Dec. 23, 1947. R. McK. STREAM 2,433,304

TRAVERSING MECHANISM

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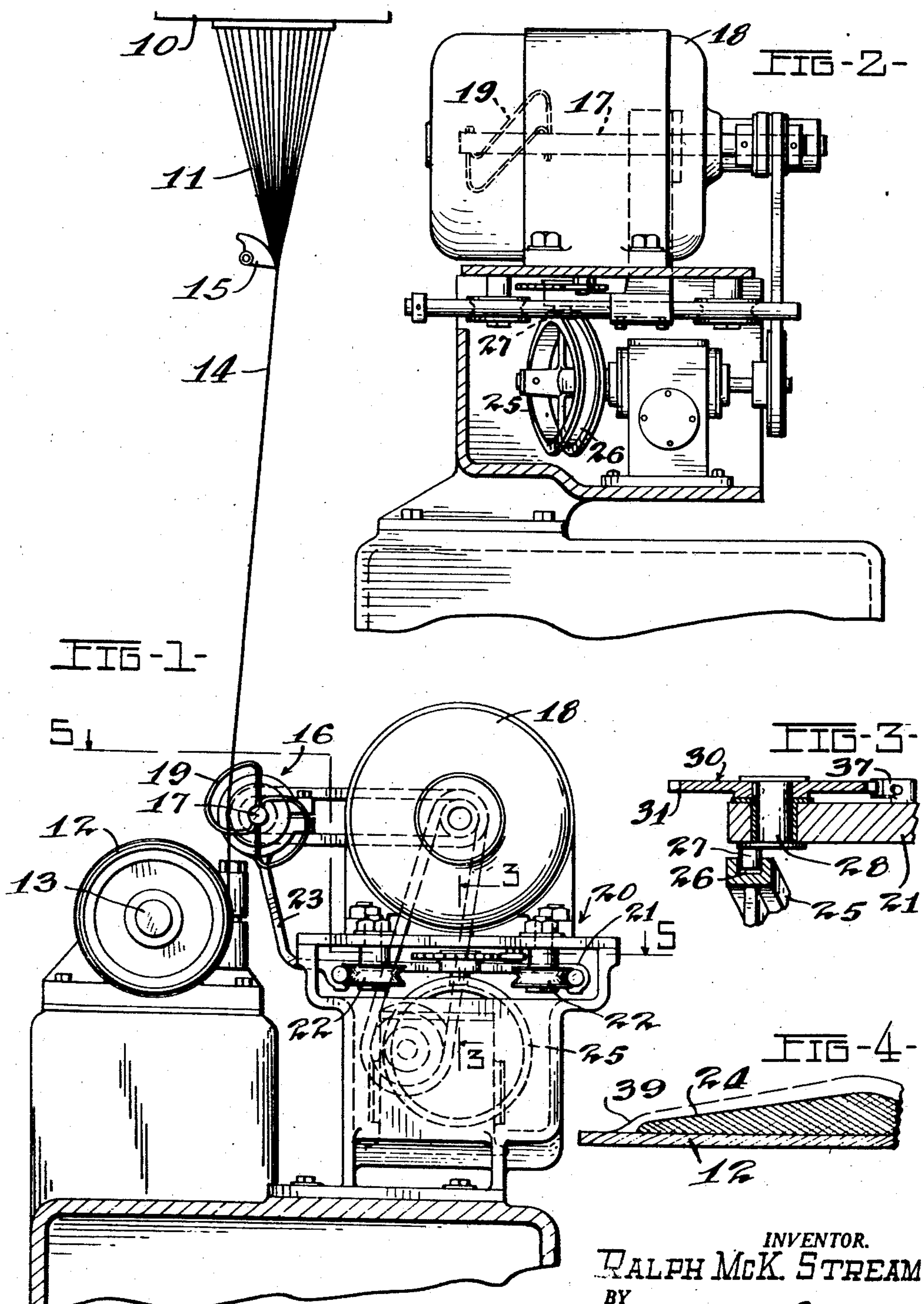

FIG-2-

FIG-1-

FIG-3-

FIG-4-

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FIG-5-

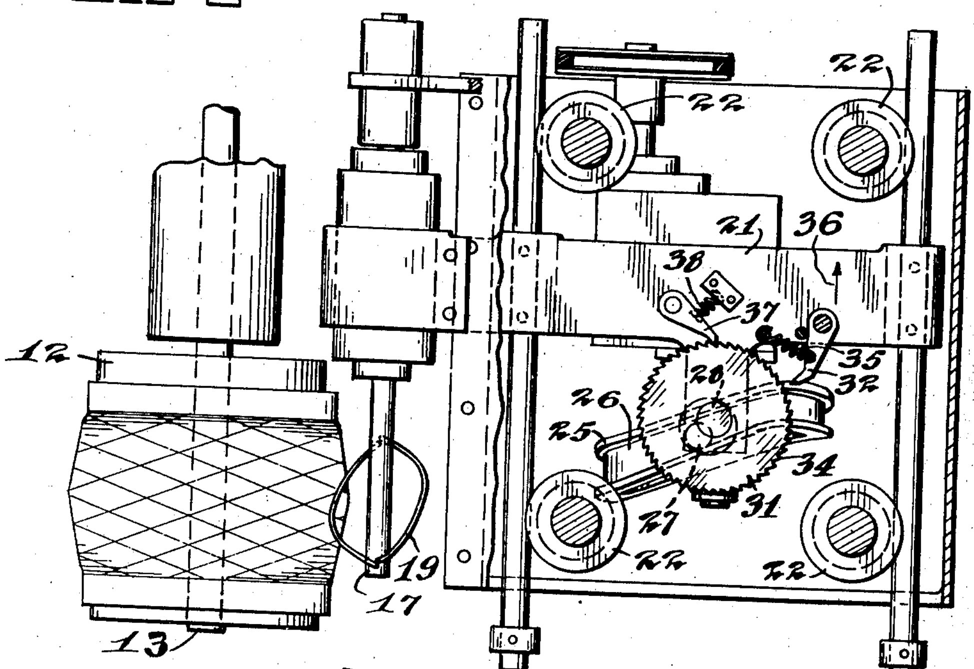


FIG-6-

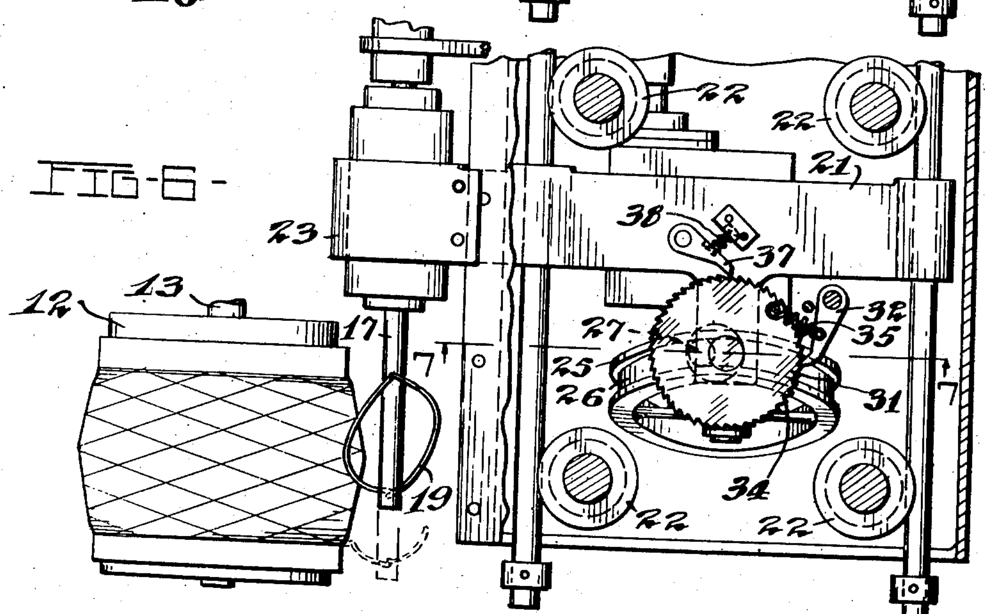
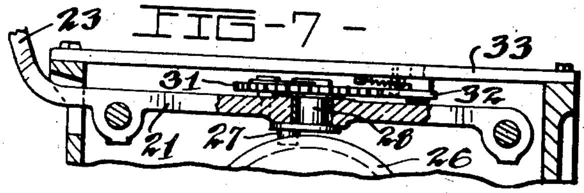


FIG-7-



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TRAVERSING MECHANISM

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8 Claims. (Cl. 242—43)

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This invention relates generally to packaging material in strand form and refers more particularly to improvements in the mechanism employed to traverse the package with the strand.

In forming certain types of fibers such, for example, as continuous type glass fibers, it is customary to gather the fibers into a strand and to wind the strand on a spool or some similar support. The process of winding the strand on the spool involves numerous problems especially in commercial installations where winding speeds of 20,000 revolutions per minute and more are desired and where it is advantageous to wind as much material as possible on a single spool. One of the major difficulties is to meet or approach these specifications and, at the same time, provide a package which may be readily unwound during further processing of the strand. These problems are especially critical when the strand is formed of glass fibers since the latter are usually coated with a lubricating and binding material to reduce abrading action between adjacent fibers and to hold the fibers in strand form. Inasmuch as the strand is being formed and wound at a relatively high rate of speed, the lubricant and binder is usually still in a wet or tacky condition when the strand is wound on the spool. As a result, there is a tendency of the adjacent and overlying strands in the package to become bonded together by the binder so that, in effect, the completed package is a solid mass of glass fibers bonded together. This makes it very difficult, if not impossible, to unwind the package in the further processing of the strand.

The above problems are overcome to a great extent by employing a traversing mechanism of the general type shown in the Beach application Serial No. 487,943, filed May 21, 1943, now Patent No. 2,391,870, dated January 1, 1946. This traversing mechanism contemplates placing the strand on the spool in large helixes so that the strands will cross each other at relatively great angles and thus eliminate much of the tendency for the convolutions of the strand to become tangled or bonded together by the binder. Ringers are thereby practically eliminated and the strand may be readily removed for twisting, rewinding or such other processing that may be required. Also with the above traversing mechanism the strand is positively moved back and forth along the spool. This enables higher traversing speeds to be reached and results in obtaining a more uniformly wound package. In addition secondary traversing mechanism is provided for reciprocating the primary traversing mechanism to

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increase the width of the package beyond the normal travel of the strand produced by the primary traversing mechanism.

Although the traversing mechanism briefly outlined above is highly satisfactory for winding material in strand form on a spool at a very high speed to produce a package capable of being easily unwound for further processing, nevertheless, this general type of traversing mechanism limits the amount of material that can be wound on a single spool at high speed without causing the strands at the extremities of the package to slip off these ends and become tangled.

With the above in view the present invention contemplates a traversing mechanism possessing all of the advantages of the traversing mechanism previously described with the further advantage that winding of the strand on the spool is controlled at the ends of the package to eliminate any possibility of the strand building-up at these ends to such an extent that loose wrappings result. In accordance with this invention the location of successive traversing movements of the secondary traverse relative to the spool are varied so that each reversal of the secondary traverse takes place at a different point on the spool. As a result, the opposite end portions of the package taper from the periphery of the package to the supporting surface of the spool and considerably more material may be wound on the spool without the danger of the strand slipping off the ends of the package in loose entangled coils and the formation of ringers.

The above as well as other objects will be made more apparent as this description proceeds especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is an elevational view of a conventional fiber forming apparatus of the type in which the present invention is embodied;

Figure 2 is a side elevational view of traversing mechanism embodying the features of the present invention and having certain parts broken away for the sake of clearness;

Figure 3 is a sectional view taken substantially on the plane indicated by the line **3—3** of Figure 1;

Figure 4 is a diagram illustrating the contour of the package formed by the traversing mechanism forming the subject matter of this invention;

Figure 5 is a fragmentary sectional plan view of a part of the traversing mechanism taken substantially along the line **5—5** of Figure 1;

Figure 6 is a similar view of the construction shown in Figure 5 illustrating the mechanism in an advanced position; and

Figure 7 is a vertical sectional view taken on the line 7—7 of Figure 6.

Referring now more in detail to the drawings and with special reference to Figure 1, it will be noted that the numeral 10 indicates a glass melting furnace adapted to contain a quantity of molten glass and having a plurality of orifices at the bottom thereof through which molten glass flows in the form of streams. The streams are attenuated into continuous fibers or filaments 11 by means of a drum or spool 12 supported on a rotating spindle 13 which is driven at the required rate of speed by any suitable mechanism not shown herein.

The filaments or fibers 11 are gathered to form a strand 14 by a guide 15 and the strand 14 is wound around the spool 13. The guide 15 may be any one of a number of accepted designs having means for applying a suitable lubricant and binder to the filaments 11 as they are gathered to form the strand 14.

As the strand 14 is drawn to the spool 12, it is traversed lengthwise of the spool by a primary traversing mechanism indicated generally in the several figures by the reference character 16. The traversing mechanism 16 is supported adjacent the spindle 13 in substantially vertical alignment with the path of the strand 14 and comprises a traverse shaft 17. The shaft 17 is rotatable about an axis parallel to the axis of the spindle 13 and is driven by a suitable prime mover such as an electric motor 18.

The primary traversing mechanism 16 selected for the purpose of illustration is identical in the principle of operation to the mechanism shown in the Beach application Serial No. 487,943, filed May 21, 1943, now Patent No. 2,391,870, dated January 1, 1946. Briefly this traversing mechanism comprises a pair of substantially spirally shaped complementary cam members 19 rotatable as a unit with the shaft 17 and cooperating with each other to positively move the strand 14 in opposite directions along the spool 12. This positive traversing of the strand enables higher traversing speeds to be reached and maintains a substantially constant angular relation between the strand and package which is desirable in that it prevents objectionable variations in the winding tension.

It will further be noted that the above type of primary traversing mechanism enables winding the strand on the spool in large helixes so that the strands will cross each other at large angles. This arrangement not only eliminates much of the tendency of the strands to become entangled during the winding operation, but is especially desirable when winding newly formed glass fibers, since it reduces to a minimum the area of contact of adjacent turns of the strand. Thus the effect of the abrasive action between the fibers forming the strand is also minimized as well as the tendency of the overlying strands to adhere to each other. The above features contribute materially to enabling the removal of the strand from the package for twisting, rewinding or such other succeeding operations as may be required.

The primary traversing mechanism 16 is reciprocated by a secondary traversing mechanism 20 to enable extending the width of the package beyond the normal travel of the strand produced by the cams 19. The secondary traversing mechanism 20 comprises a carriage 21 supported on rollers 22 for reciprocation in the general direction of the axis of the spool 12 or spindle 13 and having a portion 23 for supporting the primary traversing mechanism 16. As a result the primary traversing mechanism 16 moves as a unit with the carriage 21 relative to the spool 12 and the two mechanisms cooperate with one another to form a package of the general configuration indicated in Figure 4 by the reference character 24.

The carriage 21 is reciprocated by means of a cam 25 driven by the motor 18 and having a continuous cam groove 26 in the periphery thereof. The cam groove 26 is engaged by a follower 27 mounted on the carriage 21 so that rotation of the cam affects a movement of the carriage and the primary traversing mechanism 16 in opposite directions along the spool 12 throughout a distance depending upon the throw of the cam 25. As shown in Figure 3 the follower 27 is mounted on the lower end of a vertical shaft 28 which is journaled in the carriage 21 for rotation about an axis lying in a common plane with the axis of rotation of the cam 25 and offset laterally with respect to the cam follower 27. Thus it will be noted that the cam follower 27 is eccentrically mounted with respect to the cam 25 and rotation of the cam follower 27 about the axis of the shaft 28 in effect progressively varies the end points or limits of the throw of the cam 25.

The vertical shaft 28 is rotated with a step by step motion in timed relation to reciprocation of the carriage 21 by means of a ratchet 30. The ratchet 30 comprises a ratchet wheel 31 secured to the upper end of the shaft 28 for movement as a unit with the carriage and is operated by a pawl 32 pivotally supported on a fixed plate 33 (Figure 7). As shown in Figures 5 and 6, the free end of the pawl 32 is held in contact with the teeth 34 on the periphery of the ratchet wheel 31 by means of a spring 35. The arrangement is such that each time the carriage 21 is moved in the direction indicated by the arrow 36 in Figure 5, the ratchet wheel 31 is indexed by the pawl about the axis of the shaft 28. Rotation of the ratchet wheel 31 affects a corresponding rotation of the eccentric follower 27 and slightly increases or decreases the extent of movement of the carriage 21 or primary traversing mechanism 16 in the direction of the arrow 36, depending on whether the follower 27 is on the right or left of the shaft 28. As the carriage 21 moves in the opposite direction the pawl 32 merely rides over the teeth 34 and rotation of the ratchet is prevented by a detent 37. The detent 37 is pivoted on the carriage and the free end thereof is normally urged into engagement with the teeth 34 by means of a spring 38.

It follows from the above that as the secondary traversing mechanism 20 moves the primary traversing mechanism back and forth along the spool 12, it also rotates the eccentrically mounted cam follower 27 with a step by step movement to vary the position of the paths of successive traversing movements of the traversing mechanism 20 until one complete revolution of the follower 27 about the axis of the shaft 28 is obtained. This action eliminates any possibility of synchronous movements between the secondary traversing mechanism and the operation of the cams 19, and produces a package having the general configuration indicated in Figure 4 of the drawings by the reference character 39. It will be noted from this figure that the ends of the package taper gradually to the supporting surface of the tube 12 and form in effect a feather edge. As a result, considerably more material may be wound on the tube 12 without the danger of the material slipping off the ends of the package and causing loose wrappings which seriously interfere with unwinding the strand from the package. It will further be noted by comparing the two contours shown in Figure 4 of the drawings that the package resulting from the traversing mechanism forming the subject matter of this invention is much more uniform and this is also conducive to facilitating unwinding the strand from the package.

While in describing this invention particular stress has been placed on one specific type of primary traversing mechanism, nevertheless it will be apparent that any accepted type of traversing mechanism may be used in connection with the secondary traversing mechanism. In fact the primary traversing mechanism may be eliminated entirely, if desired, and, accordingly, such changes may be resorted to as may come within the purview of the accompanying claims.

I claim:

1. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, a member supported for reciprocation in the general direction of the axis of the spool and having means engageable with the strand for moving the latter back and forth along the spool independently of said reciprocating movement, and means for modifying movement of said member to reverse the direction of travel of the latter at different points along the spool.

2. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, a member supported for reciprocation in the general direction of the axis of the spool and having means engageable with the strand for moving the latter back and forth along the spool independently of said reciprocating movement, and means responsive to movement of the member in one direction to vary the location of the paths of successive traversing movements of the member relative to the spool and thereby provide the package with opposite ends which taper gradually to the periphery of the spool.

3. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, a pair of individual complementary cam members alternately engageable with the strand to move it back and forth along the spool, means for reciprocating the cam members relative to the spool in the general direction of the axis of the latter, and means for varying the location of the paths of successive movements of the reciprocating means relative to the spool to taper the opposite ends of the package to the periphery of the spool.

4. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, rotatable primary traversing means for moving the strand back and forth along the spool, and means for reciprocating the traversing means in the general direction of the axis of the spool including a cam and an eccentric follower cooperating with the cam to vary the location of the paths of successive movements of the traversing means relative to the spool.

5. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, a pair of complementary cam members alternately engageable with the strand to move it back and forth along the spool, means for reciprocating the cam members relative to the spool in the general direction of the axis of the latter including a rotatable cam and an eccentric follower engageable with the cam, and means operable in timed relation to the reciprocable movement of the traversing cam members to rotate the eccentric relative to the cam with a step by step motion in a direction to vary the location of the paths of successive movements of the traversing cam members relative to the spool.

6. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, rotatable primary traversing means for moving the strand back and forth along the spool, means for reciprocating the primary traversing means in the general direction of the axis of the spool including a cam, and means operable in timed relation to reciprocation of the primary traversing means for increasing the effective throw of the cam to vary the location of the paths of successive movements of the traversing means relative to the spool and thereby provide the package with gradually tapered opposite end portions.

7. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, primary traversing means for moving the strand back and forth along the spool, means for reciprocating the primary traversing means in the general direction of the axis of the spool, and means operated by the traversing means upon movement of the latter in one direction relative to the spool to vary the location of the paths of successive movements of the primary traversing means relative to the spool and thereby provide the package with tapered opposite end portions.

8. Apparatus for packaging material in strand form including means for supplying a strand, a rotatable spool adapted for winding the strand into package form, traversing means for moving the strand back and forth along the spool, means for reciprocating the traversing means in the general direction of the axis of the spool including a cam having an annular groove, a follower engageable in the cam groove and eccentrically mounted with respect to the cam, and means operated by the traversing means as the latter moves in one direction relative to the spool to rotate the eccentric with a step by step motion to vary the location of the paths of successive movements of the traversing means relative to the spool.

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