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THREAD WINDING MECHANISM

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2 Sheets-Sheet 1

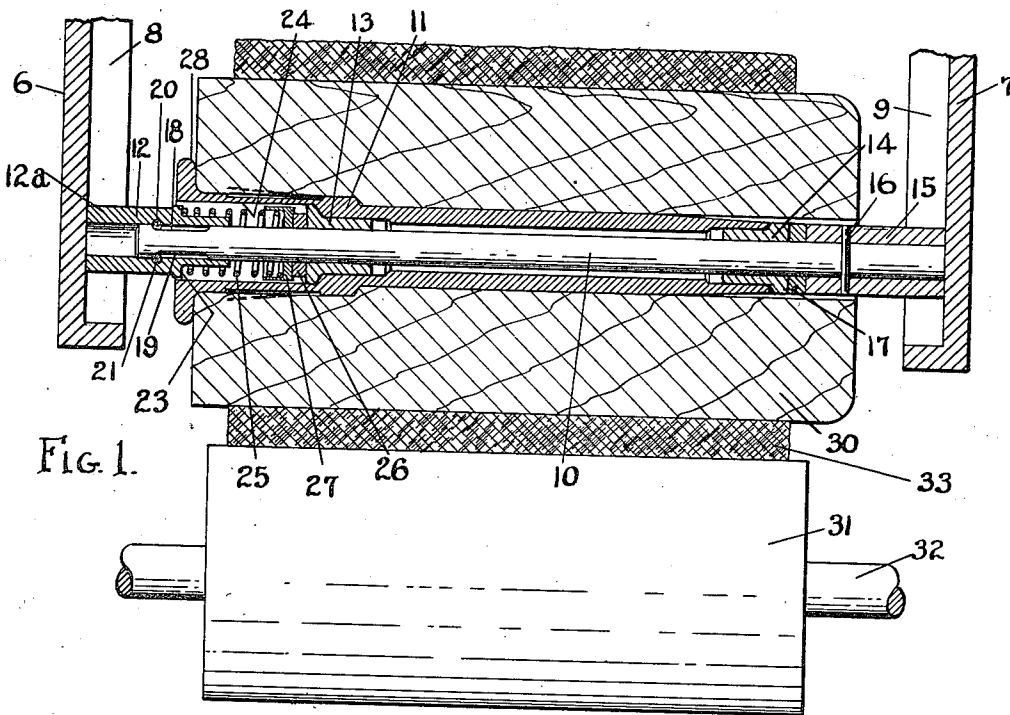


FIG. 1.

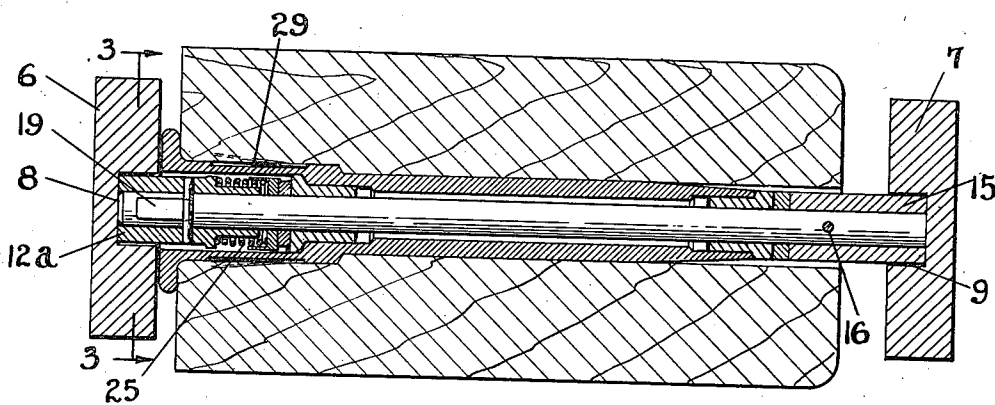


FIG. 2.

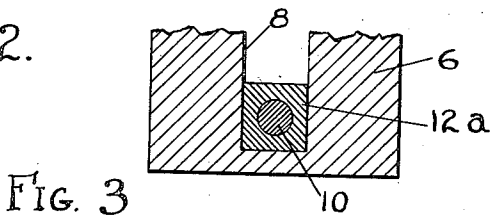


FIG. 3.

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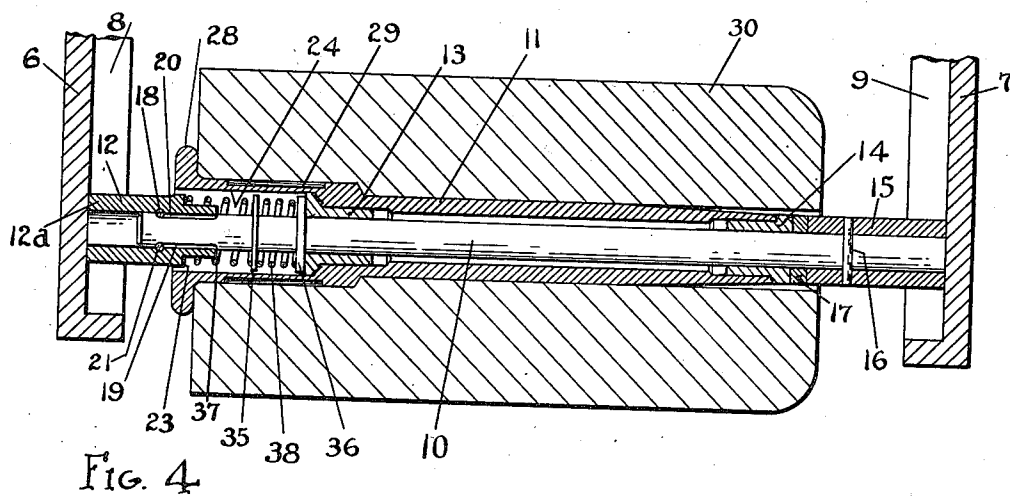
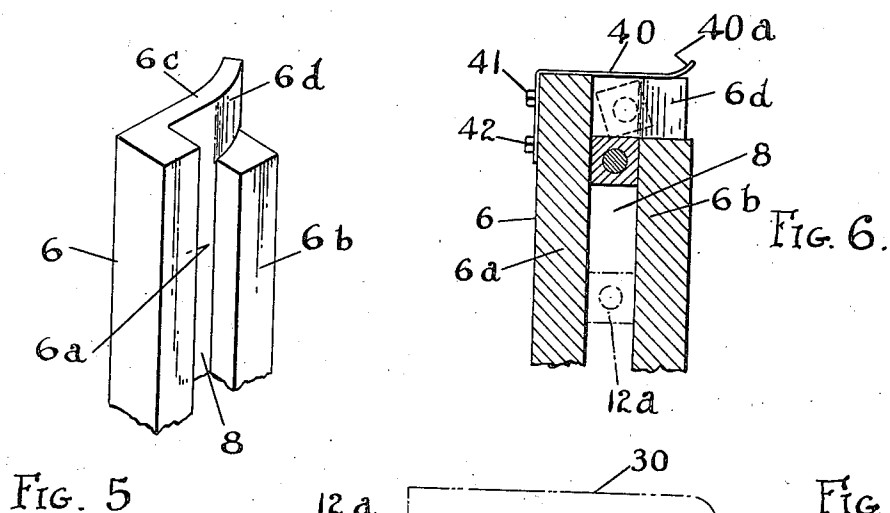
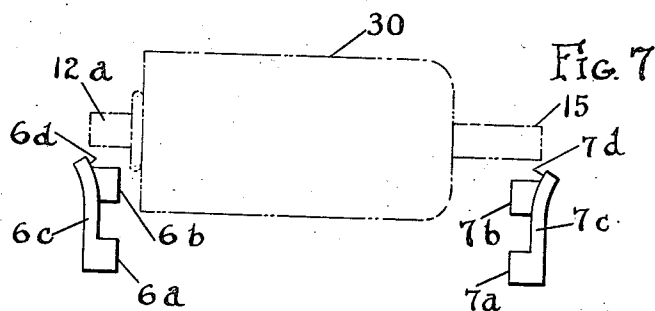
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2 Sheets-Sheet 2



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THREAD WINDING MECHANISM

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10 Claims. (Cl. 242—18)

This invention relates to a thread winding mechanism and more particularly, it relates to a thread winding spindle mechanism which may be rotated by means of a friction surface drive roller without intermittent bouncing or jumping of the spindle and thread package relative thereto.

In the winding of threads on a spool, bobbin, or the like, it is often desirable to impart rotation to the spool or bobbin by direct frictional contact between the surfaces of the outer layers of thread and a surface drive roller. As the thread builds up on the spool or bobbin, the axes of the spool or bobbin and the actuator or drive roller will gradually become more widely separated from each other. Consequently, the spindle is arranged to be moved relatively to the surface drive roller to allow for the layers of thread built up on the spool or bobbin.

Prior to this invention, when such a freely movable spindle was driven by a surface drive roller, any slight irregularity or unevenness in the surface of the wound thread or unevenness in the density of the wood, of which spools or bobbins are usually constructed, would create an eccentrically unbalanced condition in the revolution of the spindle in its guide grooves, with the result that the spindle would periodically climb upwardly by pressure on the side wall of the guide grooves and cause a jumping or bouncing of the spool or bobbin relative to the roller.

Obviously, this bouncing of the spool or bobbin is very objectionable and attempts have been made in the past to eliminate this action, for example, by enlarging the bobbin or spool to reduce the speed of revolution thereof. Despite these attempts, excessive bouncing of the spindle has not been eliminated and this, coupled with the difficulty of maintaining spindle length and guide groove spacing in exact adjustment, has restricted the permissible weight of wound packages of thread.

It is therefore an object of this invention to provide a spool or bobbin spindle adapted to rotate freely relative to a surface drive roller without jumping or bouncing relative thereto.

It is another object of this invention to provide a spool or bobbin spindle adapted to be driven by a surface drive roller in which there is a continuous driving engagement between the roller and the spool or bobbin.

It is a further object of this invention to provide a spool or bobbin spindle having an automatic spring take-up means to allow for any variations in the spacing between spindle guide grooves.

Other objects of this invention will become ap-

parent from the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a vertical sectional view of a spindle constructed in accordance with this invention, and its position relative to cooperating guide grooves and a surface drive roller.

Fig. 2 is a horizontal sectional view of the spindle shown in Fig. 1, but in which the guide grooves are spaced considerably closer together.

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a vertical sectional view of a slightly modified form of spindle.

Fig. 5 is a perspective view of the upper portion of an element containing a guide groove.

Fig. 6 is a sectional view showing the construction of the upper portion of a guide groove containing element.

Fig. 7 is a diagrammatic view showing the method of inserting a spindle into the guide grooves of a winding machine.

Referring to the embodiment of the invention illustrated in the accompanying drawings, reference characters 6 and 7 designate portions of the frame work of a spool or bobbin winding mechanism. The portions 6 and 7 are provided respectively with guide grooves 8 and 9. These guide grooves are parallel to each other and are spaced from each other a distance approximately equal to the length of the spindle which will be hereinafter described.

The spindle comprises in general a stationary shaft 10, a rotatable sleeve 11 and a spring pressed take-up member 12. The sleeve 11 is provided with internal bearings 13 and 14 in opposite ends thereof. These bearings are preferably of the so-called self-lubricating type and may be fastened to the sleeve by force fitting the same therein in a known manner. The sleeve 11 and bearings 13 and 14 are positioned to rotate freely about the shaft 10. One end of the shaft 10 is provided with a preferably hardened, cylindrical, guide member 15 which is fastened thereto by means of a pin 16. The external end of the guide member 15 is ground flat to provide a maximum friction area for contact with the bottom of the guide groove 9. The member 15 fits in the guide groove 9 with just sufficient clearance to permit of free vertical movement relative therewith. A wear-resisting thrust washer 17 composed of hardened bronze or the like is preferably positioned between the bearing 14 and the guide member 15.

The opposite end of the shaft 10 is provided

with a spring pressed take-up member 12 which is slidable on the end of said shaft between the limits of two machined flat sections 18 and 19 of the shaft and two cooperating pins 20 and 21 of the member 12. The shoulder 23 of the member 12 is adapted to move back and forth within a bore 24 of the sleeve 11. A coiled spring 25 is positioned around the shaft between the shoulder 23 and the end surface of the bearing 13, whereby the member 12 is forced outwardly from the bore 24, within the limits of movement as defined by the above said flat sections and pins. The spring 25 also functions to push the sleeve 11 together with its bearing 14 against the thrust washer 17 which in turn is forced against the guide member 15 so as to maintain the sleeve and bobbin at a constant predetermined distance from the guide groove 9, thus causing the bobbin to rotate in a fixed plane at right angles to the axis of the bobbin. A spring abutment member 27 and a hardened metallic thrust washer 26 are preferably arranged between the end of spring 25 and the bearing 13 for the purpose of guiding the spring 25 and preventing excessive wear. As shown in Fig. 3, the projecting end 12a of the take-up member 12 has a square cross section and is adapted to slidably fit guide groove 8 to permit free vertical movement of the end 12a in the guide groove 8, and to prevent rotation of shaft 10. The end surface of 12a, as in the case of guide member 15, is ground flat to provide a maximum friction area for contact with the bottom of guide groove 8.

The spring-pressed take-up member 12 permits the use of a standard length spindle in variously spaced guide grooves as is clearly shown in Figs. 1 and 2, the guide grooves 8 and 9 of Fig. 1 being spaced considerably farther apart than those of Fig. 2.

The sleeve has a flange 28 at one end thereof to limit the position of a spool or bobbin 30 fitted thereon. One end of the sleeve is preferably provided with a leaf spring member 29 on the external periphery thereof to secure the bobbin on the said sleeve and prevent relative rotation between said sleeve and bobbin.

Clearance is provided between sleeve 11 and members 12, 26 and 27, and also between the bobbin 30 and members 15 and 17, as shown in Figs. 1 and 2, to eliminate frictional contact therebetween, so that sleeve 11 is the only part of the spindle which contacts the bobbin 30.

The spool or bobbin 30 which is thus firmly but removably held on the sleeve 11 is rotated together therewith about the stationary shaft 10 by means of a surface drive roller 31 which in turn is rotated through the shaft 32. As the thread 33 builds up on the spool or bobbin 30, the spindle will rise in the guide grooves 8 and 9.

After inserting the sleeve 11 into the bore of a bobbin to the point where the end of the bobbin rests against the flange 28, the spring pressed take-up member 12 is compressed with the finger, or by other means as will be described hereinafter. The cylindrical guide member 15 is inserted into groove 9, and the spindle rotated slowly until the squared end thereof, 12a, fits into the guide groove 8. The empty bobbin is sufficiently heavy to carry the spindle downwardly in the guide grooves until the surface of the bobbin contacts the surface of the roller 31. The bobbin is then ready to be wound with thread in a manner as is well known in the art.

Instead of compressing the spring-pressed take-up member 12 with the finger, the mem-

bers 6 and 7, containing guide grooves 8 and 9, may be provided at their upper ends with diverging sections as is clearly shown in Fig. 7 by the curved flanges 6d and 7d. These curved flanges, which are extensions of the bottom walls 6c and 7c of the guide grooves, are adapted to contact the end surfaces of members 12 and 15 of the spindle, and which, upon movement of the spindle inwardly toward the guide grooves, will compress the take-up member 12 to fit the space between the bottom walls 6c and 7c of the said guide grooves. The side-wall 6a of the member 6 is made slightly higher than the side-wall 6b, as is clearly shown in Figs. 5 and 6, so that the square take-up member 12 may contact the inner surface of wall 6a and thus be positioned to readily slide into guide groove 8. A guard member 40 may be fastened over the top of member 6 (see Fig. 6) by means of screws 41 and 42, or other suitable means. This guard member serves the purpose of preventing the spindle from dropping out of the winding device when the same is placed in an inverted position. The end of the member 40 is provided with a curved lip 40a so that the spindle may be readily inserted.

Instead of using a single spring 25 within the bore 24, it may be desirable to use two springs, as is shown in the construction of Fig. 4. In this modification, the spindle shaft 10 is provided with a member 35 fixed to the shaft 10. A hardened metallic thrust washer 36 is slidably positioned about the shaft 10 and against the end of the bearing 13. A spring 37, sufficiently heavy to retard vertical vibration of the spindle within the guide grooves 8 and 9, is positioned between shoulder 23 of the take-up member 12 and fixed member 35. A second spring 38 is positioned between the fixed member 35 and the thrust washer 36 to force the sleeve 11 against the thrust washer 17 and the guide member 15, and to prevent the shaft 10 from sliding longitudinally in the bearings 13 and 14 whereby to prevent any substantial sidewise movement of the bobbin or spool.

A spindle constructed in accordance with this invention will prevent jumping or bouncing of the bobbin relative to the actuator, and will provide for a continuous, free-running contact between the bobbin and the actuator.

The bouncing or jumping repeatedly referred to above is apparently caused by two separate and distinct components, one of which is a vertical vibration, probably caused by very slight irregularities in the external surface of the bobbin or irregularities on the external surface of the top layer of thread. The other component consists of a climbing tendency of the spindle, when a rotating spindle shaft is used, in its guide slot due to eccentricities in the bobbin or thread layers with respect to the spindle axis. The latter component has been completely eliminated by the use of a stationary spindle and a rotatable sleeve. The first named component has been substantially eliminated by the insertion of a compression spring between the ends of the spindle whereby a frictional contact between the ends of the spindle and the bottom of grooves 8 and 9 is provided. This frictional contact may be adjusted to any magnitude desired to overcome the vertical vibration of the spindle.

A further advantage of the compression spring take-up device is to take up any variations in the distance of spacings between guide grooves of a winding machine. The bobbin is thus prevented from moving sidewise and is constantly in perfect relationship with its traverse guide

(not shown) to minimize unevenness of the thread layers.

Since it is obvious that the specific embodiments of the invention illustrated and described may be varied in many details of its construction within wide limits without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. A thread winding spindle comprising a non-rotatable shaft, a sleeve rotatable about said shaft, and a spring pressed take-up means mounted co-axially on one end of said shaft, said take-up means having an end surface shaped to cooperate with a supporting means over a substantial surface to frictionally engage the same.

2. A thread winding spindle comprising a non-rotatable shaft, a sleeve rotatable about said shaft, a spring pressed take-up means movably mounted on one end of said shaft, projecting members on said means, and flattened sections on said shaft cooperating with said members for limiting the movement of said means and shaft.

3. In a winding mechanism, means having a plurality of parallel guide grooves, a spindle movably mounted in said grooves, said spindle comprising a non-rotatable shaft, a sleeve rotatable about said shaft, and a spring pressed take-up means mounted co-axially on one end of said shaft, a spool on said rotatable sleeve, and a surface drive roller arranged for driving engagement with said spool.

4. In a winding mechanism, means having a plurality of substantially vertical, parallel guide grooves, a spindle comprising a non-rotatable, spring pressed, laterally movable shaft in said grooves, a rotatable sleeve on said shaft, a spool on said sleeve, and a surface drive roller arranged for driving engagement with said spool.

5. In a winding mechanism, means having a plurality of substantially vertical, parallel guide grooves, a spindle comprising a non-rotatable, laterally movable shaft in said grooves, a rotatable sleeve on said shaft, a spool on said sleeve,

and a surface drive roller arranged for driving engagement with said spool.

6. In a winding mechanism, means having a plurality of substantially vertical, parallel guide grooves, a spindle comprising a spring pressed, laterally movable shaft in said grooves, a portion of said shaft having a cross section to prevent rotation relative to said grooves, a rotatable sleeve on said shaft, a spool on said sleeve, and a surface drive roller arranged for driving engagement with said spool.

7. A thread winding spindle comprising a non-rotatable shaft, a sleeve rotatable about said shaft, a take-up means slidably mounted on one end of said shaft, spring means tending to force said take-up means from said shaft, and a second spring means tending to force said sleeve along said shaft to a definite predetermined position.

8. In a winding mechanism, means having a plurality of substantially vertical, parallel guide grooves, a spindle comprising a non-rotatable, laterally movable shaft in said grooves, spring-pressed take-up means on said shaft, and means connected to said first-named means for compressing said spring-pressed take-up means when inserting the spindle into said grooves.

9. In a winding mechanism, means having a plurality of substantially vertical, parallel guide grooves, a spindle comprising a non-rotatable, laterally movable shaft in said grooves, spring-pressed take-up means on said shaft, means connected to said first-named means for compressing said spring-pressed take-up means when inserting the spindle into said grooves, a rotatable sleeve on said shaft, a spool on said sleeve, and a surface drive roller arranged for driving engagement with said spool.

10. A thread-winding spindle comprising a non-rotatable shaft, a sleeve rotatable about and mounted for endwise movement on said shaft, a take-up means slidably mounted on one end of said shaft, and a spring means interpositioned between said sleeve and take-up means and thereby tending to force said take-up means from said shaft and to force said sleeve along said shaft to a definite, predetermined position.

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