April 6, 1954 J. J. LYTH 2,674,415

BOBBIN CLUTCHING SPINDLE FOR SPINNING FRAMES

Filed Feb. 27, 1953

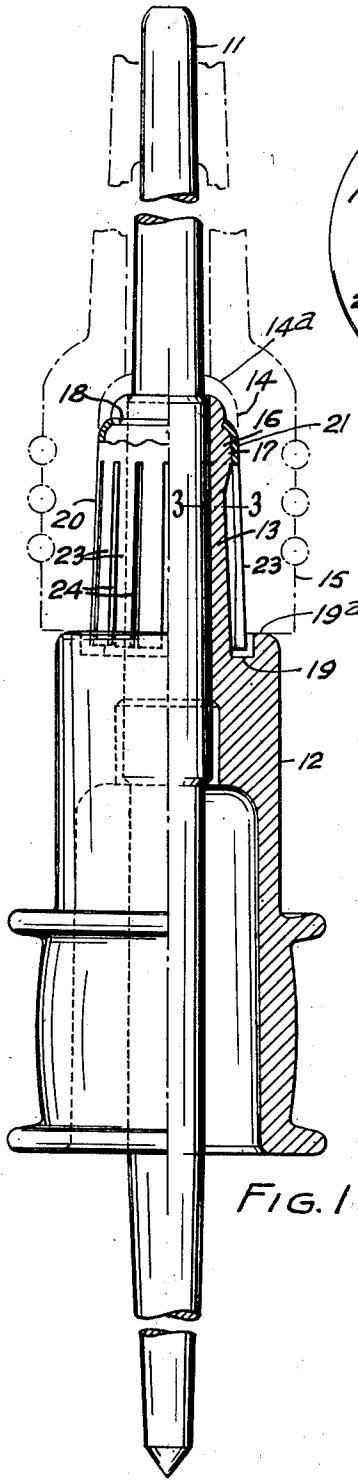


FIG. 1

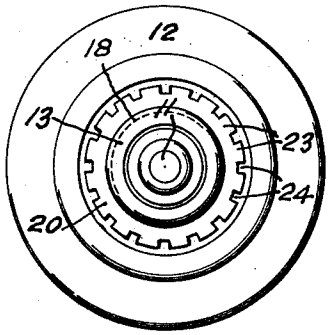


FIG. 2

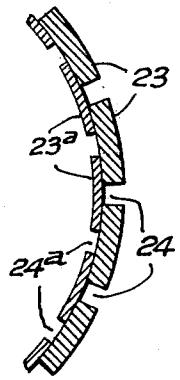


FIG. 3

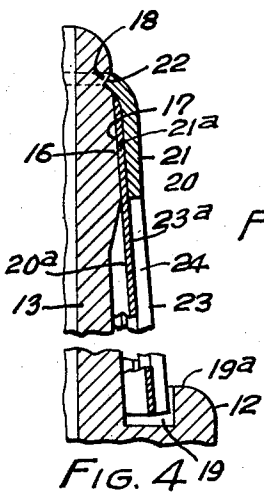


FIG. 4

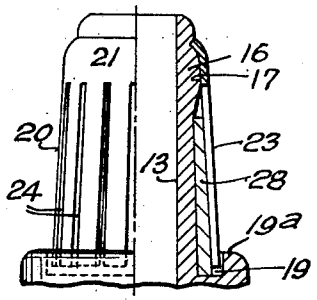


FIG. 6

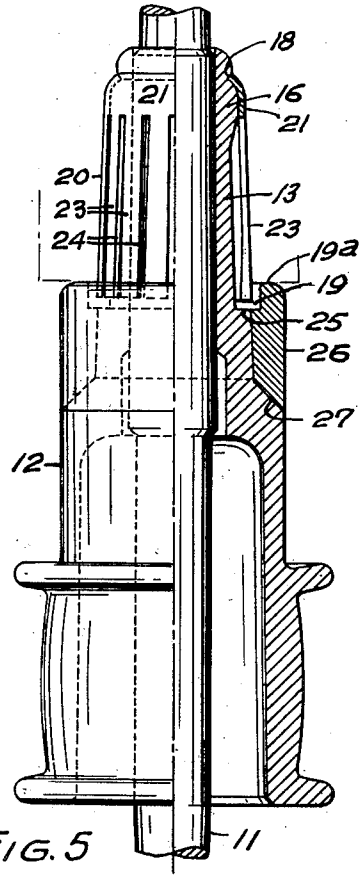


FIG. 5

Inventor
John J. Lyth
By
Attorney.

Patented Apr. 6, 1954

2,674,415

UNITED STATES PATENT OFFICE

2,674,415

BOBBIN CLUTCHING SPINDLE FOR SPINNING FRAMES

John J. Lyth, Valleyfield, Quebec, Canada

Application February 27, 1953, Serial No. 339,215

19 Claims. (Cl. 242—46.5)

1

This invention relates to improvements in bobbin clutching spindles for spinning frames and the primary object of the invention is to provide a spindle having bobbin clutching means of spring character which will expansively engage the interior of a bobbin, with bobbin centering effect, and which, by its inherent expansive action and by the action of centrifugal force thereon, will hold the bobbin securely in exactly co-axial relation with the spindle and against vibration and slipping on the spindle. A further object is to provide a spindle having out-thrusting, yielding means to engage a bobbin throughout a major portion of the inner driving surface thereof, which means is self-adjusting to any bobbin intended for use thereon, regardless of variations from bobbin to bobbin in the bores thereof and regardless of variation from time to time in any bobbin due to atmospheric changes, whereby the extent of driving engagement with a bobbin is substantially not affected by bobbin variations as aforesaid. A still further object is to provide a spindle so constructed as to ensure seating of a bobbin thereon at proper elevation with reference to the spinning frame ring rail, thereby to avoid the placement of winding undesirably high or low on the bobbin. Another object is to provide a spindle so constructed that it will enable the proper placing of a bobbin thereon and removal of a bobbin therefrom with but small effort, thereby to expedite and facilitate the usual frame filling and doffing operations. Still another object is to provide a simple, durable and inexpensive construction which may be applied to existing spindles, with only minor modification thereof, quite as well as to new spindles. An additional object is to provide a spindle which will obviate the use of metal or other wear resisting bobbin liners, thereby enabling satisfactory results to be obtained with less expensive, unlined bobbins. Various other objects and the advantages of the invention may be ascertained from the following description and the accompanying drawings.

The ordinary spinning frame spindles at present in general use include a blade and a cast iron whirl fixed thereto and having a tapered head portion to enter a similarly tapered bore in the lower end of a bobbin, the coacting tapered surfaces being intended to position and hold the bobbin in exact co-axial relation to the spindle and to afford a frictional driving contact. To assist in maintaining the co-axial relation of the bobbin and spindle, the spindle blade extends through the bobbin and engages the same near its tip end. Although the bobbins are supposedly

2

bored to the exact taper and size of the whirl head and are supposedly not subject to variation due to atmospheric change, it is found in practice that some variation exists and that variation develops with use. The tapers of the whirl and bobbin are slight and as the whirl surface is unyielding, it follows that a slight variation in the bobbin bore will have considerable effect in the positioning of the bobbin, vertically, with respect to the whirl. A slight reduction in the bobbin bore may prevent the bobbin descending far enough on the whirl for the bobbin to be held securely in the necessary co-axial relation to the spindle, with result that the tip of the bobbin is loose on the blade and permits vibration of the bobbin with consequent loosening of its lower end on the whirl. Under such conditions, detrimental wearing of both bobbin and spindle occurs. A slight enlargement of the bobbin bore, especially if the whirl is also worn, may result in the upper end of the bobbin bore coming to rest on the tip of the whirl before the bobbin has made sufficiently tight contact with the whirl head for bobbin centering and for transmission of adequate rotative force, so that the bobbin will both vibrate and slip on the spindle. At the very high speeds at which the spindle rotates even slight vibration produces rapid wearing of the spindle where the tip of its blade engages the bobbin and where the whirl engages the lower end of the bobbin. Also, any slipping of the bobbin on the spindle soon wears both.

In an effort to overcome these adverse conditions, bobbins have been provided with liners of metal or other wear resisting material but the results have not been entirely satisfactory and the liners add considerably to the cost of the bobbins. Other efforts to overcome the disadvantages of the ordinary constructions have resulted in the provision of spring-acting bobbin-clutching members on the spindle but for various reasons these have not proved entirely satisfactory. For instance, some such spring members have only line contact or only a few point contacts with a bobbin and thus invite wearing of channels in the bobbin, either circumferentially or longitudinally thereof, with eventual loose fitting on the spindle and consequent vibration which leads to wearing of the spindle and further wearing of the bobbin.

My invention overcomes all the previously noted difficulties by providing, on the spindle, resilient bobbin clutching means which is completely effective regardless of variation from bobbin to bobbin for so engaging the bobbin at

its lower end as to hold it always co-axial with the spindle and at the same time to afford ample transmission of rotative force for complete avoidance of slipping, and which additionally enables bobbins to be properly positioned on the spindle with reference to a ring rail.

Broadly speaking, the invention consists in the provision on the whirl of a spindle of a plurality of spring fingers in frusto-conical arrangement, each of said fingers being formed to have contact throughout substantially its entire length and width with the tapered bore of a bobbin and said fingers collectively engaging a major part of the tapered bore surface of a bobbin to position and hold the bobbin co-axially with respect to the spindle and to thrust outwardly against the bobbin with force sufficient to ensure transmission of spindle rotation to the bobbin without slipping, said fingers being capable of yielding sufficiently to permit a bobbin to be positioned at a predetermined point on the spindle, irrespective of variation in the bobbin bore from standard dimensions.

In greater detail, the invention consists in the features and combinations of features herein disclosed, together with all such modifications thereof and substitutions of equivalents therefor as are within the scope of the appended claims.

In the accompanying drawings forming part of this specification which illustrate various embodiments of the invention and the adaption thereof to existing spindles, but to the details of which the invention is not confined:

Fig.1 is a view of a spinning frame spindle initially constructed according to this invention and illustrates the same, on an enlarged scale, half in elevation and half in vertical section, through the axis of the spindle.

Fig. 2 is a plan view of the spindle of Fig. 1.

Fig. 3 is a cross-section of a group of spring fingers at, say, the line 3—3 of Fig. 1, and on a still more enlarged scale, and shows a clutch sealing means.

Fig. 4 is a fragmentary vertical sectional view of the whirl head and clutch as shown in Fig. 1, but on a further enlarged scale, and with the sealing means for Fig. 3.

Fig. 5 is a view similar to Fig. 1, illustrating the adaption of the invention to an existing spindle and the modification of the spindle whirl for that purpose.

Fig. 6 is a view of a clutch member, half in elevation and half in vertical section, illustrating modifications of detail and an alternative sealing means.

Referring more particularly to the drawings, and especially to Figs. 1 to 4 thereof, 11 designates the blade of a spinning spindle, which may be of any usual or suitable form, and 12 designates a whirl which is, in general, of substantially the usual form, or any other suitable form, irrevolubly mounted on the blade 11. The upper, bobbin-receiving part or head 13 of the whirl may be generally frusto-conical in form, tapering upwardly, though a taper is not essential but is preferred in the upper part thereof, as hereafter specified. The degree of taper of the head may be substantially the same as the degree of taper of the head of an ordinary spindle whirl but the diameter is less than that of an ordinary whirl head so that there will be considerable clearance all around between the head 13 and the inner tapered wall 14 of a bobbin indicated at 15, as will be clearly seen in Fig. 1. Near its upper end the head 13 is enlarged radially outward, as shown at 16, and has a preferably upwardly tapering circumferential surface 17 exactly co-axial with the spindle and of less diameter than the corresponding part of the bobbin bore. The degree of taper may be the same as that of the bobbin bore but may be more or less. Above the tapered surface 17, the head is formed with a laterally opening, circumferential groove 18. The tapered surface 17 extends downwardly from the groove 18 only for such distance as is necessary for the rigid seating of the bobbin clutching member hereafter referred to in exactly co-axial relation to the spindle. The upper end of the whirl body is formed with an upwardly opening, circular groove 19 which extends outwardly from the base of the head 13. The upper surface 19a of the whirl body, outwardly of the groove, constitutes a bobbin stop to position a bobbin in exactly predetermined relation to a ring rail.

While the bobbin illustrated is a filling, or weft, bobbin, it will be understood the invention is not limited to use of such a bobbin but extends equally to use of warp bobbins.

The bobbin clutching means of my invention comprises a hollow-frusto-conical body member 20 of spring tempered metal, having an upper or girdle part 21 which is continuous circumferentially and is bored concentrically with the outer surface of the girdle to fit the head surface 17 and is a press fit thereon so as to position the member 20 in exactly co-axial relation to the spindle. When the girdle 21 of member 20 is properly seated on the surface 17, its upper edge portion 22 projects above the said surface and is swaged into the groove 18 so that its upper edge surface tightly abuts the upper wall of the groove and holds the member 20 against working upwardly on the tapered surface 17 and becoming loose on the whirl head. I prefer to form the groove 18 substantially V-shaped in profile, with its upper wall in the form of a downwardly tapering frusto-conical surface, as shown, so disposed that in the swaging operation the upper edge surface of the member 20 will be crowded against the upper wall of the groove to hold the girdle member tightly on the surface 17, but the groove may be differently shaped, if desired, or other means may be resorted to for holding the girdle 21 tightly on the surface 17. The girdle 21 extends downwardly preferably to at least the lower edge of the head surface 17 but may, if desired, extend somewhat below it. Below the girdle, the clutch member is divided into a plurality of fingers 23, the outer surfaces of which are substantially in continuation of the outer surface of the girdle. These fingers extend, in divergent relation to the axis of the member, to the lower end thereof and are slightly spaced from one another, circumferentially of the member, so as to define narrow slots 24 between them. The lower ends of these fingers enter into the whirl groove 19 but do not extend to the bottom thereof nor, normally, do they touch either the inner or the outer wall of the groove. Because of the reduced diameter of the head below the part 16, it will be evident that the fingers will be spaced outwardly from the head. The outer surface of the clutch girdle is tapered and dimensioned to be an easy fit in the upper part of the tapered bore of a bobbin, so that it will not interfere with proper seating of a bobbin having an undersize bore. The outer surfaces of the fingers 23 are curved transversely thereof to the same curvature as the proper bore of a bobbin

and are preferably straight from the girdle to their lower ends. In the idle or expanded condition of the member 20 the downward divergence of the fingers from the axis of the member is somewhat greater than the downward divergence of the bore wall of a bobbin from the axis thereof, so that when a bobbin is pressed down on the spindle it will flex the fingers radially inward, this movement being possible because of the clearance between the fingers and the whirl head and because of the slots 24 between the fingers. When idle, the lower ends of the fingers are positioned adjacent the outer wall of the groove 19, as shown in Fig. 4, and when they are inwardly flexed by a bobbin they occupy positions approximately midway between the inner and outer walls of the groove, or slightly nearer the inner wall than the outer, as shown in Figs. 1 and 5. The capacity for further inward movement of the fingers provides for bobbins with undersize bores and for movement, if any, incident to dynamic centering of a bobbin on the spindle.

Inward flexion of the spring fingers by a bobbin causes them to thrust outwardly by reflex action against a bobbin, with clutching effect, and this outward thrust is augmented by centrifugal action when the spindle is rotating at operating speed.

It is now preferred that the fingers 23 be of equal lengths, equal widths and equal thicknesses and that they be uniformly spaced about the member 20 so as to have out-thrusting effect uniformly around the member and so that the member is perfectly balanced. It is also preferred that the slots be as narrow as is possible without causing edge to edge contact of the fingers when they are inwardly flexed by a bobbin, as above described, so as to obtain, as nearly as is possible, contact with a bobbin completely around the inner surface thereof. Each finger may be of uniform width from the girdle to its lower end, in which case the slots 24 between adjacent fingers will have a slight upward taper, all as shown in Fig. 6. Because of the frusto-conical form of the member 20, the fingers may be and preferably are a little wider at their lower ends than at the girdle, as shown in Figs. 1 and 5. This is advantageous as it affords the maximum of surface for contact with a bobbin. Also, each finger may be of uniform thickness from the girdle to its lower end, as shown in Fig. 6, but may be thicker at its lower end, as shown in Figs. 1 and 5. As compared with fingers uniformly wide and uniformly thick, there is advantage in fingers wider or thicker or both wider and thicker at their lower ends than at their upper ends in that this distribution of mass increases the effect of centrifugal action on the fingers when the spindle is in operation and thus increases the bobbin clutching effect. A further result of widening or thickening or both widening and thickening the fingers toward their lower ends is that flexion of the fingers is thereby concentrated near the girdle and the flexed fingers remain straight throughout substantially their entire lengths and so have contact throughout substantially their entire lentghs with a bobbin, which would not be the case if the fingers were bowed between their ends when flexed. Such bowing of the fingers would be so slight as to be barely discernible to the eye but would result in the pressure against a bobbin varying considerably from point to point along the length of the fingers, with tendency to wear a groove circumferentially in the bobbin.

As the slots 24 are quite narrow it is evident that the sum of the outer surface areas of the fingers is but little less than the area of that part of the inner surface of a bobbin which surrounds the clutch member 20 so that the member affords an area for frictional engagement with a bobbin which is but little less than the corresponding area of an ordinary whirl head but which, because of the out-thrusting action of the spring fingers, is more effective than the rigid surface of an ordinary whirl head.

I prefer to form the clutch member 20 with a substantial number of relatively narrow fingers so as to obtain radial out-thrusting effect practically all around the clutch rather than at only a few relatively widely spaced points or lines. While sixteen fingers have been shown in the drawings, and have been found satisfactory in practice, I do not limit myself to this number but may use a greater or lesser number of fingers within the practical limits fixed by the excessive stiffness of wider fingers and the difficulty of obtaining proper contact of them with a bobbin bore which is either over or under size; and by the reduced total contact area of narrower fingers, due to increase in the number of slots between them. For the foregoing reasons it now appears that the clutch member should have more than eight fingers and not more than twenty-four fingers.

While the provision of fingers which are wider at their lower ends than at the upper ends predisposes to slots having parallel edges, it does not necessitate such form as the slots may be slightly wider at their lower ends than at their upper ends. The essential thing is that the slots be only wide enough so that the edges of adjacent fingers do not contact one another when they are inwardly flexed by a bobbin. The tapering form of slots illustrated in Fig. 6 enables them to be of the least possible width while avoiding contact of the fingers with one another. If the edges of the slots are parallel, it is evident that the slots must be wider than upwardly tapering slots need be, if mutual contact of the fingers is to be avoided.

It will be evident that when the spindle is rotating at operating speed, the fingers will be outwardly urged by centrifugal force, in addition to their inherent outward thrusting action, so that they will have tight frictional engagement with a bobbin, preventing slipping of the bobbin on the spindle and ensuring that the full rotative effort of the spindle is transmitted to the bobbin. The outer wall of the groove 19 will restrain outward movement of the fingers by centrifugal force if the spindle should be running without a bobbin thereon and thus prevent straining or breaking of the fingers. The shrouding of the finger ends in the groove 19 also protects them from damage due to contact with a passing object and from picking up lint.

When placing bobbins on ordinary spindles with rigid heads, it is necessary to thrust the bobbins down with sufficient force to ensure such close frictional contact of the tapered surface of the bobbin bore and whirl head as will transmit necessary rotative effort from the spindle. A skilled operator tends to apply approximately equal force to all bobbins and if there is any variation from bobbin to bobbin in the size of their bores, the bobbins will be set at different elevations on the spindles with result that the bobbins will not be uniformly related to the ring rail and winding will be undesirably high on some bobbins and undesirably low on others. If additional force is

applied to suitably seat a high bobbin, it becomes difficult to remove it when the frame is doffed. These difficulties are avoided by use of my invention. The force required to properly seat a bobbin on the spindle of my invention is less than that required to secure satisfactorily tight contact of a bobbin with an ordinary rigid whirl head and this facilitates and expedites the filling and doffing of a spinning frame. The yielding fingers 23 avoid excessively tight fit of bobbins on spindles and allow all bobbins to descend easily to the bobbin stops 19a so that all bobbins on a frame will be at the same elevation and will be uniformly wound. The expansive action of the clutch compensates for any variation from bobbin to bobbin in the size of their bores and ensures positioning and holding of the bobbins in exactly coaxial relation to the spindles so that vibration is avoided. The positive action of the clutch is superior to the inertness of an ordinary whirl in transmitting power sufficient to rotate a bobbin at spindle speed and this superiority is due in considerable measure to the large number of fingers and the complete surface contact of each with the bobbin. At the running speed of a spindle, the inherent gripping capacity of the clutch is augmented by the action fo centrifugal force so that the grip is greater than that of an ordinary solid whirl.

The application of my invention to an existing spindle is very easily accomplished, as will be seen from Fig. 5. The usual whirl head, having a circumferential surface which would occupy the same position as the outer surface of the clutch member 20, is turned or ground down to suitable profile, such as that shown in Fig. 5, which is the same as that shown in Fig. 1, and produces the head 13 and a shoulder 25 which becomes part of the bottom of the groove 19. The clutch member 20 is then pressed onto the head and its upper edge portion swaged into the groove 18. As the dimensions of the lower portion of an ordinary whirl head do not permit of forming the groove 19 and bobbin stop 19a, the groove is produced by a collar 26 surrounding the lower end portion of the head and projecting above the shoulder 25 to form the outer wall of the groove and the bobbin stop 19a. The collar may be checked out as necessary to give sufficient width to the groove. This collar may be taper bored to the taper of the whirl head below the shoulder 25 and pressed onto the head, or the engaging surfaces may be otherwise formed and the collar otherwise secured. The collar preferably extends down to and contacts the shoulder 27 between the head and body of the whirl and will thus reinforce the whirl.

When a bobbin is placed on a spindle for winding, it is customary to secure the end of yarn to be wound by catching it between the bobbin and the whirl head. It is possible that in course of time yarn ends or lint therefrom might work through the slots 24 and accumulate in the clearance between the clutch member 20 and the whirl head to such an extent that it would interfere with proper operation of the clutch. Although such accumulation is extremely unlikely because of the narrowness of the slots 24 and although the presence of lint within the clutch has not been detected after prolonged operation, it is expedient to provide means for dealing with such a condition if it should be encountered. To this end, I provide within the clutch member, as shown in Figs. 3 and 4, an inner member 20a having a girdle portion 21a and fingers 23a separated by slots 24a, all exactly or substantially similar to the corresponding parts of the member 20 and arranged with the fingers of the two members in staggered relation so that the fingers of the inner member cover the slots 24 of the outer member and seal the space between the clutch member and the whirl head. The inner member 20a is preferably considerably thinner walled than the outer member and is externally dimensioned to always have close contact with the inner surface of the outer member. The girdle part 21a of the inner member is a press fit on the head surface 17 and the girdle part 21 of the outer member is a press fit on the girdle of the inner member. The members 20 and 20a may be assembled together prior to assembly to a whirl head and secured together in any suitable way to hold the fingers thereof in their staggered relation and so that the two members constitute a unit. The upper edge portion of the inner member may be swaged into the groove 18 similarly to the outer member but this is not necessary as it may terminate below the groove, as shown in Fig. 4, and will be held in place on the whirl head by the swaged-in upper edge of the outer member. The fingers of the inner member thrust outwardly against the fingers of the outer member and are inwardly flexed upon inward flexion of the outer fingers. Also, the inner fingers are subject to the action of centrifugal force similarly to the outer fingers. In so far as bobbin clutching is concerned, the outer and inner members are a unit. In other words, the two members may be regarded as constituting a single clutch member of laminated construction.

As an alternative, and less expensive, slot sealing means, I may provide a sleeve 28 of soft elastic material substantially filling the space between the clutch fingers and the whirl head when the clutch is idle, as shown in Fig. 6. While I do not limit myself to any particular one of the various materials now available, it is to be noted that a suitable material must have certain characteristics, namely; that it be sufficiently soft so it will not interfere with inward movement of the clutch fingers; that it have sufficient cohesion so it will not be extracted through the slots 24 by centrifugal force; and that it be not deteriorated by mineral oils. A material which meets the above requirements is a soft synthetic rubber, preferably of fine sponge texture. The synthetic material itself, apart from the softness due to its spongy texture, may have a hardness between 145 and 160, as measured with a Pusey & Jones densimeter, but I do not confine myself to this degree of hardness, as it may be found that material harder or softer than indicated by the foregoing figures will be serviceable.

Having thus described my invention, I claim:

1. In a bobbin clutching spindle, a whirl including a head adapted to enter the bore of a bobbin and to be spaced from the bore wall; and a hollow, frusto-conical clutch member surrounding said head and including an upper end portion tightly surrounding and fixed directly to the upper portion of the head, said clutch member being elsewhere spaced from the head.

2. A bobbin clutching spindle according to claim 1 in which the head is formed with a circumferential groove and the clutch member includes an upper girdle part having its upper edge portion seated tightly in said groove, said girdle part being elsewhere a tight fit on said head.

3. A bobbin clutching spindle according to claim 1 in which the head is formed near its upper

end with a groove and with an upwardly tapering part below the groove and in which the upper edge portion of the clutch member is engaged, fitting tightly against a wall of the groove, the clutch member below said upper edge portion being formed with a tapered bore in which the tapered portion of the head is tightly engaged.

4. A bobbin clutching spindle according to claim 1 in which the whirl head is formed with a circumferential enlarged portion near its upper end and with a circumferential groove above said enlarged portion; and in which the upper part of the clutch member fits tightly on said enlarged head portion and extends into said groove in tight engagement with a wall thereof.

5. In a bobbin clutching spindle, a whirl including a head to enter the bore of a bobbin and having an upwardly tapering upper portion; a bobbin clutching member having in its upper part an upwardly tapering bore in which the tapered upper portion of the head is tightly engaged; and means engaging the whirl head and holding said taper bored clutching member part against upward movement on the whirl head.

6. In a bobbin clutching spindle, a whirl including a head to enter the bore of a bobbin and to be spaced from the bore wall; and a hollow, frusto-conical clutch member surrounding said head and including an upper girdle portion rigidly mounted on the upper part of said head; and a plurality of spring fingers depending from the girdle portion and spaced from the head throughout their entire lengths.

7. A bobbin clutching spindle according to claim 6 in which the spring fingers are straight from the girdle to their lower ends and diverge downwardly at an angle greater than the angle of taper of the bore of a bobbin.

8. A bobbin clutching spindle according to claim 6 in which the spring fingers are wider at their lower ends than at their upper ends.

9. A bobbin clutching spindle according to claim 6 in which the spring fingers are thicker at their lower ends than at their upper ends.

10. A bobbin clutching spindle according to claim 6 in which the spring fingers are spaced apart by narrow upwardly tapering slots.

11. A bobbin clutching spindle according to claim 6 in which the outer surfaces of the fingers are circularly curved, transversely thereof, the curvature corresponding to the curvature of the inner surface of a bobbin whereby the entire outer surface of each finger will engage the inner surface of a bobbin on the spindle.

12. In a bobbin clutching spindle, a whirl including a head to enter the bore of a bobbin and to be spaced from the bore wall and a clutch member fixed to and surrounding said head and including inner and outer series of fingers spaced circumferentially of the member, the fingers of each series covering the spaces between the fingers of the other series.

13. A bobbin clutching spindle including a whirl and a bobbin clutching member fixed to the whirl and including a plurality of fingers spaced circumferentially of the member and spaced from the whirl and a filling of soft, elastic material in the space between the fingers and the whirl.

14. A clutch member for a bobbin clutching spindle comprising an upper, endless, girdle portion to encirclingly engage the head of a spindle whirl; and a plurality of spring fingers springing from an edge of said girdle portion and diverging from the axis of the girdle, said fingers being straight from the girdle to their free ends.

15. A clutch member according to claim 14 in which the outer surfaces of the fingers are circularly curved, transversely thereof, said curvature corresponding to the internal surface curvature of a bobbin.

16. A clutch member according to claim 14 in which each of the fingers is wider at its free end than at the girdle.

17. A clutch member according to claim 14 in which each of the fingers is thicker at its free end than it is adjacent the girdle.

18. A clutch member according to claim 14 in which the number of fingers is more than eight and less than twenty-four.

19. A clutch member according to claim 14 in which the fingers are arranged in inner and outer series, and are circumferentially spaced, the fingers of each series being disposed to cover the spaces between the fingers of the other series.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
916,358	McCullough	Mar. 23, 1909
1,024,396	Cunniff	Apr. 23, 1912

FOREIGN PATENTS

Number	Country	Date
222,438	Great Britain	Feb. 5, 1925