United States Patent [19]

Hamel

[11] **3,807,159**

[45] **Apr. 30, 1974**

[54] **APPARATUS FOR SPINNING A FILAMENT**

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[22] Filed: **May 19, 1972**

[21] Appl. No.: **255,147**

[30] **Foreign Application Priority Data**

May 26, 1971 Germany 2126196

[52] **U.S. Cl.** **57/62,** 57/35, 57/106, 242/128, 242/147

[51] **Int. Cl.** **D01h 7/02,** D01h 13/10, D01h 13/30

[58] **Field of Search** 57/59, 60, 62, 106, 32, 57/35; 242/128

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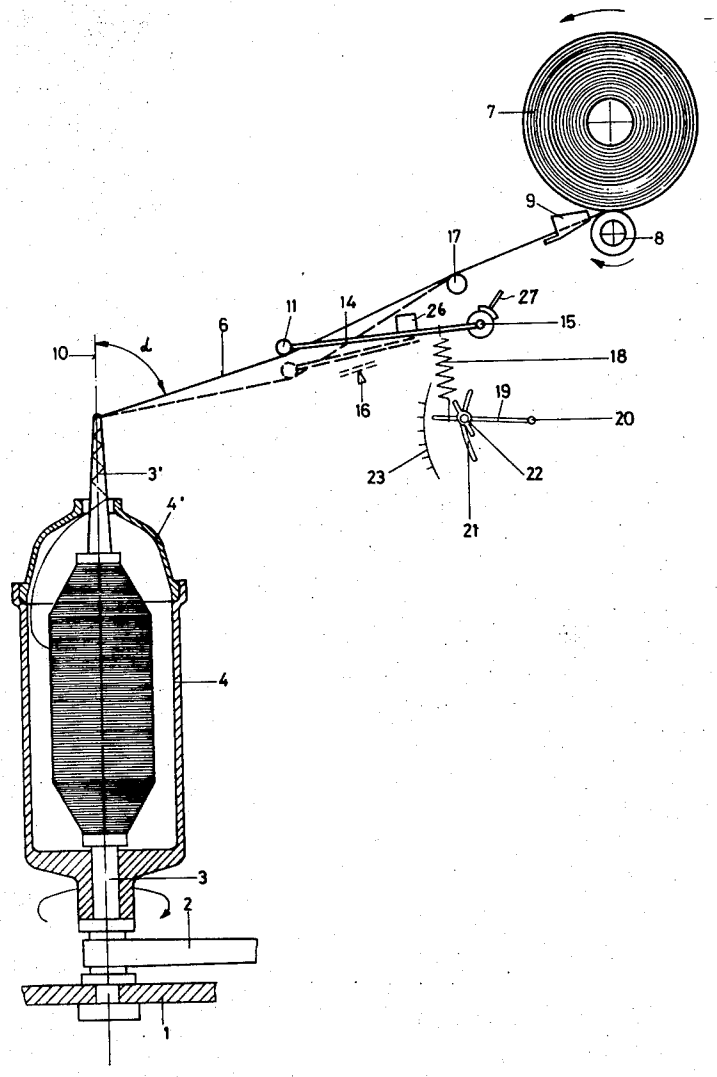
[57] **ABSTRACT**

An apparatus for spinning a filament includes a vertical spindle carrying a bobbin of filament to be spun and having a balloon-limiting bell surrounding the bobbin and formed with an upwardly open mouth. The spindle carries at its upper end an upwardly tapered guide pin which projects through the bell mouth and around which the filament is wound several times. The filament is pulled tangentially off this guide pin at an acute angle to the spindle axis as the bell, spindle, and guide pin are rotated about this axis. A tensioning rod may be provided between the pin and the driven takeup spool. This rod is displaceable and may be resiliently biased parallel to the spindle axis. No other filament guide is provided on the bell.

10 Claims, 5 Drawing Figures



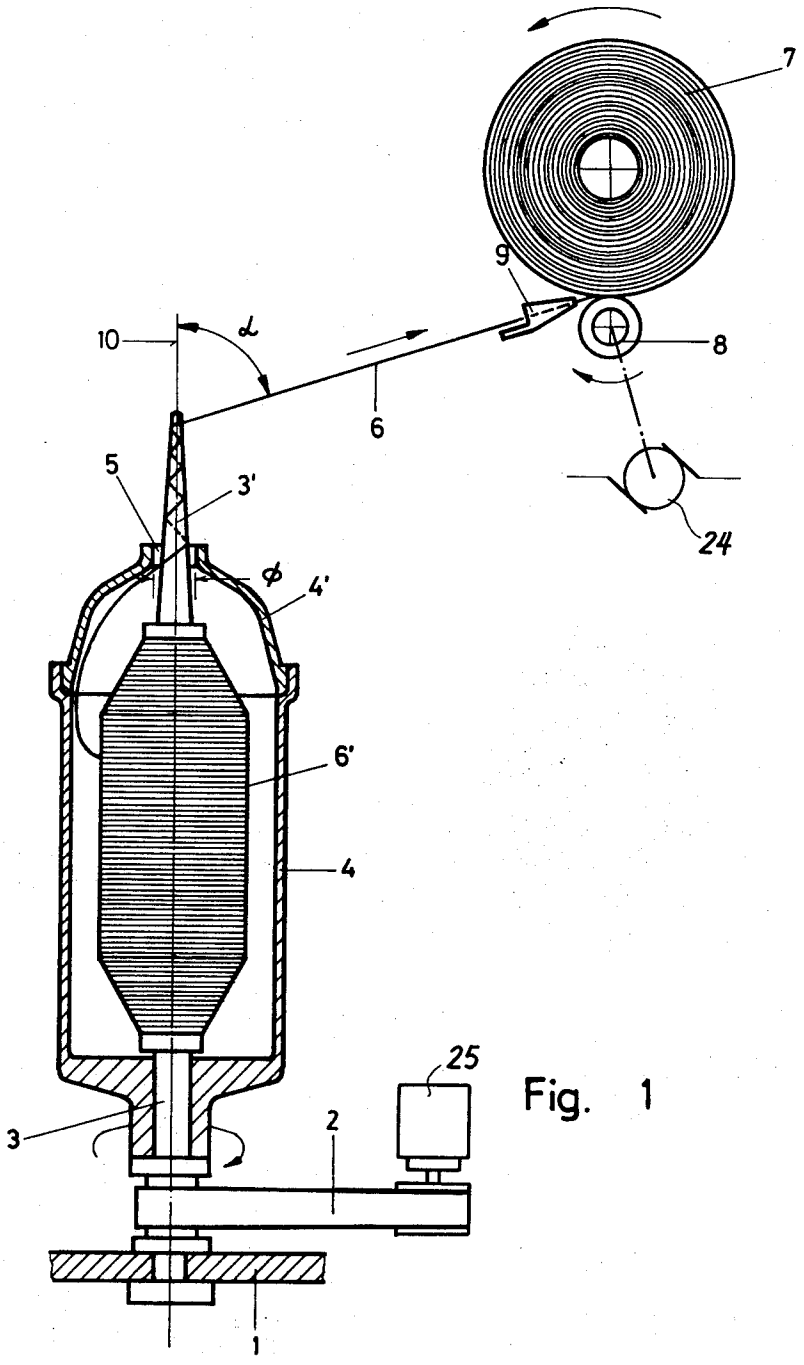


Fig. 1

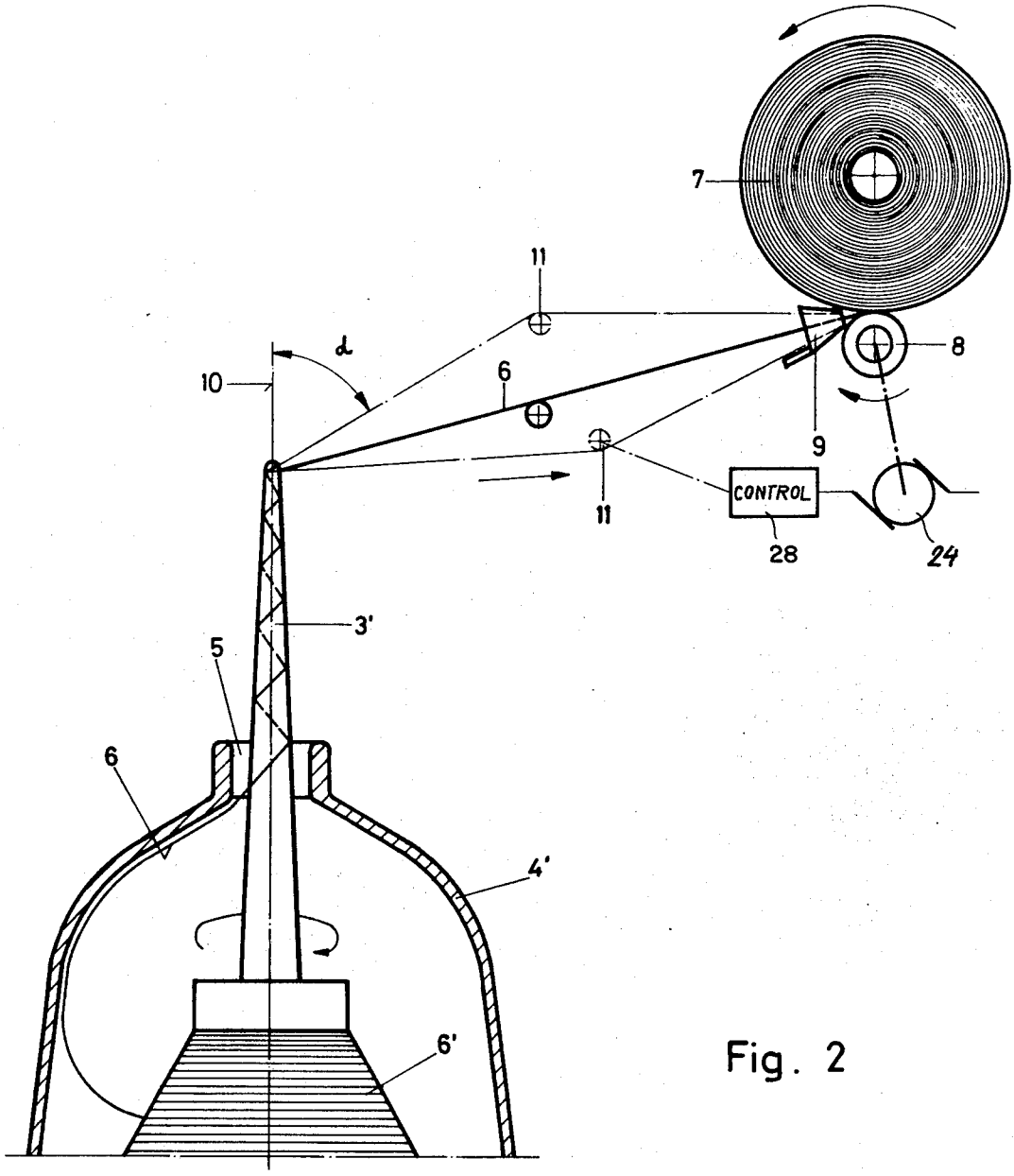


Fig. 2

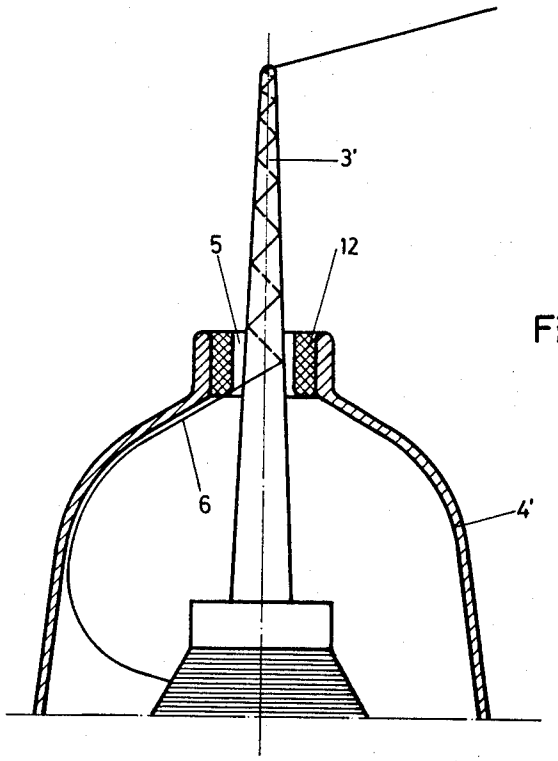


Fig. 3

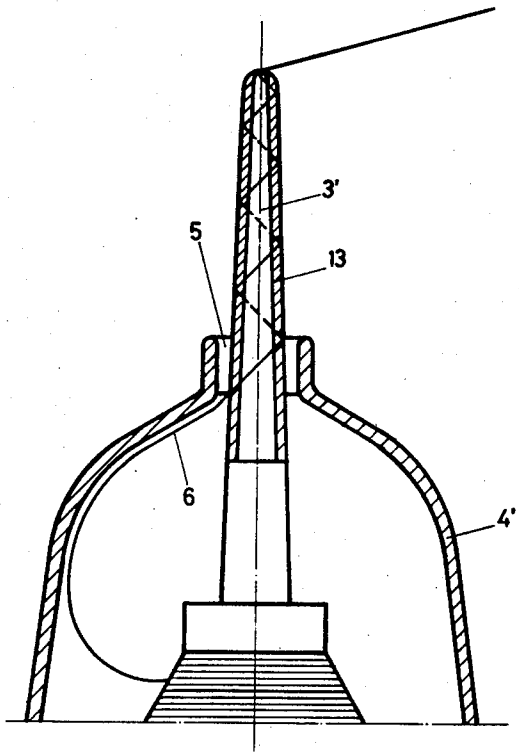


Fig. 4

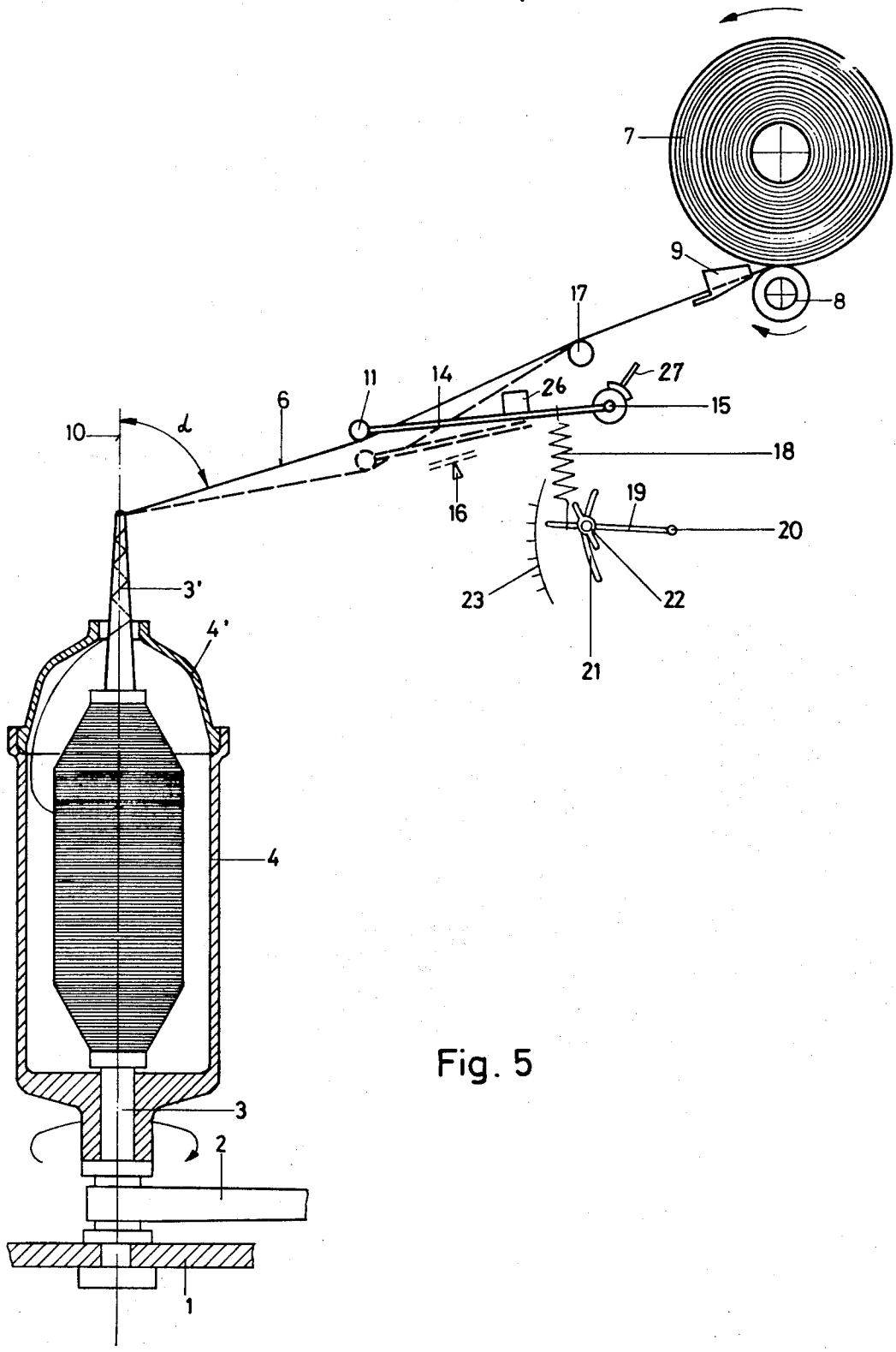


Fig. 5

APPARATUS FOR SPINNING A FILAMENT

FIELD OF THE INVENTION

The present invention relates to an apparatus for spinning a filament. More particularly this invention concerns such an apparatus for imparting twist to single or multi-ply yarns or threads.

BACKGROUND OF THE INVENTION

Twist is imparted to the filament by pulling it from a spool or bobbin in an axial direction relative to the core of the spool or bobbin. At the same time this filament supply may be rotated about its axis to increase the amount of twist imparted to it.

The filament is drawn off the supply in a filament balloon which is either limited by a bell or defined by a traveller ring. In both cases a thread brake must be employed at some point to prevent the thread from paying off the supply too rapidly. An eye or a hook which is not rotatable is generally provided above the yarn package to guide the thread.

In all such installations a considerable amount of setup time is required to load the spools of yarn into the twisters and thread the yarn along its path to the takeup spool. The inevitable thread brake complicates this problem even further.

OBJECTS OF THE INVENTION

It is therefore an object of the present invention to provide an improved filament-twisting apparatus.

Another object is the provision of a filament spinning apparatus which is of simple construction and which is easy to use, having little tendency to break down, simple loading procedures, convenient adjustability and, in several, freedom from the aforedescribed disadvantages.

SUMMARY OF THE INVENTION

These objects are attained according to the present invention in an apparatus having a rotatable upright spindle on which the filament supply is carried and which is provided at one end with a guide pin tapered axially away from the filament supply. The filament is pulled tangentially away from the pin on which it is wound with several turns and the spindle and guide pin are rotated to spin or twist the filament. A bell having an axially open mouth is provided around the yarn supply and is rotationally fixed on the spindle for limiting any balloon forming between the periphery of the yarn supply and the pin.

According to another feature of this invention this pin extends completely through the mouth in the bell and means is provided for adjusting the angle defined between the thread and the spindle and guide -pin axis, which angle (pitch angle) is always acute. The angle at which the filament or thread is pulled off the guide pin determines the pitch of the turns of filament wound around this pin, which thereby determines the tension in the thread.

The bell or the guide pin may be coated with wax to coat the filament automatically as it is drawn off the filament supply according to another feature of this invention. In prior-art devices a separate device was generally required to wax the thread.

DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages will become apparent from the following description, reference being made to the accompanying drawings in which:

FIG. 1 is a vertical sectional view, partly in diagrammatic form, showing an embodiment of the present invention;

FIG. 2 is a view similar to a detail of FIG. 1 showing a takeoff-angle or pitch-angle adjuster usable with the FIG. 1 apparatus;

FIG. 3 and 4 are views similar to a detail of FIG. 1 showing two further alternative embodiments of the present invention; and

FIG. 5 is another view similar to FIG. 1 showing yet another embodiment of the present invention.

SPECIFIC DESCRIPTION

As seen in FIG. 1, journaled on a housing 1 is a vertical spindle 3 which is rotated by means of a belt 2 connected to a motor 25 which rotates it about its axis 10. The spindle 3 carries a bobbin 6' of yarn 6 and is rotationally coupled to a removable vapor bell 4 having a cover 4' formed with a mouth 5. The upper end of the spindle 3 is formed as an upwardly conically and uniformly tapered guide pin 3' with a rounded apex and having sides tapered at about 4° to axis 10(half angle of about 4°±3°). The mouth of the bell is cylindrical with internal diameter of ϕ and a length of 0.5ϕ to about 1.5ϕ, the diameter of the pin within the bell being from 0.25ϕ to 0.8ϕ. The pin may extend 2ϕ to 5ϕ below the mouth and 2ϕ to 5ϕ thereabove.

The yarn 6 is pulled off the pin 3' by means of a takeup spool 7 (yarn package) driven by a roller 8 attached to a motor 24. A reciprocating guide eye 9 is displaceable parallel to the axis of the spool 7 (here orthogonal to the to the of the paper) to lay (distribute) the thread 6 uniformly on the spool 7.

The yarn or thread 6 is pulled from the pin 3' at an angle α of about 72° (pitch angle) to the axis 10. This angle determines how many times the thread 6 will wind around the pin 3'. Since with an increasing number of turns so wound the friction between yarn and pin 3' will increase, and vice versa, a thread brake is thereby formed by this element. FIG. 2 shows how a horizontal rod 11 can be provided between the tip of pin 3' and the roller 8 in order to vary this angle from about 60° up to almost 90°. It should be clear that the takeoff angle α largely determines the braking effect. The rod 11 is connected through a control 28 to motor 24 to drop into the lower dot-dash position of FIG. 2 on stopping of the machine to ensure uniform twisting in the yarn 6.

FIG. 3 illustrates a method of waxing the yarn 6 by means of a paraffin or wax ring 12 provided inside the mouth 5 of the bell cover 4'. As seen in FIG. 4 it is also possible to provide a wax coating 13 on the pin 3' for this same purpose. Since the thread 6 always rides around inside the bell 4 and slides over the surface of the pin 3' a good waxing is obtained along with an even wear of the wax ring 12 or sleeve 13.

Finally FIG. 5 shows an arrangement for tensioning the thread 6 between the pin 3 and roller 8 which operates on the principle of a belt tightener. A horizontal stationary rod 15 is provided immediately adjacent the guide 9, and the rod 11 is provided mounted on two

arms **14** (only one visible in FIG. **5**) which are pivoted about a horizontal axis **15**. Weights **26** are removably attached to these arms **14** and a brake **27** is applied against the hub at axis **15** to restrict oscillations of this rod **11**.

A tension spring **18** has one end attached to one of the arms **14** and its other end attached to an arm **19** pivoted about a horizontal axis **20**. The end of the arm **19** approaches a scale **23** and a tightenable screw **22** is engaged in the arm **19** and fits into a fixed slot **21** to lock the arm **19** in any angular position. An abutment **16** is provided for the arms **14** which defines for these arms a maximum angle α of 90°.

The tension in filament **6** is adjusted by varying the angular position of the arm **19** and by providing more or fewer weights **26** on the arms **14**. A greater amount of tension is produced by increasing the number of weights **26** and by locking the arm **19** in a more counterclockwise position.

The devices described above are extremely simple to operate. The all-important tension in the thread being spun is easily and constantly maintained at an exact level by a virtually foolproof mechanism. When a bobbin is to be changed there is no complicated threading operation, since one need merely pass the end out through the mouth **5**, between the rods **11** and **17** if they are provided, through the guide **9**, and around the spool **7**. Thereafter once the synchronized drive motors **24** and **25** are started up the thread **6** will automatically wind itself a predetermined number of times around the guide pin **3'** and will thereafter be twisted with complete uniformity.

I claim:

1. An apparatus for twisting a filament comprising:

a rotatable spindle having a longitudinal axis and adapted to receive a supply of filament;

a filament-guide pin tapered axially away from said supply and provided on said spindle coaxial therewith, said filament passing along at least one turn around said guide pin;

means offset from said axis for directly and tangetially drawing said filament away from said supply along said pin proximal to the apex thereof;

a thread-balloon-limiting bell rotatable with said spindle and surrounding said supply, said bell being formed with an axially open mouth, said filament passing through said mouth, said means being spaced from and unconnected to said bell; and

means for rotating said spindle, said guide pin, and said bell, said means for darwing said filament from said supply including guide means for guiding said filament from said pin at an acute angle to said axis, said guide means including means for selectively increasing and decreasing said angle.

2. The apparatus defined in claim **1** wherein said means for increasing and decreasing said angle includes an element pivotal about a horizontal axis and spring means for resiliently urging said element downwardly against said filament, said filament tensioned by said element.

3. The apparatus defined in claim **1** wherein said means for increasing and decreasing said angle includes a vertically displaceable horizontal rod, said filament passing over said rod.

4. The apparatus defined in claim **1**, further comprising a wax ring inside the mouth of said bell and contacted by the filament passing onto said pin.

5. The apparatus defined in claim **1** wherein said guide pin is provided with a wax covering contacted by the filament passing therearound.

6. An apparatus for twisting a filament comprising:

a rotatable spindle having a longitudinal axis and adapted to receive a supply of filament;

a filament-guide pin tapered axially away from said supply and provided on said spindle coaxial therewith, said filament passing along at least one turn around said guide pin;

means offset from said axis for directly and tangentially drawing said filament away from said supply along said pin proximal to the apex thereof;

a thread-balloon-limiting bell rotatable with said spindle and surrounding said supply, said bell being formed with an axially open mouth, said filament passing through said mouth, said means being spaced from and unconnected to said bell; and

means for rotating said spindle, said guide pin, and said bell, said spindle being upright, said mouth being upwardly open and said means for directly drawing said filament away from said guide pin including a yarn package laterally offset from said pin and disposed at a location higher than the top of said pin, a guide mechanism for leading said filament between said pin and said yarn package generally in a plane inclined at an acute angle to said axis downwardly from said package to said pin and for distributing the filament across said package, and tension-control means between said guide mechanism and said package for controlling said angle.

7. The apparatus defined in claim **6** wherein said mouth closely surrounds said pin with clearance, said pin commencing below said mouth and extending therethrough to terminate above said mouth, said bell being free from any element engaging said filament above said mouth and having a cylindrical configuration with a removable cap forming said mouth, said apparatus further comprising a body of wax disposed in the region of said mouth and engaged by said filament.

8. The apparatus defined in claim **6**, further comprising a wax ring inside the mouth of said bell and contacted by the filament passing onto said pin.

9. The apparatus defined in claim **6** wherein said guide pin is provided with a wax covering contacted by the filament passing therearound.

10. The apparatus defined in claim **6** wherein said means for drawing said filament from said supply includes guide means for guiding said filament from said pin at an acute angle to said axis.

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