Dec. 23, 1952 H. P. FARIS ET AL 2,622,818

YARN WINDER

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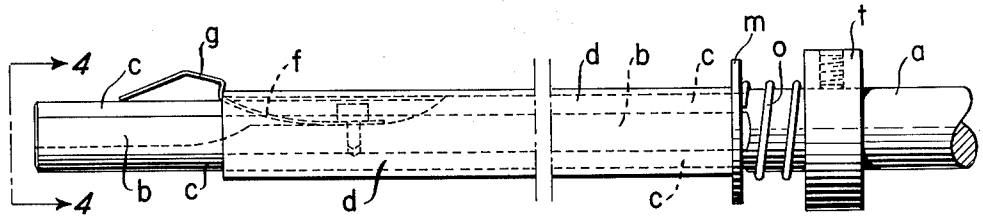

FIG. 1.

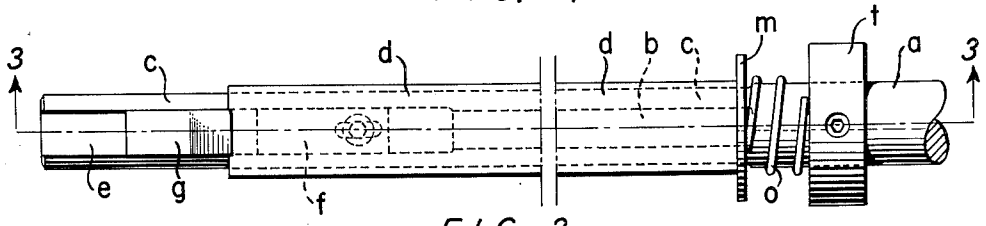

FIG. 2.

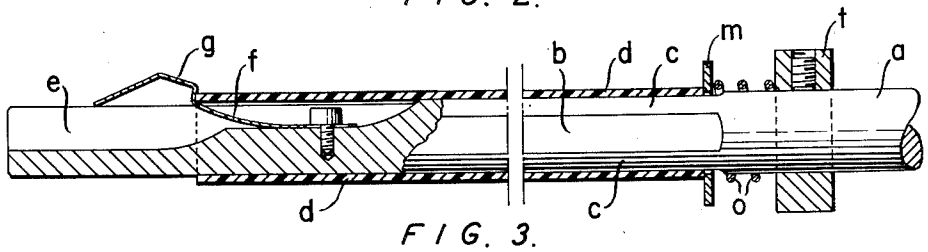

FIG. 3.

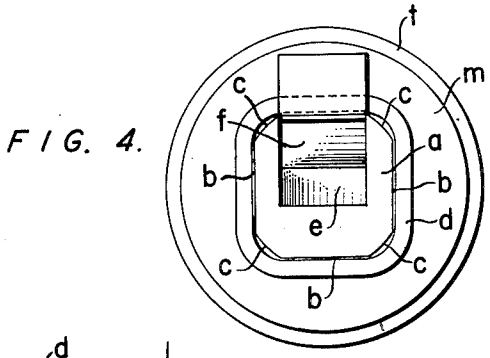

FIG. 4.

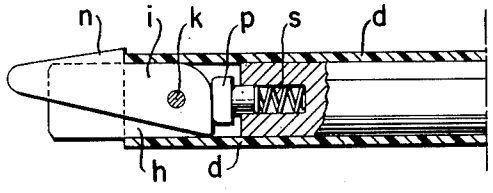

FIG. 5.

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YARN WINDER

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8 Claims. (Cl. 242—68)

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Winders for winding yarns on tubes to be used in the weaving of carpets and other textile fabrics comprise a motor-driven spindle upon which is sleeved a paper tube, applied and removed by hand, upon which, in the rotation of the spindle, the yarn is wound. It is unnecessary to disclose or explain the details of the winding machinery, including the means for moving the yarn, during the winding operation, lengthwise of the spindle, to effect helical winding of the yarn on the tube, since our invention relates solely to the construction of the spindle and spool.

The conventional spindle is circular in cross-section, as is also the tube. Even if the fit of the tube upon the spindle is a fairly tight one, there is no insurance against the turning of the tube upon the spindle. There may also be a sliding movement of the tube relative to the spindle. Various means have been devised to tighten the tube upon the spindle, none of which is free of serious objection.

In the described winding operation the time required to wind upon the tube a predetermined length of yarn is of comparatively short duration, so that the operator must remove the wound tube and replace it with a new tube at frequent intervals. The operations of removal and replacement, due to the need for a tight fit of the tube on the spindle and the manipulation of means designed to effect such tight fit when in place and facilitate removal after winding, must be performed with some care and skill and occupy a not inconsiderable amount of time. Bearing in mind that many of these winders may be in operation, it will be understood that in the course, say, of a year, the labor cost, measured by the time required to remove a wound tube and replace it with a fresh tube, multiplied by the number of times such operation is required on each winder, multiplied by the number of winders, amounts to thousands of dollars.

The object of our invention is to so modify the construction of the spindle and the tube that no tightening of the tube upon the spindle is required to prevent the circumferential slippage of the tube upon the spindle and so that the operations of tube application and removal may be effected within a small fraction of the time now required to be expended in these operations. Not only are these operations performed, with the use of our improvement, much more expeditiously, but the manipulation of the tube requires no special skill or care and the grip of the tube

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on the spindle required to prevent circumferential slippage is absolutely insured.

The invention is susceptible of various specific embodiments, only a few of which need be shown and described.

In the drawings:

Fig. 1 is a side view of the spindle with the tube applied thereto in operative position for winding.

Fig. 2 is a plan view of the same.

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

Fig. 4 is an end view, enlarged, looking in the direction of the arrows, Fig. 1.

Fig. 5 is a sectional view of a modified form of latch.

The spindle *a*, as in the conventional winder, is rotated by a motor (not shown). It differs from the ordinary spindle, aside from the special devices, hereinafter described, applied thereto, only in being slightly tapered and having, in cross-section, a non-circular contour, preferably like that shown in Figs. 1, 2 and 4. The most practicable way of manufacturing the spindle is to form it, in the first instance, of the usual circular contour and then plane it to form a plurality, preferably four, of longitudinally extending flat faces *b* equally spaced apart circumferentially, the unplaned surfaces *c*, spacing apart the flat surfaces, being, breadthwise, of arcuate contour. In addition to the described operation, or as a part of such operation, the spindle is slightly gradually reduced in diameter toward its free, tube-receiving end, throughout the whole, or a substantial part, of that length of the spindle to which the tube is applied. This gradual tapering need be so slight as to be difficult to show on a drawing, and may be effected by slightly planing off the flat faces toward the free end of the spindle, or preferably by slightly turning the arcuate faces toward the free end of the spindle, or by any other convenient expedient.

The tube *d* is shaped to have approximately the same internal contour as the external contour of the spindle. It is not necessary, however, that the inner wall of the tube shall have the precise and exact contour of the spindle surface, but it is necessary that it shall not have an absolutely tight fit on the spindle, the deviation from a circular contour of both the spindle and the tube preventing the latter from turning. Nor is it required that the internal wall of the tube shall have a taper corresponding to that of the spindle, so long as the tube is made of material having

some degree of flexibility, such as the usual paper spool. It is difficult, however, to make a paper tube of any special non-circular contour, but we find it entirely practicable, and much preferable, to make it of any well known plastic material. One advantage of making the tube of uniform internal diameter is that it avoids the necessity of being careful, in slipping it on the spindle, the latter being tapered as above described, to initially apply to the spindle the wider end of the tube. Even should the spindle be not tapered as above described, if the spindle and tube are of substantially corresponding but non-circular contour and have a somewhat loose fit, the tube may be readily applied to, and removed from, the spindle with minimum friction and be held, while on the spindle, and during the winding operation, from circumferential slippage. However, it is highly desirable to still further facilitate and expedite the application of the tube to, and its removal from, the spindle, which can be effected only by slightly tapering the spindle.

As above stated, the invention is best embodied in a plastic tube, since, as compared with tubes of other material, particularly paper tubes, it is not damaged on the inside as an incident of normal use and can be used over and over again on winders and can be used in other operations without impairing its utility for subsequent re-use on winders; and, as above stated, it can readily be given a non-circular shape in cross-section.

To insure proper positioning of the applied tube lengthwise of the spindle, the latter may be of increased diameter beyond its spool-receiving end so as to afford a shoulder against which the spool may abut or a special collar *m* performing the same function of a stop, may be secured to the shaft. (The collar *m* is, however, preferably slidable upon the shaft, as hereinafter described.) To insure against longitudinal slippage of the tube upon the spindle, after its application to the spindle, it is preferred to provide, near the free end of the spindle, a latch which the operator can manipulate, or which may operate automatically, to move out of the path of movement of the tube during its application to, and (or) removal from, the spindle, and to move into such path after the tube is slid into winding position. Preferably this latch should be spring-pressed so that it will always be in latching position except when moved out of such position by the operator prior to slipping the tube off the spindle. A latch so operating is shown in Figs. 1, 2, 3 and 4. Another such latch is shown in Fig. 5.

As shown best in Figs. 2 and 3, the free end portion of the spindle is cut away to form a longitudinally extending groove *e*. One end *f* of a spring pressed latch is secured to the spindle within said groove and the other end *g* carries a head having a forwardly facing lock face perpendicular to the axis of the tube and an inwardly inclined outer end. In sliding the tube *d* onto the spindle, it readily slips over and depresses the latch, which, however, as soon as the rear end of the tube passes beyond it, springs into locking position. Preparatory to removing the wound tube from the spindle, the operator simply presses down into the groove the headed end of the latch.

In Fig. 5 a similar latch is illustrated. In the spindle is cut a longitudinally extending groove *h*, which may be of a depth corresponding to the diameter of the spindle. One end of a lever *i* extends into this groove and is pivoted to the spindle at *k*. The outer end of the lever carries a head *n* having an inner lock face like the head *g* of leaf spring *f*, such outer end of the lever *i* projecting beyond the end of the spindle. Inserted into an axially located recess in the solid end of the spindle is a pin *p* backed by a spring *s*. In sliding the tube onto the spindle it easily slips over the inclined outer end of the lever and, against the pressure of the spring *s*, depresses the lever, which, however, as soon as the rear end of the tube passes beyond it, springs into locking position. Preparatory to removing the wound tube, the operator merely depresses the projecting end of the lever, thereby sinking its head below the plane of the spindle surface.

The stop *m* and the lock face of the latch *k* or *i* may be spaced apart a distance but slightly greater than the length of the tube *d* so that possibility of longitudinal slippage of the tube on the spindle will be almost negligible. However, it is desirable that the tube should be firmly locked between the stop *m* and the latch. To this end the collar *m* is sleeved on the spindle and is pressed forward by a spring *o* confined between the collar *m* and another fixed collar *t* or by a shoulder formed by an enlargement of the shaft. Just before the tube *d*, in its application to the shaft, completes its sliding movement, it engages the collar *m* and moves it, against the tension of the spring *o*, the slight distance required to clear the latch. Thereafter the tube is securely confined between the collar *m* and the latch, thus confining the tube against any slight longitudinal movement.

An additional and important function performed by the spring-pressed collar *m* is that, in the withdrawal of the tube, wound with yarn, from the spindle, the spring-pressed collar *m*, after the recession of the latch, gives a preliminary impulsive movement to the tube, which facilitates its ready withdrawal from the spindle.

From the foregoing description it will be apparent that the application and removal of the tube can be effected in scarcely more than an instant of time. If the spindle is equipped with either of the spring latches described, then, aside from the manual sliding of a tube on and off the spindle, it is only necessary, preparatory to removing a tube, to depress the latch with the finger of one hand preparatory to slipping off the tube with the other hand; while in the application of a tube to the spindle the operation of the latch is entirely automatic.

It is also clear that, by the exercise of ordinary mechanical skill, the details of the above described embodiment of our invention may be modified. For example, the described and illustrated cross-sectional contour of the spindle and tube need not be adhered to. All that is required is that these elements shall have substantially corresponding non-circular cross-sectional contours, that the fit of the tube on the spindle shall not be tight, and that the spindle should be slightly tapered toward its free end throughout the whole or a substantial part of its length. So, also, any latch, preferably but not necessarily spring-actuated, may be substituted for the described and illustrated latches. For example, the lever *i* need not be a spring lever or spring-actuated, but such modification would require the depression of the latch before slipping the tube upon the spindle as well as before its removal. With any of these obvious modifications, the time required to apply and remove the tube is exceed-

ingly short, while the spindle and tube will, with certainty, throughout the winding operation, rotate as a unit.

What is claimed is:

1. In a machine for winding yarn on tubular spools, the combination with a motor-driven spindle and a tube movable onto and off its free end; and including also a stop on the spindle to limit the sliding movement of the tube thereon and a latch at the free end of the tube that is movable into position behind the tube after the engagement of the tube with the stop, said stop being slidable upon the spindle and being spring-pressed toward the free end of the spindle and which is movable against spring-pressure by the engagement of the tube therewith and which, after the tube clears the latch, is movable in the opposite direction to confine the tube between the stop and the latch, said latch having a free tail end which extends inward toward the spindle and terminates a distance from the axis of the spindle not greater than the radius of the tube to thereby allow the tube to be applied to the spindle without the necessity of hand-depressing the latch.

2. In a machine for winding yarn on tubular spools, the combination of a motor-driven spindle, a tube movable onto and off its free end, the outer end of the spindle being longitudinally grooved along that part of its length which receives the rear end of the tube when the latter is applied to the spindle, and a spring-pressed latch one end of which is secured to the spindle within said groove and the other end of which has a forwardly facing lock face and extends beyond the rear end of the tube after the latter is applied to the spindle and which is adapted to be depressed by the tube against its actuating spring during the slippage of the tube upon the spindle and which is adapted, when the slippage of the tube upon the spindle is completed, to spring outward and move its lock face back of the rear end of the tube.

3. The combination defined in claim 2 in which the latch at its outer end has an inwardly inclined face whose outer end is not above the plane of the surface of the spindle longitudinally aligning therewith before the application of the tube, thus, without manual operation of the latch, effecting its automatic depression in the application of the tube to the spindle.

4. The combination defined in claim 2 in which the latch comprises a leaf spring which extends rearward from its secured end toward the outer end of the tube, thence bent outward to form the lock face and thence extending rearward and inward.

5. The combination defined in claim 2 in which the latch comprises a lever which at one end is pivoted to the spindle, its other end having an outwardly extending lock face and a rearwardly and inwardly extending edge, the spindle having an axially extending recess, a pin extending into said recess and engaging the pivoted end of the lever and a spring in said recess between said face and the base of the recess.

6. In a machine for winding yarn on tubular spools, the combination with a motor-driven spindle and a tube movable onto and off its free end; the spindle, throughout a substantial part of the length thereof adapted to receive the spool, having a non-circular transverse cross-sectional contour, and the tube having an inner wall of a transverse cross-sectional contour conforming substantially to that of the spindle, but having a somewhat loose fit thereon, a collar slidable upon the spindle and which is spring-pressed toward the free end of the spindle and which is retractable against spring-pressure by the engagement of the forward end of the tube therewith, a spring-actuated latch seating in a longitudinal groove in the spindle that is movable laterally inward by the tube when the tube is applied to the spindle and which is movable by its spring laterally outward into position behind the tube after the tube is slipped into yarn-winding position and retracts the collar as above specified, the collar being then spring-actuated to move the tube toward the outer end of the spindle and confine the tube between the collar and the latch.

7. In a machine for winding yarn on tubular spools, the combination with a motor-driven spindle and a tube movable onto and off its free end; the exterior face of the spindle having spaced apart longitudinally extending surfaces which, in transverse cross-section, are respectively of arcuate and straight contours, the arcuate surfaces being slightly tapered toward the free tube-receiving end; the tube having an internal wall of a contour approximating that of the external face of the spindle but of uniform internal diameter, while at its free end the spindle has a transverse cross-sectional area less than the transverse cross-sectional area of the internal wall of the tube.

8. In a machine for winding yarn on tubular spools, the combination with a motor-driven spindle and a tube movable onto and off its free end; the spindle having a non-circular transverse cross-sectional contour and the tube having an inner wall of a transverse cross-sectional contour substantially conforming to that of the spindle, the transverse cross-sectional area of the tube being substantially uniform throughout its length, the spindle, throughout a substantial part of the length thereof adapted to receive the tube, being slightly tapered toward its free tube-receiving end and at that end being of smaller cross-sectional area than the inner wall of the tube to facilitate ready slippage of the tube upon the spindle.

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