United States Patent

[11] 3,598,338

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[45] Patented **Aug. 10, 1971**
[73] Assignee **The United States of America as represented by the Secretary of the Army**

[54] **FILAMENT LAYER ALIGNING DEVICE**
1 Claim, 5 Drawing Figs.

[52] **U.S. Cl.** **242/158,** 242/47, 242/54, 242/157, 242/18
[51] **Int. Cl.** **B65h 75/00,** B65h 57/00
[50] **Field of Search** ..... 242/158, 158.1, 158.2, 158.3, 158.4, 157, 54, 18 G, 18, 47, 7.14, 7.15, 7.21, 7.22

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Primary Examiner—Stanley N. Gilreath
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ABSTRACT: This invention relates to a technique and device for accurately aligning filaments of varying size that are wound on a drum and is particularly useful in winding glass filaments for optical use. As the filamentary material is wound on a rotating steel drum, it is held in place next to the preceding winding by means of a magnetically coupled rider whose contacting surfaces are made of materials having low sliding friction. The rider is prevented from rotating with the drum by means of a rod positioned axially with respect to the rotating steel drum. The force with which the rider presses against the preceding winding or layer may be controlled by an electromagnet in the rider or by varying the alignment of the rod with respect to the axis of the steel drum.

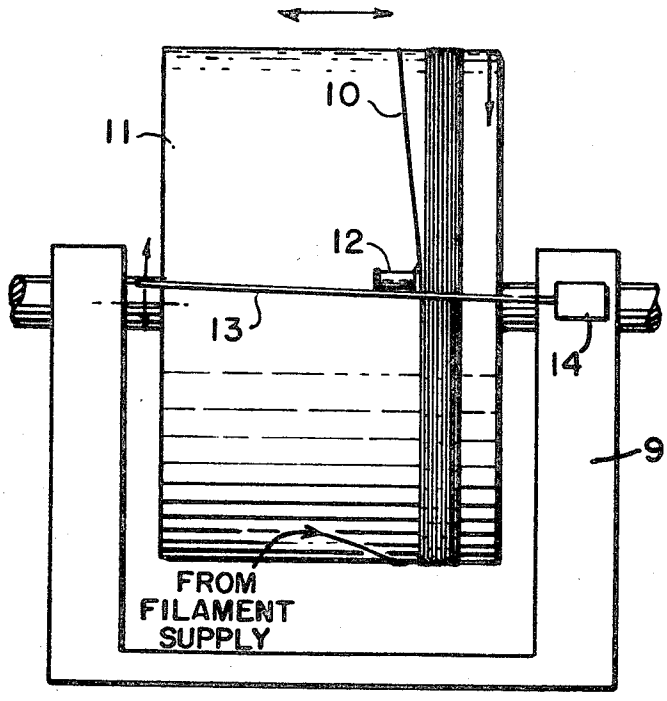


FIG. 1

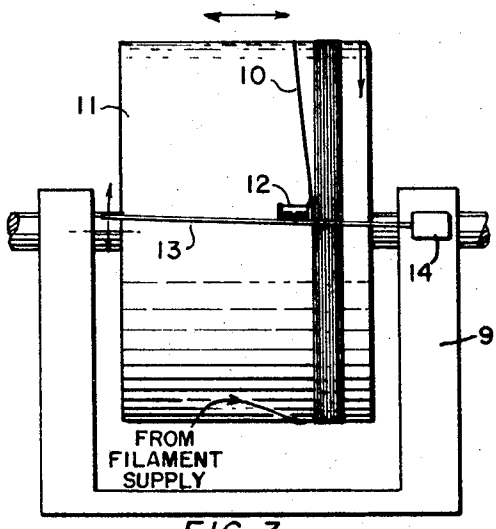


FIG. 2

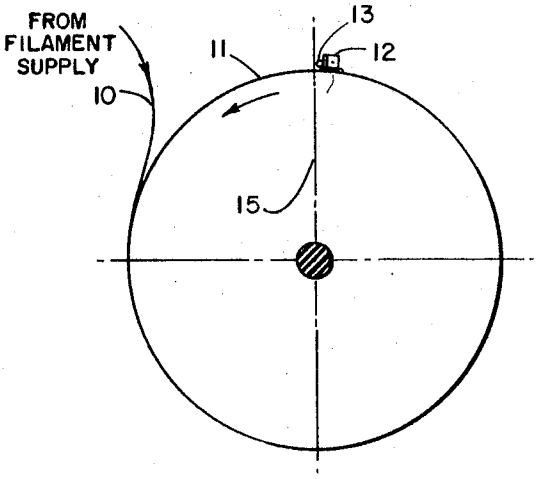


FIG. 3

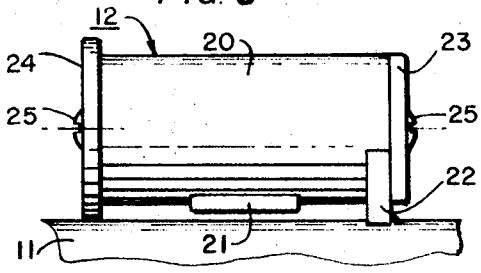


FIG. 4

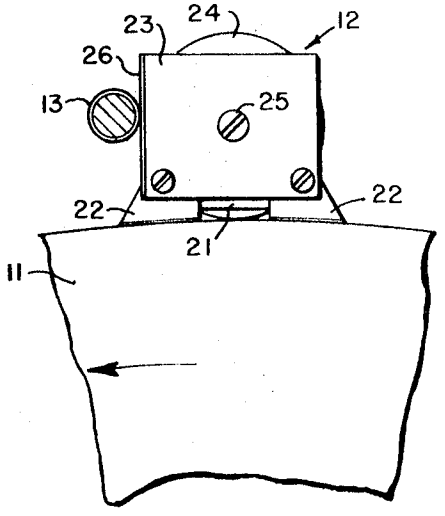
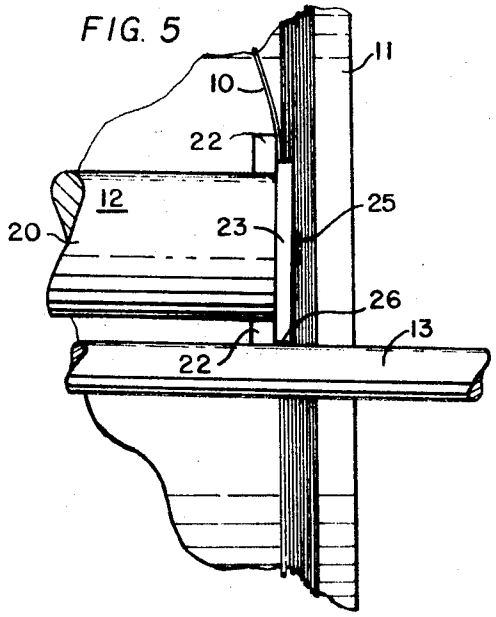


FIG. 5



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FILAMENT LAYER ALIGNING DEVICE

BACKGROUND OF THE INVENTION

Various types of devices have been designed to remotely transmit photographs, maps, or other graphic material and such devices are commonly known aforenoted facsimile systems. Broadly, these systems are composed of scanners, transmitters, receivers and printers. In the scanning section of one type of facsimile system, certain optical fibers sequentially illuminate and scan the material to be remotely transmitted. The optical fibers used therein may be fabricated by pulling a glass rod and tube through a vertical furnace and wound onto a drum where the fibers may be bound together and cut for subsequent use in layers or bundles in the aforenoted scanning section. It is to the winding operation of the fiber optic filaments that the instant invention relates. More particularly, the invention of the instant disclosure relates to a method and apparatus for accurately aligning filaments that are wound on a drum.

In the past, numerous devices have been designed to wind filamentary material onto a drum or other surface. Such devices include various shaped drums, numerous sizes and shapes of guides, tiltable drums, etc. Typical of such prior art devices is the apparatus shown in U.S. Pat. No. 3,273,812, for forming and winding glass strands. It is noted that none of such prior art devices perform the desired function of the instant invention with the simplicity of construction and ease of operation of the device herein disclosed.

SUMMARY OF THE INVENTION

The instant invention concerns itself with an improved method and apparatus for accurately aligning glass filaments as they are wound on a drum. This particular method and apparatus is especially effective in winding glass filaments for optical use where delicate tensions control is required and where the filamentary material may vary in diameter throughout its length.

As glass filamentary material comes from a vertical furnace it is wound onto a steel drum. The steel drum rotates about its longitudinal axis thereby accepting the filamentary material. To insure that the filamentary material is wound onto the drum so that each winding of filamentary material contacts the preceding winding, a magnetic rider arrangement is provided. To prevent the rider from rotating with the steel drum a retainer rod is employed. The rod may be vibrated at a low amplitude high frequency rate, to insure that the rider slides along the drum as the drum fills with filamentary material. The incoming feed of filamentary material is kept slightly ahead of the rotating drum by moving the drum on a carriage transversally with respect to said feed thereby insuring that the wound material does not overlap or overlay. The single layer of wound material is then bound by suitable adhesive, removed from the drum, and further processed for use in the scanning section of a facsimile system.

In an ideal apparatus for winding glass filamentary material, it is desirable to keep material feed constant thereby allowing drum rotation to be kept at a constant rate and consequently simplifying construction of the device. In practice, however, various factors complicate the design of such in ideal system. Among others, varying line power supply and furnace temperatures cause the feed to be at an uneven rate or cause the drum to rotate at varying rates. The device of the instant invention can be either manually or automatically adjusted for filamentary material of various diameters or feed rate by changing the rate of transverse movement of the drum relative to the feed.

BRIEF DESCRIPTION OF THE DRAWING

The exact nature of this invention will be readily apparent from consideration of the following specification relating to the annexed drawings in which:

FIG. 1 is a top view of the preferred embodiment of the instant invention.

FIG. 2 is a side view of the preferred embodiment of the instant invention.

FIG. 3 is a side view of the rider assembly.

FIG. 4 is an end view of the rider assembly.

FIG. 5 is an enlarged view of rider shown guiding the filamentary material over the drum.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a filamentary material 10 being wound on steel drum 11 that is rotated in a desired direction. Drum 11 may be rotated at any suitable speed depending, generally, on the centrifugal forces generated; however, the drum 11 has been rotated at approximately 100 r.p.m. in the preferred embodiment. The size of filamentary material employed in the device actually constructed was approximately 3 mils. Using an 18-inch diameter drum, filamentary windings approximately 9 inches wide may be wound in approximately 2 minutes. Although any suitable width drum may be employed, the width of the drum in the device actually constructed was approximately 12 inches. Rider 12 is shown in position for maintaining the wound filaments in contact with one another. Rod 13 prevents rider 12 from rotating with the steel drum 11 and is shown as being vibrated by a low amplitude high frequency vibrator 12 so as to eliminate a tendency of the rider to 'stick' to the rod at comparatively slow relative movement between the rider 12 and and 13 during the winding of filaments of relatively small diameter. The surface of rod 13 should be as smooth as practical in order to further reduce this tendency to 'stick.' Drum 11 is positioned on a carriage 9, shown in FIG. 1, and may be moved by any suitable means to the right or left as shown in FIG. 1 so as to compensate for varying rates of filament feed or varying diameters of the filament to be wound as heretofore mentioned. Vibrator 14, to which rod 13 is attached, is mounted on the same carriage (not shown) that moves the drum laterally as shown in FIG. 1.

Referring now to FIG. 2, there is seen a side view of the instant invention wherein the method of mounting the magnetically loaded rider 12 on the steel drum 11 is more easily seen. The magnetic coupling between the steel drum 11 and rider 12 may be controlled as hereafter explained. Although the placement of the rider 12 is shown as somewhat offset from the vertical line 15 of the steel drum 11, the placement of the rider 12 does not require precision positioning; however, the rider should be placed near the vertical line 15, otherwise, there would be a tendency of the rider 12 to all from the drum 11. Of course, this tendency may be overcome by use of a stronger permanent magnet or an electromagnet.

FIG. 3 shows rider 12 with body 20. Body 20 may be composed of any suitable material generally selected with reference to the weight desired. For thin filaments a magnesium body may be constructed while a heavier body of aluminum might be preferred for larger filaments, say, in excess of 3 mils. Magnet 21 is a permanent magnet, however, an electromagnet may be employed to control the magnetic coupling between the rider 12 and the steel drum 11. End pieces 23 and 24 are attached to body 20 by any suitable means although conventional fasteners 25 are shown. Filament guides 22 are attached to front end piece 23 by any suitable means. Guides 22 and rear end piece 24 are fabricated with nylon contacting or bearing surfaces so as to reduce sliding friction between the rider 12 and drum 11.

FIG. 4 is provided so as to more clearly show the rider 12 in its relation to the drum 11 and the rod 13. It is here seen that rear end piece 24 rests at one point on the drum 11 and that the front end piece 23 has a nylon bearing surface 26 so as to reduce sliding friction between the rod 13 and rider 12. It is clear that other bearing surfaces such as Teflon may be employed with equally good results. Likewise, filament guide 22

may be constructed of a magnetic material thereby replacing magnet **21**. In this later alternative method of construction, the tips of guides **22** should be coated with an antifriction surface.

Referring now to FIG. **5**, there is seen an enlarged top view of the rider **12** as it presses against filaments **10** thereby maintaining each winding juxtaposed the preceding winding. The relation between bearing surface **26** and rod **13** is more clearly seen here.

It is seen from the above disclosure that the Filament Layer Aligning Device is of simple construction and yet highly suitable and effective for its intended purpose of winding filamentary material.

It should be understood, of course, that the foregoing disclosure relates only to preferred embodiments of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and the scope of the invention as set forth in the appended claims.

What I claim is:

1. A device for winding filamentary material comprising:

steel drum means rotating about the longitudinal axis thereof;

a magnetic rider means for accurately guiding and aligning said filamentary material as said material is being wound on said drum, said rider means maintaining each turn of the wound filament in close contact with the immediately preceding turn of filament;

retaining rod means positioned axially with respect to the rotating steel drum for preventing said rider means from rotating with and falling off said drum, said rod means having a very smooth surface and being vibrated at a low amplitude, high frequency so as to eliminate the the tendency of the rider to stick to said rod;

said drum means adjustably mounted on a carriage for transverse movement with respect to the feed of the filamentary material;

said retaining rod means connected to the dame carriage as said drum means;

said magnetic rider means consisting essentially of filament guides fabricated from a low friction material attached to a supporting body having magnetic means integral therewith for producing a strong magnetic coupling between the rider and steel drum, whereby said rider firmly abuts against the outermost side of the filament being wound on the drum and moves along the restraining rod only in r response the force placed on the side of the rider by the buildup of successively wound turns of filamentary material.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,598,338 Dated August 10, 1971

Inventor(s) ANATOLI BRUSHENKO

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

claim 1, column 4, line 12, "dame" should read -- same --;

line 21 should read -- rod only in response to the force placed on the side of the --.

Signed and sealed this 28th day of November 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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