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K. LANDOLT

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DOUBLE TWIST SPINDLE

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Fig. 1

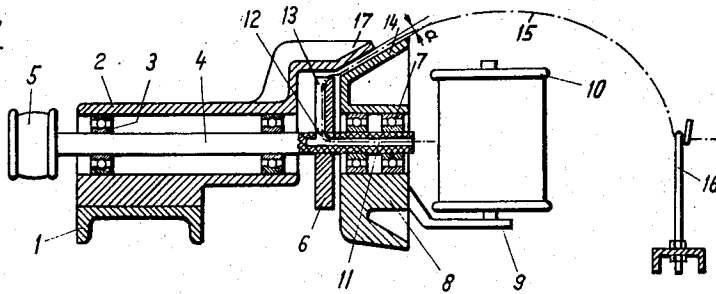


Fig. 2

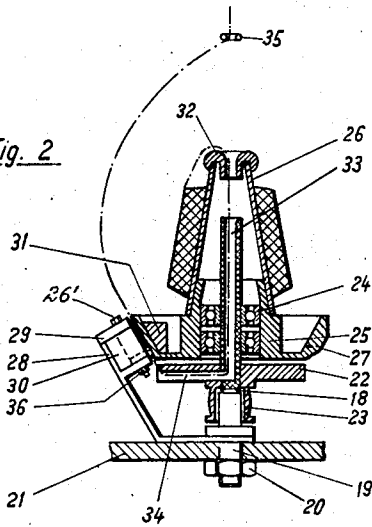


Fig. 3

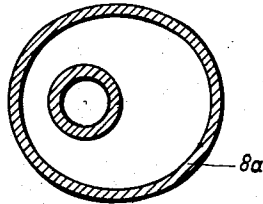


Fig. 4

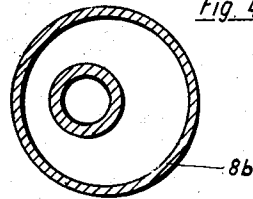


Fig. 2a

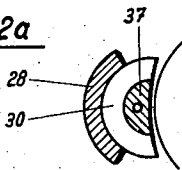


Fig. 6

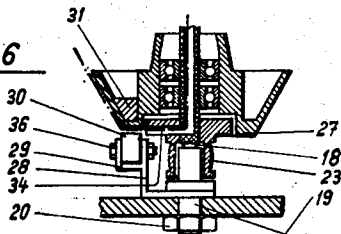
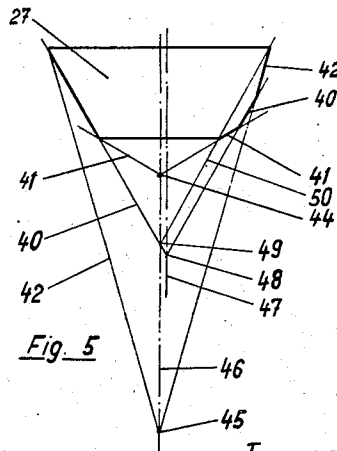


Fig. 5



Inventor
Karl Landolt
By Robert E. Burns
Attorney

UNITED STATES PATENT OFFICE

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DOUBLE TWIST SPINDLE

Karl Landolt, Zurich, Switzerland

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16 Claims. (Cl. 57—58.83)

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This invention relates to double twist spindles and is more particularly concerned with a double twist spindle of improved construction.

In the operation of conventional double twist spindles, the so-called stationary portion of the spindle, which is positioned within the twist balloon loop, is frequently caused to rotate, which is undesirable in normal operation. Once the stationary portion begins to rotate it is gradually accelerated until it reaches substantially the speed of the spindle. Aside from the fact that the advantages of operation of the double twist spindle are thereby lost, there is serious danger that the rotating portion will be damaged since it normally cannot feasibly be constructed to withstand high speeds of rotation.

It is the principal object of the present invention to provide a double twist spindle in which means are provided for restraining the stationary portion from undesired rotation.

The means employed in accordance with the invention are suitable for all types of double twist spindles, whether the winder which is positioned within the spindle is arranged to wind or unwind single or multiply thread, and regardless of the form of the means which I employ for holding the stationary portion of the spindle in its position of rest, e. g. holding means operable by magnets, by gravity, by eccentricity or by special gear means.

In accordance with the invention, double twist spindles are provided in which the inner stationary portions also serve as thread guide means, the thread touching the guiding peripheral surface along its entire periphery or only along part of its periphery. Furthermore, the guiding surface may be formed from one or more portions. The inner stationary portions in their normal position are separated from a stationary body disposed exteriorly of the spindle and separated from the inner parts by sufficient space to permit the twist balloon to swing free through it. The construction is such that it does not matter that the twist balloon may touch parts defining the sides of this space when passing through it. The characteristic feature of the invention is that the inner stationary portions are formed with parts on their outer surface which project across the space between the stationary parts and the above-mentioned stationary body and engage the exteriorly-positioned stationary body when the inner stationary portions tend to rotate.

By reason of the special construction of the guiding surface defined by the inner stationary portion, in accordance with the invention, the

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so-called balloon tends to become distorted. It has been found, however, that this distortion of the balloon has no adverse effect upon the twisting process.

5 Illustrative embodiments of the invention are shown in the accompanying drawing wherein

Fig. 1 is a cross-sectional view, partly in elevation, of a double twist spindle embodying features of the invention;

10 Fig. 2 is a sectional view, partly in section, showing another embodiment of the invention;

Fig. 2a is a sectional view of a detail of construction;

15 Fig. 3 is a sectional view showing a modified form of the stationary body guiding surface;

Fig. 4 is a similar view of a further modification of the guiding surface;

20 Fig. 5 is a diagrammatic view showing the geometrical construction of the stationary body guiding surface in accordance with the invention; and

Fig. 6 is a sectional view, showing a further slight modification of the invention.

Referring to the drawings, and particularly to Fig. 1, there is shown a horizontally-disposed double twist spindle, the inner stationary unit of which is maintained at rest in accordance with the invention by the action of gravity. In Fig. 1 the reference numeral 1 designates a supporting beam. On the beam 1 is fixedly mounted a casing 2 carrying ball bearings 3 in which is supported a horizontal shaft 4. Shaft 4 carries at its outer end the driving pulley 5, and a disc 6 is mounted on it adjacent its inner end. Inwardly of the disc 6, the shaft 4 carries two axially-spaced ball bearings 7 on which the stationary inner unit 8 of the spindle is supported. The stationary unit 8 has a nose 9 which, by reason of its weight, normally keeps the stationary unit 8 at rest during rotation of the shaft 4. A bobbin 10 is rotatably supported on the nose 9. From bobbin 10 the thread runs through bores 11 and 12 in shaft 4 into a groove 13 formed in the disc 6, and then forms a twist balloon 15 over the guiding surface 14, the guiding surface 14 being defined by the peripheral surface of the stationary unit 8. The twist balloon 15 ends at the guide 16 from which the thread is led to the winding mechanism. As may be seen from the drawing, the guiding surface 14 as viewed from the center of the spindle cannot be truly circular since the portion disposed opposite the stop 17 which is supported, for example, by the casing 2, is much smaller than the remaining portion of the stationary unit 8.

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In accordance with the invention it is immaterial what cross-sectional form is given the guiding surface, it being only necessary that the stationary unit be sufficiently large at some point along its periphery that it cannot rotate past the stop 17, and that at the same time when the guiding surface is in its normal position, an air-gap or space *a* is provided between the surface of the stationary unit and the stop 17. This gap *a* is sufficiently wide for the twist balloon to pass through it. Without departing from the scope of the invention, the disc 6 could be smaller than shown in Fig. 1 and could be recessed in the stationary part (see Fig. 6). In this case, the stop 17 could be arranged opposite the front portion of the stationary unit 8 and the front portion of the unit 8 could be formed to project sufficiently that it would engage the stop if the unit 8 should tend to rotate. Advantageously, the stationary unit 8 is given as simple a form as possible in order not to interfere with the free movement of the twist balloon. For example, the cross-section of the stationary unit 8a could advantageously be oval, as shown in Fig. 3. From the standpoint of economical manufacture, however, it is preferable for the stationary unit 8b to have a circular cross-section but to be mounted eccentrically with respect to the axis of the spindle, as shown in Fig. 4.

Fig. 2 shows the application of the principles of the invention to a vertically disposed double twist spindle having an inner stationary unit which is maintained at rest by means of magnets. The shaft 18 of the spindle is rotatably supported in the usual way in the casing 19, which is fixedly secured to the frame 21 by means of a nut 20. Above the casing 19 is disposed the disc 22, which is fixedly secured to the shaft 18 and has a lower portion in the form of a pulley 23. Above the disc 22 the shaft 18 carries two spaced apart ball bearings 24 on which the stationary part 25 is supported. The inner portion of the stationary unit 25 is constructed to function as a bobbin carrier for supporting the bobbin 26, while its outer portion defines a guiding surface 27. A magnet 30 is supported in the arm 28 and has a cover 29. Opposite the magnet 30, a soft iron armature 31 is positioned in the stationary unit 25.

From the bobbin 26 the thread runs over an inlet-defining bushing 32 into the bore 33 of the shaft 18 and then through the groove 34 in the disc 22 to the periphery of the disc 22. From this point the thread, which engages the guiding surface 27 of stationary unit 25 along a portion or all of its periphery, swings upwardly as a twist balloon and is led to the winding mechanism through the eye 35.

It is preferable to form the stationary unit in such manner that the air-gap or space between its exterior thread-guiding surface and the magnet 30 is at its maximum when the stationary unit is in its normal position and that the surface furthest from the axis is diametrically opposite the magnet. Since the thread normally slides over the guiding surface of the stationary part, it is preferable to provide the guiding surface with a circular form, i. e. to curve it in the direction of the disc 22 and in the direction of the free swinging balloon. It is thus of advantage for the cross-section of the stationary unit to be concentrically circular at some points. Advantageously, the peripheral surface of the stationary unit is a surface of revolution which is eccentric

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with respect to the axis of the spindle but has its axis parallel to the axis of the spindle.

In Fig. 2 it is seen that the eccentric and concentric surfaces of revolution are preferably conical surfaces. It is, however, also possible for the transition surface between the concentric and the eccentric surfaces of revolution to be defined by a surface of revolution of gradually decreasing eccentricity.

Fig. 5 is a diagrammatic illustration of the generic construction of the outer surface of the stationary unit 27, shown in Fig. 2. From Fig. 5 it may be seen that this surface actually consists of a conical surface 40, having an apex 48, which surface with its axis 47 lies eccentrically with respect to the axis 46 of the spindle, this conical surface being bisected below and above by two central conical surfaces 41 and 42 respectively having apices 44 and 45, respectively, which lie higher for the lower part 41 of the conical surface and lower for the upper part 42. The conical surface 50, having an apex 49 and a central axis 46, shows the preliminary form of the stationary unit 27. Thus it is clearly seen how this preliminary central form is changed into the definite form as claimed, by the three conical surfaces 40, 41 and 42.

Fig. 2 shows the manner in which the magnet 30 is held in the magnet holder 28 by means of a screw 26' and a cover 29. Fig. 2a shows a section through the magnet holder and the magnet. From this it may be seen that it is preferable to construct the outer stop in the form of a magnet holder. It may also be seen that the stop of the magnet holder is positioned between the two poles of the horseshoe magnet. This has the advantage that the stop of the magnet holder is not as far away from the stationary unit as the magnet itself.

For constructional reasons it is particularly advantageous to form the stationary unit from a plastic or like material. When so formed, the stationary unit is light, and because of its small mass does not cause much wear on the ball bearings 24. Since the material of which magnets are made is extremely hard, it is not desirable to allow the soft stationary unit to frictionally engage the hard magnet surface since the stationary unit might thereby easily be roughened with the result that adverse effects upon the thread would result because the relatively delicate thread could easily be damaged on the roughened surface of the stationary unit. It is, therefore, preferable to form the stop with curved surfaces corresponding to those of the stationary unit which they engage so that when engagement occurs comparatively large surfaces are engaged, thereby minimizing damage to the stationary unit. If desired, the stationary unit may be formed of the same material used for the magnets or preferably the stop of the magnet holder may be made of a softer material than the material from which the stationary unit is formed. The magnet holder may be made of light metal or may be made of wood, lead, plastic, leather or the like.

It is important that the stationary unit is not permitted to rotate until it comes against the stop. It has been found that by having an armature of soft iron in the stationary unit opposite the magnet, it is possible for the stationary unit always to be brought back to its normal position even if the degree of rotation is comparatively great. This is not the case where a magnet is used instead of a soft iron armature.

What I claim is:

1. In a double twist spindle, a freely journaled stationary unit having a periphery formed to provide a thread guiding surface, a fixed member disposed externally of the stationary unit and spaced a predetermined distance from at least a portion of the peripheral surface of said stationary unit to provide a gap for the passage of the twist balloon formed by the thread, a portion of the stationary unit projecting outwardly a sufficient distance to engage the fixed member upon limited rotational movement of the stationary unit, whereby to prevent complete rotation of said unit.

2. A double twist spindle as defined in claim 1, wherein the cross-section of the peripheral surface of the stationary unit is circular but eccentric with respect to the axis of the stationary unit.

3. A double twist spindle as defined in claim 2, wherein a portion of the peripheral surface of the stationary unit comprises a surface of revolution eccentric with respect to the axis of the spindle, and having an axis parallel to the said axis of the spindle.

4. A double twist spindle as defined in claim 3, wherein other portions of the peripheral surface of the stationary unit further comprise a surface of revolution concentric with the axis of the spindle.

5. A double twist spindle as defined in claim 4, wherein the concentric surface of revolution is a conical surface.

6. A double twist spindle as defined in claim 5, wherein the parts connecting the concentric and eccentric surfaces of revolution are formed with gradually decreasing eccentricity.

7. A double twist spindle as defined in claim 1, wherein the cross-section of the peripheral surface of the stationary unit comprises portions eccentric to the axis of the spindle and other portions circular and concentric with respect to the axis of the spindle.

8. A double twist spindle as defined in claim 1, wherein the peripheral surface of the stationary unit comprises a surface of revolution eccentric with respect to the axis of the spindle, the axis

of the said surface of revolution being parallel to the said axis of the spindle, and the said surface of revolution being in the form of a conical surface and being combined with a surface of revolution concentric with respect to the axis of the spindle.

9. A double twist spindle as defined in claim 1, wherein a magnet is disposed in the fixed member along a surface facing the stationary unit.

10. A double twist spindle as defined in claim 9, wherein the said fixed member is formed from a softer material than the material from which the peripheral surface of the stationary unit is formed.

11. A double twist spindle as defined in claim 10, wherein the stationary unit is formed from a plastic.

12. A double twist spindle as defined in claim 9, wherein the fixed member is formed from a light metal.

13. A double twist spindle as defined in claim 9, wherein the portion of the fixed member in which the magnet is positioned is closer to the surface of the stationary unit than is the magnet.

14. A double twist spindle as defined in claim 9, wherein the magnet is a horseshoe magnet and the portions of the fixed member lying closest to the surface of the stationary unit lie between the poles of the magnet.

15. A double twist spindle as defined in claim 1, wherein a magnet is positioned in the said fixed member and said fixed member and said stationary unit are formed from the same material.

16. A double twist spindle as defined in claim 1, wherein a magnet is positioned in the fixed member and a soft iron armature is positioned in the stationary unit at a point at which the peripheral surface of the stationary unit is the greatest distance from the surface of the fixed member.

KARL LANDOLT.

References Cited in the file of this patent

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Number	Country	Date
617,259	Germany	Aug. 15, 1935