Dec. 26, 1967 J. L. WINKLER 3,360,208

APPARATUS FOR WINDING TEXTILE THREADS

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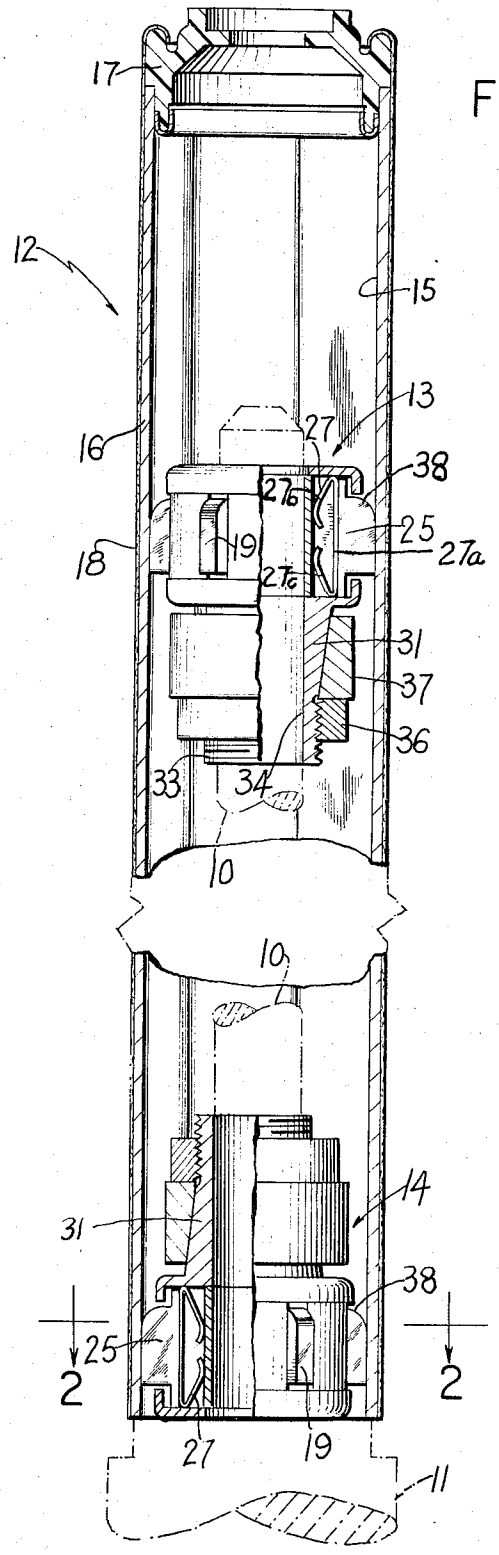


FIG. 1

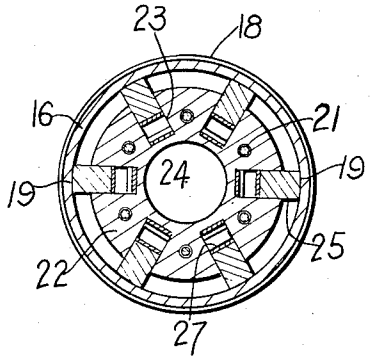


FIG. 2

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Fig. 3

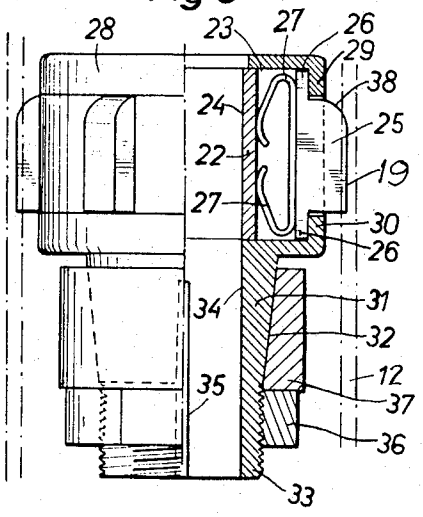


Fig. 5

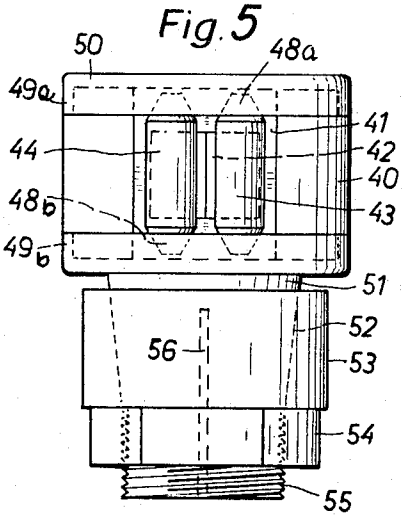


Fig. 4

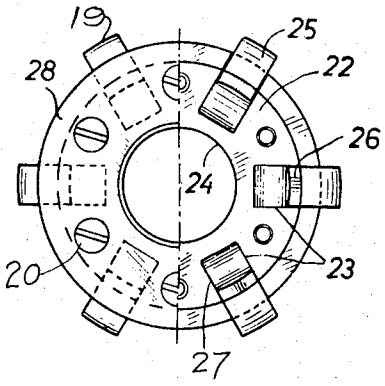
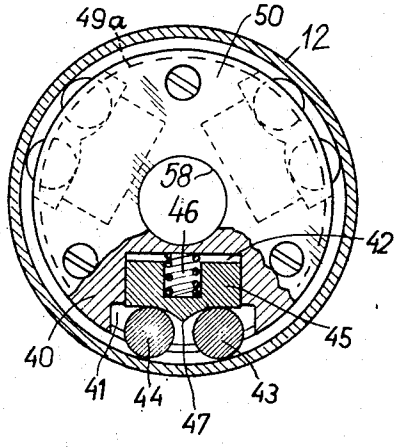


Fig. 6



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APPARATUS FOR WINDING TEXTILE THREADS

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ABSTRACT OF THE DISCLOSURE

In a thread winding apparatus including a spindle having couplings thereon for centering and driving a hollow bobbin having a cylindrical inner surface, each coupling comprises a cylindrical, axially bored body receiving the spindle formed with a plurality of radial recesses having outer portions opening at the outer periphery and ends of the body, movable clutch elements contained by and projecting radially from the outer recess portions to engage and rotatably couple the bobbin with the spindle, the clutch elements being coextensive with the outer recess portions in the direction of the axis of the body and being urged radially outward by springs in the recesses, annular members secured to the body ends and extending across the recesses to retain the coupling elements therein in said direction of the axis, the annular members having peripheral flanges extending toward each other at the outer periphery of the body to limit radially outward movement of the clutch elements, and one of the annular members having means thereon for securing the coupling on the spindle.

This invention relates to apparatus for winding textile threads onto bobbins which are adapted to be interchangeably placed onto spindles, and more particularly to means for drivingly engaging and centering bobbins on spindles.

In order to avoid any rupture of the thread, especially in case of high speed winding frames, and to ensure a precise winding operation, the bobbins, usually consisting of a tube made of metal or other suitable material, have to be slipped over the spindle in exactly centered position and their driving engagement must be arranged so as to absolutely inhibit any beating of the bobbin, even during repeated starting of the spindle.

The devices of the present invention provide novel coupling means for centering and driving a hollow bobbin having a cylindrical inner wall. One of the devices is removably clamped to the lower end of a spindle for engaging the lower end of the bobbin, and the other is removably clamped to the spindle to engage the bobbin at any desired height as, for example, at an elevation about two-thirds of its length from its lower end. The bobbin is centered and driven by both of the devices, which assure a perfect running.

Among the objects of the invention is to provide for facilitating the placement of a bobbin onto a spindle and to effect the immediate centering of the bobbin as it is slipped onto the spindle and positive driving of the bobbin under all operating conditions, without requiring the use of fittings fixed to the bobbin itself.

Another object is to effect a secure frictional driving relation between a spindle and a bobbin which is effective to rotate the bobbin immediately without any appreciable slip as the spindle accelerates and to prevent overrunning of a filled bobbin as the rotation of the spindle is slowed to a stop, even with a heavy load.

Another object is to provide novel coupling means having spring-loaded clutch elements which act to center a bobbin with respect to the axis of the spindle and which are so constructed and arranged as to augment the force of the springs by their centrifugal action and thereby increase the force which is effective to drive the bobbin.

Other objects, features and advantages of the present invention and preferred ways of practicing it will be evident from the accompanying drawings and the following detailed description of illustrative embodiments of the invention.

In the drawings:

FIG. 1 illustrates an apparatus according to the invention and with elements shown partly in section;

FIG. 2 is a transverse section on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged view of the coupling shown in FIG. 1;

FIG. 4 is a view of one end of the coupling of FIG. 3, and showing one-half of the lid at one end of the coupling removed;

FIG. 5 is an elevation of a modified coupling means; and

FIG. 6 is a transverse section of the coupling means of FIG. 5.

The thread-winding apparatus illustrated in FIG. 1 includes a cylindrical spindle 10 extending upwardly from a base 11 which is rotatably driven during a winding operation. A bobbin 12 is mounted symmetrically with respect to the spindle by two similarly constructed coupling means located at 13 and 14. Each of the couplings includes a plurality of clutch elements uniformly spaced therearound for engaging the cylindrical inside surface 15 of the bobbin, and means for clamping the couplings to the spindle 10. The bobbin shown comprises a tubular barrel 16 made of metal, or of other suitable material, and a synthetic plastic head bushing 17 to which is attached a sleeve 18 having antistatic properties and an exterior surface finished in a manner to support thread wound thereon and prevent it from slipping.

The two couplings at 13 and 14 operate in coaxial relation to drive and center the bobbin symmetrically with respect to the axis of the spindle. As shown in FIG. 1, the upper coupling is located on the spindle at such an elevation as to engage the bobbin at a location in the upper part of the bobbin, say at a distance of about two-thirds of its height from its bottom edge; and the lower coupling is clamped to the lower end of the spindle in such a position as to make engagement with the lower end of the bobbin.

The coupling shown in FIGS. 3 and 4 comprises a cylindrical body 22 which is provided with six regularly spaced radial recesses or slots 23 and a central axial bore 24. Each of the recesses 23 has opposite parallel side walls parallel to the axis of the body and a planar inner end wall perpendicular to its side walls. Each recess contains a radially movable friction die 25 having a vertically elongated outer face 19 which in the horizontal direction is cylindrically curved in conformance with the curvature of the inner cylindrical surface of the bobbin for making frictional contact therewith. Each die 25 is provided with top and bottom axially extending projections or lugs 26 for guiding the die in its recess 23 and limiting the outward position of the die before it is engaged by a bobbin.

A spring 27 which is seated against the planar inner wall of each recess 23 tends to push the die 25 radially outward in its recess. A lid member 28 is fastened by screws 20 to one end of the cylindrical body 22 and is provided with an annular marginal flange 29 which engages the upper lugs 26 to restrain the dies from leaving the recess or slots under the action of the springs 27. A similar annular flange 30 is formed on a sleeve 31 which is fastened by screws 21 (FIG. 2) to the other end of the cylindrical body 22. The flange 30 serves as a stop to limit the outward movement of the lower lugs 26. When the dies 25 are at their positions in the recesses limited by the flanges 29 and 30, the radially outermost

portions of their surfaces lie at a radial distance from the axis of the coupling greater than the radius of the inner surface of the bobbin.

The sleeve **31** has an external conical surface portion **32**, a threaded lower end portion **33**, and a central bore **34** having a diameter slightly greater than the diameter of the spindle. The sleeve **31** is provided with a longitudinal slit **35** extending from the lower or distal end of the sleeve to short of the top end of the sleeve. A nut **36** is threaded onto the threaded portion **33**. The nut is adapted to be brought into abutting contact with the end face of a clamping collar or ring **37** having a conical inner surface for cooperation with the external conical surface **32** of the sleeve **31**.

The coupling is mounted on the spindle by passing it over the end of the spindle and sliding it to its desired position where it is clamped to the spindle. When the coupling is in the desired axial position, the nut is screwed against the collar **37** to force the sleeve to contract and seize onto the spindle. The coupling is thus firmly secured to the spindle by tightening the nut.

The outer faces **19** of the dies are provided with sloped end portions **38** which are initially engaged by the lower edge of a bobbin as it is slid over the coupling. These sloped portions constitute cams extending from one end of the bobbin-engaging faces **19** towards the axis of the spindle so as to be engaged and thrust inward by the lower edge of the bobbin, to effect radially inward movement of the dies against the action of the springs **27**, as a bobbin is slid downward over the coupling. When the bobbin is in place, the cylindrically curved faces **19** of the dies **25** frictionally engage its inner surface under the force of the springs **27**, thus coupling the bobbin with the spindle so that the bobbin will be rotated upon any rotation of the spindle, free of any vibration.

A feature of the present invention is that a bobbin can be driven positively and kept centered and in dynamic balance with respect to the spindle axis solely by using two of the couplings, having identical parts, in the manner illustrated in FIG. 1. The lower end of the bobbin is centered close to the base of the spindle by mounting one of the couplings on the spindle with the clamping sleeve **31** disposed above the die members **25** as illustrated at **14** in FIG. 1. The coupling used in this disposition has its dies **25** arranged in their recesses so that their ends provided with the sloped surfaces **38** are nearer to the sleeve **31**. The other coupling, secured near the top of the spindle, has its dies **25** oppositely arranged in their recesses, as seen in FIG. 3. Thus the sloped end surfaces of the dies of both couplings are engaged by the lower edge of the bobbin as the bobbin is slid into its working position on the spindle.

The centering of a bobbin with respect to the axis of the spindle is assured by the pressure exerted thereon by the dies **25** of the two vertically spaced couplings **13** and **14**. This pressure is applied evenly and symmetrically with respect to the axis of the spindle, by virtue of the construction of the springs **27**. Each of them has a flat elongated base portion **27***a* bearing against the inner face of the coacting die under the pressure exerted by resilient leg portions **27***b* and **27***c* which extend inwardly from the ends of the base portion **27***a* and are compressed between said die and the inner end wall of the recess containing it. The spring legs exert constantly against said die radially directed forces which not only urge said die outwardly but are distributed evenly over its height or axial length, so that the entire outer face **19** of the die will have a firm even frictional engagement with the bobbin.

When the spindle starts to rotate the friction between the dies **25** and the inner surface of the bobbin causes the bobbin to rotate with the spindle. As the angular velocity of the spindle and couplings increases, the forces exerted by the springs are augmented by the centrifugal forces of the several dies with the result that the frictional driving force between the dies and the bobbin is greater when the spindle is rotating at high speed and while the weight of the thread being wound on the bobbin is increasing. The uniform spacing of the dies circumferentially around the respective couplings assures the required dynamic balance of the assembly by precisely centering the bobbin with respect to the axis of rotation of the spindle.

In the modified form of coupling illustrated in FIGS. 5 and 6, a cylindrical body **40** is provided with three angularly-spaced radial recesses which are open at the outer periphery of the body. Each recess is sub-divided into an outer portion **41** of greater horizontal width (FIG. 6) and an inner portion **42** of lesser horizontal width. The outer portion **41** of the recess extends the entire axial height of the body **40**, while the inner portion **42** of the recess is of less axial height than the body **40**.

The outer portion **41** of each recess contains two rollers **43** and **44** and the inner portion **42** contains and guides a radially movable plunger block **45** which is urged outwardly against the rollers **43** and **44** by a spring **46**. A central projection **47** of the outer face of the block **45** prevents the two rollers from making contact with each other.

The rollers **43** and **44** have conical portions **48***a* and **48***b* projecting axially beyond the ends of the cylindrical surfaces of the rollers. The projections **48***a* are partially overlapped by an annular flange **49***a* and the projections **48***b* are partially overlapped by an annular flange **49***b* so as to restrain the rollers from ejectment from the recesses whenever the rollers do not bear on the inner surface of a bobbin. The flange **49***a* is the rim of a lid member **50** which is removably fastened by screws to the upper end of the cylindrical body **40**. The flange **49***b* is joined to a sleeve **51** which is similarly screwed to the lower end of the cylindrical body **40**.

The sleeve **51** has a conical outer surface **52** which cooperates with a mating conical inner surface of a collar **53**. A nut **54** is engaged on a threaded lower portion **55** of the sleeve **51** which has an axial slit **56** to enable the sleeve to be clamped onto a spindle.

The coupling illustrated in FIGS. 5 and 6 is mountable onto a spindle by sliding it over the end of the spindle to a desired location on the spindle axis, the spindle being received in its central bore **58**. For fixing the coupling to the spindle, the nut **54** is screwed against the collar **53** and tightened to force the conical surface of the collar axially along the conical surface of the sleeve and thereby cause the slit sleeve **51** to seize about the spindle.

The several pairs of rollers **43** and **44** normally reach to a radial distance from the axis of the spindle greater than the inside radius of the bobbin. When a bobbin is placed in working position over the spindle, the rollers and the plunger blocks **45** are pressed inwardly against the force of the springs **46**, which then holds the rollers pressed into firm frictional engagement with the inner cylindrical surface of the bobbin. The face of each plunger block presents vertically elongated surfaces which are sloped oppositely and concavely away from the central radial projection **47**, and each of these surfaces bears against one of the rollers **43**, **44**. Accordingly, when a bobbin is in place on the spindle, either a driving torque applied to the spindle or a braking torque applied to stop its rotation will cause the rollers to be wedged immediately between the respective sloped surfaces which bear against them and the inner surface of the bobbin. A positive driving connection between the spindle and the bobbin is thus assured under various working conditions, and even when braking a heavily wound bobbin rapidly from a speed as high as 9,000 r.p.m.

What is claimed is:

1. A thread winding apparatus including a spindle having couplings mounted thereon for centering and driving a hollow bobbin having a cylindrical inner surface, wherein at least one of said couplings comprises a cylindrical body having an axial bore receiving the spindle and a

plurality of radial recesses opening outwardly to the outer pheriphery of said body and being coextensive with said body in the direction of the axis of said body at least at radially outer portions of said recesses, each of said recesses being elongated in the direction of said axis and having opposite side walls and an inner end wall substantially parallel to said axis, movable clutch elements contained by and projecting radially from said recesses to engage and effect rotation of said bobbin, said clutch elements being substantially coextensive in axial length with said outer portions of the recesses, said recesses containing spring means respectively bearing against the inner end walls of said recesses and exerting radially outwardly directed force on said clutch elements, annular members secured on the ends of said body and extending across said outer portions of the recesses to retain said clutch elements therein in said direction of the axis, said annular members having outer peripheral flanges extending toward each other at said outer periphery of the body for limiting outward radial movement of said clutch elements when said elements are not engaged by the bobbin, and means on one of said members disposed symmetrically relative to said axis for removably securing said coupling on the spindle.

2. Apparatus according to claim 1, each of said clutch elements having on an end thereof a surface sloping radially inwardly from its bobbin-driving surface, whereby said clutch elements are displaced radially inwardly against the force of said spring means and brought into frictional driving engagement with the inner surface of the bobbin as the bobbin is slid onto said coupling.

3. A thread winding apparatus as set forth in claim 1 wherein said one coupling is clamped to the spindle at a location to engage the bobbin at an elevation about two-thirds of its length from the lower end of the bobbin, and a second coupling is clamped to the lower end of the spindle to guide and center the lower end of the bobbin, said couplings being constituted of like parts.

4. Apparatus according to claim 1, said securing means including a sleeve extending axially from said one annular member, said sleeve being slit longitudinally and having a clamping portion presenting a conical outer surface and a threaded portion between said conical surface and the distal end of the sleeve, a collar surrounding and movable axially on said sleeve and having a conical inner surface to engage said conical outer surface, and a nut threaded and operable on said threaded portion to force said collar along said clamping portion, whereby to contract and clamp said sleeve onto the spindle.

5. Apparatus according to claim 1, each of said clutch elements having axially projecting portions at its opposite ends for engagement with said movement-limiting flanges.

6. Apparatus according to claim 1, each of said clutch elements comprising a die member having opposite side faces and an inner face substantially parallel to the side walls and inner end wall of the recess containing it, and an elongated bobbin-engaging surface cylindrically curved to conform to the curvature of the inner surface of the bobbin.

7. Apparatus according to claim 6, each of said spring means being constituted by an elongated flat leaf portion and resilient leg portions respectively bent backward from and inwardly over opposite end portions of said flat portion, the free ends of said leg portions bearing against said inner end wall of the related recess and said flat portion bearing against said inner face of said die member so that the forces exerted by the leg portions are applied radially and distributed evenly over the axial length of the related die member.

8. Apparatus according to claim 1, each of said clutch elements being constituted by a pair of rollers and a plunger block that is displaceable radially in the related recess and is constantly pressed against said rollers by said spring means in said recess.

9. Apparatus according to claim 8, said plunger block having a vertically divided outer face presenting separate surfaces, each bearing against one of said rollers, which are sloped oppositely in the horizontal direction away from an intermediate radial projection of said face, whereby said rollers are wedged against the inner surface of a bobbin immediately upon movement of the spindle relative to the bobbin in either direction about the axis of rotation.

10. Apparatus according to claim 8, each of said rollers presenting an elongated cylindrical surface merging into an inwardly sloped conical surface at each of its ends for engagement by an adjacent one of said flanges.

11. A coupling for centering and driving on a thread winding spindle a hollow bobbin having a cylindrical inner surface, comprising a cylindrical body having an axial bore to receve the spindle and a plurality of radial recesses opening to the outer periphery of said body and also opening to the opposite ends of the body, each of said recesses being elongated in the direction of the axis of said body and having opposite side walls and an inner end wall substantially parallel to said axis, die members slidable radially in said recesses and projecting therefrom to engage and effect rotation of said bobbin, said die members being substantially coextensive in axial length with said recesses, said recesses containing spring means respectively exerting radially outwardly directed force on said die members, each die member having a substantially flat axially elongated inner face and an axially elongated outer face transversely curved to conform to the curvture of the inner surface of said bobbin, said spring means in each recess being constituted by an elongated flat leaf portion bearing against said inner face of the die member therein and leg portions respectively bent backward from and inwardly over opposite end portions of said flat portion, the free ends of said leg portions bearing against said inner end wall of the related recess to that the forces they exert are applied radially and distributed substantially uniformly over the area of said inner surface, annular members secured on the ends of said body and extending across the adjacent openings of said recesses to retain said die members therein in said direction of the axis, said annular members having peripheral flanges extending toward each other at said outer periphery of the body for limiting outward radial movement of said die members when said die members are not engaged by a bobbin, and means extending axially and symmetrically from one of said annular members for removably clamping the coupling on the spindle.

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