral velocities.

4. An applicator for applying a coating material to filaments, said applicator comprising means including end walls forming a receptacle for a pool of coating material, said end walls having a first pair of vertical, elongate notches and a second pair of notches located to one side of and extending toward said elongate notches, means for establishing a pool of coating material of predetermined depth within said receptacle, a first roll, a pair of first bearing blocks supporting said first roll for rotation about its longitudinal axis and for partial immersion in the pool of coating material in said receptacle, said first bearing blocks being slidably supported in said generally vertical elongate notches in said end walls, a second roll,

a pair of second bearing blocks supporting said second roll for rotation about its longitudinal axis, with such axis above and substantially parallel to the axis of said first roll and with the periphery of said second roll being spaced from said pool, said second bearing blocks being slidably supported in the same elongate notches in said end walls as said first bearing blocks, first shims of predetermined thickness located between the bearing blocks of each of said pair to space the periphery of said first roll from the periphery of said second roll by a small, predetermined distance, a third roll, a pair of third bearing blocks supporting said third roll for rotation about its longitudinal axis, with such axis above and substantially parallel to the axis of said first roll, with the periphery of said third roll above the pool, and with a portion of the periphery of the third roll lying to one side of the peripheries of said first and second rolls, said third bearing blocks being slidably supported in the second pair of notches in said end walls, second shims located between said third bearing blocks and the ends of said second pair of notches to space the periphery of said third roll from the periphery of said second roll by a small predetermined distance, and means for simultaneously driving said rolls.

References Cited by the Examiner

UNITED STATES PATENTS

194,613	8/1877	Morton	118—262 X
1,375,126	4/1921	Willwerscheid	118—262 X
1,402,288	1/1922	Fisher.	
2,022,484	11/1935	Watkins	118—249
2,293,691	8/1942	Harrigan	118—249
2,329,034	9/1943	Buck et al.	118—262 X
2,331,980	10/1943	Hoffman et al.	118—234
2,466,718	4/1949	Lobstein	118—262 X
2,681,636	6/1954	Fridolph	118—262 X
2,693,429	11/1954	Radtke et al.	117—111
2,728,972	1/1956	Drummond et al.	
3,013,527	12/1961	Novick	118—262

FOREIGN PATENTS

198,906	8/1958	Austria.
1,250,728	12/1960	France.
829,335	1/1952	Germany.
703,932	2/1954	Great Britain.

OTHER REFERENCES

Booth: Modern Plastics, vol. 36, Number 1, September 1958, pp. 91–95. (Copy in Scientific Library.)

CHARLES A. WILLMUTH, *Primary Examiner.*

RICHARD D. NEVIUS, *Examiner.*