

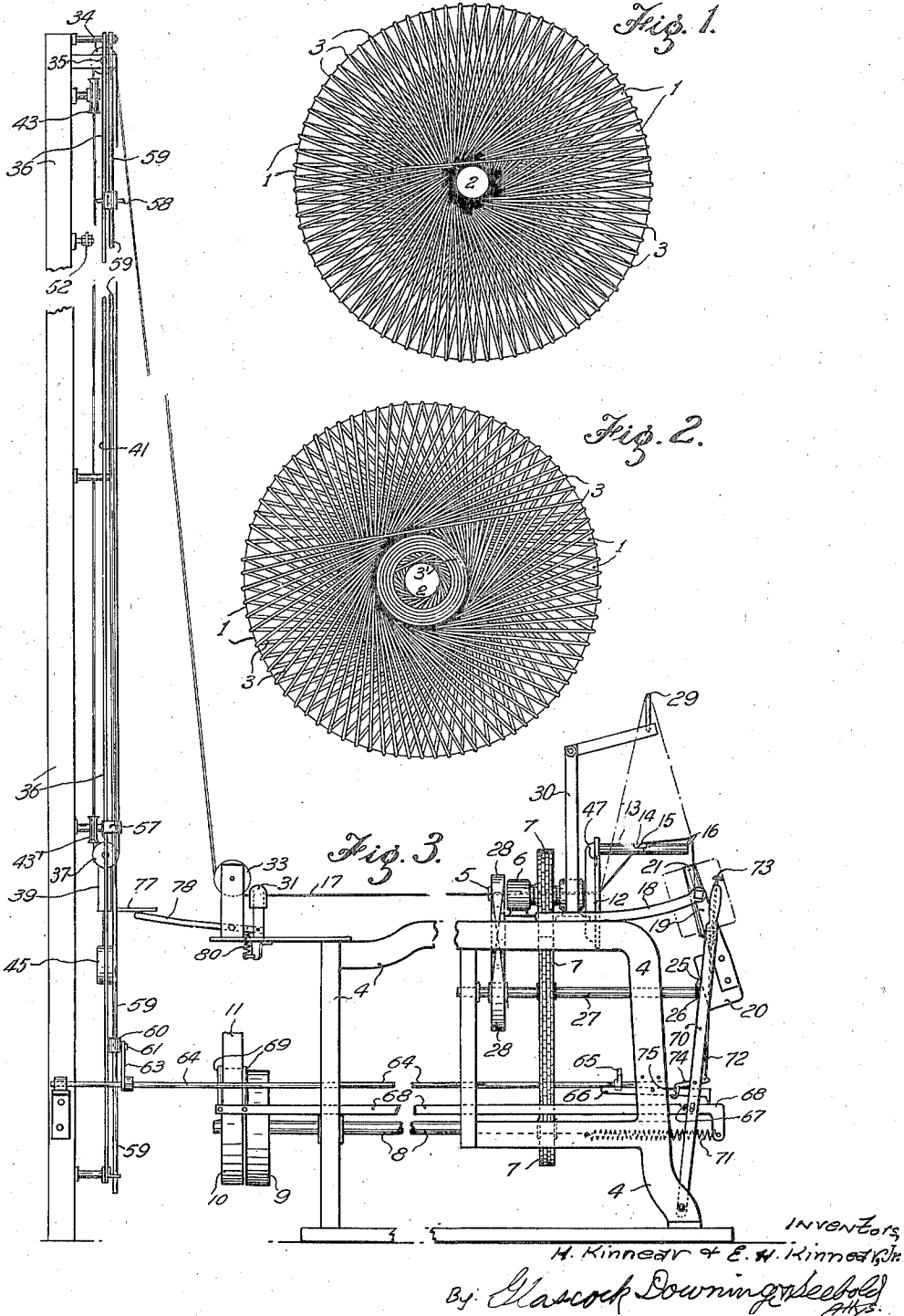
April 26, 1938.

H. KINNEAR ET AL
WINDING OF TWINE SPOOLS

2,115,636

Filed Oct. 7, 1935

3 Sheets-Sheet 1



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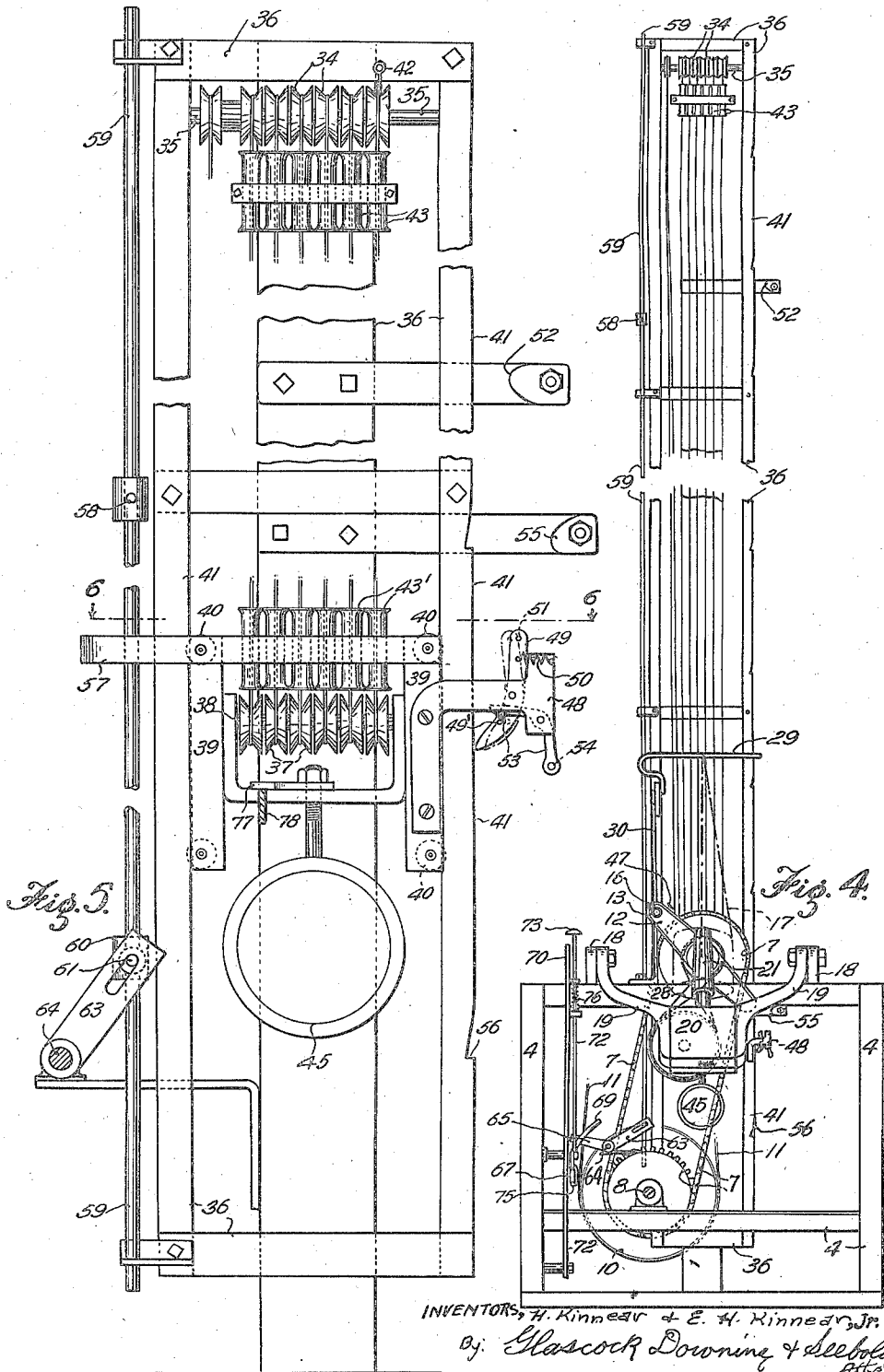
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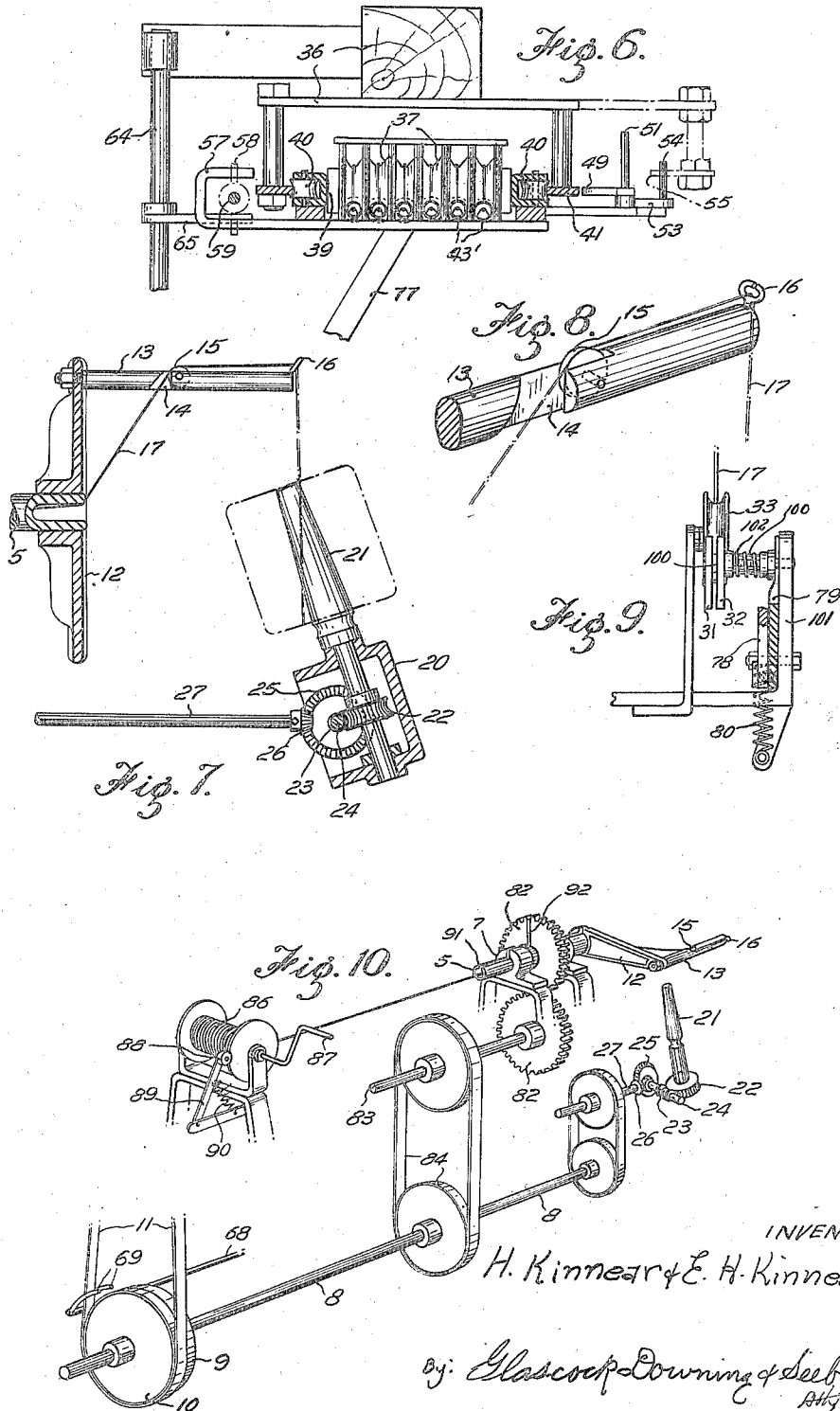
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UNITED STATES PATENT OFFICE

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WINDING OF TWINE SPOOLS

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This invention relates to improvements in twine spools and means for winding same and refers especially but is not limited to twine spools of the kind used in reaping and binding machines for binding the sheaves of hay.

These spools are usually of cylindrical shape and are formed with flat ends and with an axial opening extending from end to end thereof whilst the windings are of the well known universal type. In use, the twine is drawn from the centre of the spool and it has been found that when the major portion has been unwound, the remaining outer layers of the winding, tend to collapse and cause tangling and snarling.

To obviate this disability it has heretofore been proposed to provide the "Universal" wound spool with a cover winding which serves to hold the outer layers of the main winding in position under the circumstances above mentioned and also to prevent endwise bulging or spreading of the said main winding.

This cover winding is usually of open mesh formation and is wound at a relatively small angle to the axis of the main winding, whereby the convolutions extend substantially longitudinally over the periphery of the main winding and across the ends thereof.

In one known arrangement, this cover winding is so wound as to provide at each end of the spool an axial opening which is larger in diameter than the axial opening in the main winding so that an annular portion of each end of the core is exposed.

In another known arrangement the cover winding at one end of the spool is disposed flush with the periphery of the axial hole in the core winding whilst, at the other end of the spool, the said cover winding is formed with an axial hole which is larger in diameter than said hole in the main winding.

This last mentioned arrangement has the advantage of indicating to the user, by reason of the larger opening at one end, of the spool, the correct end from which to withdraw the free inner end of the twine.

In all known methods of covering a Universal wound spool, it has been necessary to form the spool on a spooling machine and then to transfer the spool to a covering machine where the portion of the twine to form the cover windings is knotted to the outer end of the twine forming the main winding of the spool prior to the winding operation to form the open mesh cover.

This knot connecting the twine forming the cover winding to the spool has been recognized

as a disadvantage, as it is liable to interfere with the normal operation of the binder tying mechanism.

By means of our invention, the necessity for this knot has been obviated, and the twine forming the cover and the twine forming the major portion of the spool is spun in one continuous unbroken length.

The object of the invention resides in the provision of an improved cover winding for a spool of twine and apparatus for forming the said cover winding from a single unbroken length of twine thereby eliminating the necessity of forming a knot between the portions forming the main winding or core and the cover winding.

One broad feature of the invention resides in providing a universally wound core of cylindrical shape with a cover winding the convolutions of which are disposed substantially longitudinally, and which is so arranged as to completely cover the axial core opening at one end of the spool or alternatively to form a central opening which is appreciably smaller in diameter than the axial opening in the core.

The opening in the said cover winding at the opposite end of the ball may be flush with or of larger diameter than the core opening.

The preferred form of apparatus for carrying out the method comprises a rotatively mounted spindle for supporting a spool of twine, a flyer arm arranged adjacent to the spool carrying spindle and mounted on a hollow shaft having means for imparting rotation thereto synchronously with and at a higher rate of speed than the rotation imparted to the spindle supporting the spool, a cord or like flexible member passing through the hollow shaft and adapted to be connected to the outer end of the twine forming the spool, means for exerting a pull on the flexible member to unwind portion of the twine from the spool, and means whereby when the twine is connected to the flyer arm and the said flyer arm and spool carrying spindle are in motion the portion of the twine unwound from the spool will be wound around the same to form the open mesh cover winding thereon.

The apparatus embodied in the invention also comprises certain novel combinations and arrangement of parts which will hereinafter be fully described.

In the accompanying drawings, illustrating the preferred embodiment of the present invention:

Figure 1 is a view in inverted plan showing the lower end of a spool of twine having a cover winding formed in accordance with the invention.

Figure 2 is a view in plan of the spool.

Figure 3 is a view in side elevation of one form of apparatus for applying an open mesh cover winding to a spool of twine in accordance with the invention.

Figure 4 is a view in front elevation of the apparatus shown in Figure 3.

Figure 5 is a view in front elevation of part of the apparatus drawn to a larger scale than Figures 3 and 4.

Figure 6 is a view in sectional plan taken on the dotted line 6—6 of Figure 5.

Figure 7 is a view in side elevation of the spool carrying spindle, flyer arm and portion of the hollow shaft supporting the said arm, portions being shown in section to illustrate details in construction.

Figure 8 is a view in perspective of portion of the flyer arm.

Figure 9 is a view in front elevation of a tensioning or gripping device for the twine, and hereinafter is fully described.

Figure 10 is a view in perspective of a modified form of apparatus for forming an open mesh cover winding on a spool of twine.

In these drawings where like characters of reference are used to indicate similar parts in the different views the numeral 1 designates a compactly wound inner core or main winding of a spool of twine which is formed on the well known type of universal winding machine.

The spool is formed with a slightly tapered axial hole 2 which extends from end to end thereof.

The main winding or core of the spool is provided with an open mesh cover winding 3 which is formed from a continuation of the twine forming the main winding. The twine from which the cover winding is formed, preferably, is unwound from the outer part of the main winding and this unwound portion is rewound tightly around the main winding to form the cover winding 3, see Figures 1 and 2.

The ends of the main winding of the spool are flat and the cover winding is so applied that the strands thereof overlay the axial hole at one end of the spool to a greater or lesser extent, as required, and leave an uncovered area 3' surrounding the hole at the other end of the spool.

If preferred the strands of the cover winding can pass diametrically or substantially diametrically across one end of the spool whereby the axial hole will be entirely or almost entirely covered.

It is well known that if the free inner end of the twine is pulled out of the correct end of the spool that it will unwind more freely and be less liable to snarl than if pulled out of the other end of the spool. Thus if the pull is in a direction against the twist of the twine the liability of snarling is much greater than if the pull is in the same direction as the twist in the twine. When the cover winding is applied as hereinbefore described the end of the axial hole from which the free end of the twine should be drawn is left quite open and free from obstruction whilst the opposite end is entirely or almost entirely closed, thereby affording easy access to the thread from the right end of the spool and making it difficult of access from the wrong end thereof.

Referring now to Figures 3 to 9 of the drawings illustrating apparatus which has been devised to carry the improved method into practical effect the numeral 4 designates a frame upon which is mounted a hollow spindle 5 carried in bearings 6.

The hollow spindle 5 is driven by chain and sprocket gearing 7 from a drive shaft 8 rotatively mounted in the lower part of the frame and fitted with fast and loose pulleys 9, and 10, respectively, adapted to be driven by a belt 11 from any suitable source of power. The front end of the hollow spindle 5 is fitted with a flyer arm 12 having a spindle 13 projecting forwardly from one end thereof, provided with a recess 14 in which is mounted a grooved guide roller 15.

The outer end of the spindle on the flyer arm is provided with an open eye 16 which together with the roller 15 serves as a guide for a pull cord 17 which is passed through the hollow spindle, over the roller 15 and through the said eye. A pair of brackets 18 project forwardly from the frame and the outer ends of the said brackets are connected to arms 19 fitted to and projecting upwardly from a casting 20 supporting an inclined rotatably mounted spool carrying spindle 21.

The portion of the spool carrying spindle extending through the casting 20 is fitted with a worm wheel 22 which meshes with a worm 23 carried on a transverse spindle 24. The spindle 24 is also provided with a bevel gear 25 which meshes with a bevel cog 26 carried on a shaft 27 rotatively mounted in the frame 4 and driven by belt and pulley gearing 28 from the hollow spindle 5.

Thus, when motion is applied to the driving shaft a comparatively rapid rotary motion is imparted to the flyer arm and a slow rotary motion is imparted to the spool carrying spindle.

The spool carrying spindle is set at a rearward inclination and at a suitable height thereabove a guide arm 29 is supported by a bracket 30 which is affixed to the frame 4. The construction and disposition of the spool carrying spindle and flyer arm are somewhat similar to the corresponding elements of an ordinary ball winding machine. The pull cord passes rearwardly from the hollow spindle 5 between a pair of clamping plates 31 and 32, around a guide roller 33 and upwardly to and over the first of a series of rollers 34 rotatively mounted on a spindle 35 carried on the upper end of a vertical frame 36. Plates 31, 32 are carried by a shaft 100 mounted in a bracket 101, plate 31 being fixed adjacent the extremity of said shaft, and plate 32 interposed between the bracket and plate 31 but yieldingly urged toward the latter by a spring 102.

After passing around the first roller 34 the pull cord passes downwardly to and around the first of a series of rollers 37 mounted on a spindle 38 supported by a carrier 39 which is adapted to slide vertically in the frame 36. The frame 39 is provided with rollers 40 which engage with and freely traverse vertical side members 41 of the frame 36. After passing around the first roller of the lower series 37 the pull cord is led upwardly to and over the second roller of the upper series and then downwardly to and around the second roller of the lower series and after passing around all of the rollers in both series as above described the end of the cord is attached to the vertical frame, as at 42.

In order to ensure the pull cord being guided correctly to, and being retained within the groove in the rollers 34 and 37 it may be arranged to pass through tubular guides 43 on the upper end of the frame 36 and through tubular guides 43' on the carrier 39, see Figures 5 and 6 of the drawings.

The carrier 39 is provided with a depending

weight 45 which ensures a desired tension being maintained on the pull cord.

When a spool of twine wound on a universal winding machine in the ordinary way and of correct size and weight is placed on the inclined spindle 21 the outer end thereof is passed upwardly over the guide arm 29 and is connected by a knot or in any other approved way to the free end of the pull cord 17 whereby when the carrier 39 is allowed to gravitate downwardly to the lower end of the vertical frame 36, a sufficient length of twine will be unwound from the spool to form an open mesh cover winding about the spool when the machine is operated to impart rotation to the flyer arm and to the spool carrying spindle.

Prior to placing the machine in operation the twine is slipped over the end of the guide arm 29 and is threaded around the roller 15 and through the eye 16 whereby the open mesh windings will be formed at an angle around the sides of the ball so as to overlap each other and form diamond shaped meshes through which the inner cord will be visible and across the ends of the spool as indicated in Figures 1 and 2 of the drawings.

The disposition of the spindle with respect to the eye 16 on the end of the spindle on the flyer arm 12 is such that the cross windings at the upper end of the spool will cross and completely or partially cover the axial hole 2 while the transverse windings at the lower end of the spool will be located at a distance from the said axial hole thereby leaving portion of that end of the spool exposed, as shown in Figure 2.

During the application of the open mesh cover winding a desired tension will be maintained on the twine by the weight 45 attached to the movable carrier 39. When the cover winding has been completed the free end of the pull cord 17 will have passed beyond the front end of the hollow spindle 5 and the machine is stopped automatically as hereinafter described.

The carrier 39 will then be in its raised position and the operator severs or detaches the end of the twine from the outer end of the pull cord after attaching the pull cord to a hook 47 on the flyer arm. The free end of the twine is then fastened to the spool and the spool is removed from the spindle 21.

The carrier 39 carrying the lower series of rollers 37 is provided with a laterally projecting bracket 48 having a pawl 49 pivoted thereto and acted upon by a spring 50 to maintain the lower end of the pawl bearing against the outer edge of the adjacent vertical member 41 of the frame 36.

A pin 51 projects rearwardly from the upper end of the pawl 49 and when the carrier 39 is reaching the uppermost limit of its travel the pin 51 contacts with a cam faced abutment 52 and is forced inwardly to cause the lower end of the pawl to be moved outwardly from the side member 41 and a pin 49' on the lower part of the pawl to be engaged by a catch 53 pivoted to the bracket 48. The catch 53 will retain the pawl 49 out of engagement with the side member 41.

When the carrier 39 is nearing the lowermost part of its travel a pin 54 projecting rearwardly from an arm depending from the catch 53 contacts with a cam shaped abutment 55 thereby causing the said catch to be released and allowing the engaging end of the pawl to be forced inwardly by the action of the spring 50. When

the carrier 39 has descended a desired distance the pawl 49 will engage with a recess 56 in the side member 41 and arrest the further downward movement of the said carrier thereby obviating any excessive unwinding of the twine from the ball supported by the spindle 21.

An arm 57 projects laterally from the carrier 39 and when the said carrier is nearing the limit of its upward travel the said arm contacts with an abutment 58 adjustably fitted to a vertical rod 59 reciprocally mounted on the frame 36.

The lower part of the rod 59 is provided with a collar 60 having a pin 61 projecting forwardly therefrom and engaged by a slot in an arm 63 fitted to a horizontally disposed rock-shaft 64 oscillatively mounted in bearings on the frame 36 and on the frame 4 of the machine. The forward part of the rock-shaft is provided with a laterally projecting arm 65 which is located above the rear arm of a pawl 66 pivotally mounted on the frame 4. The front end of the pawl 66 is adapted to engage with a recess 67 in a belt shifting rod 68 slidably mounted on the frame of the machine.

The rear end of the belt shifting rod is provided with a fork 69 for engaging the driving belt 11 and an operating lever 70 connected to the front end of the said rod 68 and pivotally mounted on the frame 4 is adapted to be oscillated to cause the belt shifting rod to be reciprocated to move the belt 11 from the fast to the loose pulley and vice versa as desired.

When the belt shifting rod is in its forward position the belt is located on the fast pulley 9 and the pawl 66 engaging with the recess 67 in the belt shifting rod retains the said belt on the said fast pulley. When the rock-shaft 64 is oscillated by the arm 57 on the carrier 39 striking against the collar 60 the arm 65 will depress the rear end of the pawl 66 causing the engaging end thereof to be removed from the recess 67. When the pawl 66 is released a tension spring 71 will cause the belt shifting rod to be moved rearwardly to place the belt 11 on the loose pulley 10 thereby rendering the machine inoperative.

A rod 72 having a knob 73 at its upper end is reciprocally mounted on the side of the lever 70 and the lower end of the said rod is connected to the front end of a short lever 74 oscillatively mounted on the said lever 70.

The rear end of the oscillatively mounted lever 74 is provided with a depending hook shaped member 75 which loosely engages and is free to slide on the forward end of the pawl 66 when the belt striking lever 70 is actuated. A spring 76 exerts an upward thrust on the rod 72 thereby causing the rear end of the oscillatively mounted lever 74 to bear down upon the engaging end of the pawl 66.

Should the operator desire to render the machine inoperative he merely presses downwardly on the knob 73 to cause the rear end of the oscillatively mounted lever to be raised to disengage the pawl 66 from the recess 67 in the belt shifting rod 68, when the spring 71 will automatically cause the belt shifting rod to be moved rearwardly to move the belt 11 from the fast pulley 9 to the loose pulley 10.

When the carrier 39 is nearing the lowermost part of its travel a forwardly projecting arm 77 thereon contacts with and depresses a lever 78 to cause the clamping plates 31 and 32 to frictionally engage the twine thereby preventing any excessive unwinding of the twine from the spool. The lever 78 is pivotally mounted on a standard

supporting the guide roller 33 and its forward end is pivotally connected to a vertically reciprocable plate 79 having a slot in its upper end loosely engaging the spindle supporting the clamping plates 31 and 32.

The upper end of the reciprocatively mounted plate is of wedge shape construction so that when it is thrust upwardly by the movement of the lever 78 it causes the movable clamping plate to move towards the fixed clamping plate whereby the twine will be frictionally engaged therebetween.

When a pull is imparted to the twine at the commencement of the winding of the open mesh cover, the carrier 39 is raised and the lever 78, and the reciprocatively mounted wedge will be returned to their normal positions by a spring 80 which exerts a constant downward pull on the front end of the said lever.

In operation the free end of the permanently threaded pull cord 17 is attached to the outer end of the spool mounted on the spindle 21 and sufficient twine is pulled from the said spool to enable it to be passed over the guide arm 29. The pull cord is then detached from the fastening hook 47 when the weight 45 will cause the carrier 39 to descend by gravity to the lower end of the frame 36.

During the descent of the carrier 39, sufficient twine is removed from the spool to enable a cover winding to be subsequently formed therefrom. The twine is then slipped over the end of the guide arm 29 and threaded over the guide roller 15 and through the open eye 16 on the spindle 13. The operator then pulls forwardly on the lever 70 to cause the driving belt 11 to be moved from the loose pulley 10 to the fast pulley 9 on the driving shaft 8 when motion will be imparted to the machine and the flyer arm 12 and spool carrying spindle 21 will be rotated to cause the open mesh cover winding to be applied to the spool on the said spindle.

When the carrier 39 is reaching the upper end of its travel the arm 57 thereon will strike against the abutment collar 58 on and elevate the rod 59. The upward movement of the rod 59 will cause an oscillative movement to be imparted to the rock-shaft 64 and the arm 65 thereon to depress the rear end of the pawl 66 to cause its front end to be disengaged from the recess 67 in the belt shifting rod 68 when the spring 71 will cause the said rod to be moved rearwardly to place the driving belt on the loose pulley and stop the machine. The operator then pulls on the cord 17 to obtain sufficient looseness to enable it to be securely attached to the retaining hook 47 on the flyer arm.

When the permanently threaded pull cord 17 is attached to the flyer arm the operator detaches the end of the twine from the pull cord and fastens the same to the cover winding and the spool is removed from the spindle 21 and replaced by another spool around which a cover winding is applied in the manner above described.

In the modified form of apparatus shown in Figure 10 of the drawings the hollow spindle 5 is driven by toothed gearing 82 from a counter shaft 83 driven by belt and pulley gearing 84 from the driving shaft 8 and the shaft 27 is driven by belt and pulley gearing 85 from the said drive shaft 8.

In this form of the invention the rear end of the pull cord is attached to a winding drum 86 which is operated by a crank handle 87 or by other approved means. Frictional resistance to the operation of the winding drum may be ap-

plied by a roller 88 bearing upon the drum and attached to a pivoted arm 89 having a spring 90 acting thereon to maintain the roller 88 bearing against the winding drum.

A longitudinally disposed slot 91 extends the full length of the spindle 5 and into the bore thereof and corresponding slots are formed in the supporting bearings for the said spindle. The boss of the flyer arm and the upper gear wheel 82 are formed with radial slots 92 which are arranged in alignment with the slot 91 in the spindle 5. When the slots 91 and 92 are arranged in alignment with the slots in the bearings for the hollow spindle, the pull cord 17 can be radially passed into the bore of the said hollow spindle 5 and when the machine is operated the twine will be drawn therethrough without fouling the said slots.

In the operation of the modified form of the apparatus, the free end of the pull cord is attached to the outer end of the twine on a spool supported by the spindle 21 and when the pull cord is inserted through the slots 91 and 92 and is located axially within the spindle 5 the operator can rotate the winding drum to wind a sufficient amount of twine thereon to form the outer open mesh cover winding on the spool.

The portion of the twine located between the flyer arm and the spool is then threaded over the roller 15 on the spindle 13 attached to the flyer arm 12 and through the open eye 16 on the front end thereof so that, when motion is imparted to the machine, the outer cover winding will be applied to the spool in the manner hereinbefore described.

When the open mesh cover winding has been completely wound on the spool the free end of the pull cord will be located beyond the front end of the hollow spindle and the twine can be detached therefrom and attached to the finished spool which is then removed from the spindle 21.

We claim:—

1. An apparatus for forming an open mesh cover winding on a spool of twine and having a flyer arm adapted to rotate about a spool supported on a rotary spindle, characterized in that the flyer arm is mounted on a hollow spindle, a flexible member passes axially through the hollow spindle and is adapted to be connected at its front end to the outer end of the twine on the spool, means for exerting a pull on the rear end of the flexible member to unwind portion of the twine from the spool, and means for guiding the unwound twine over the flyer arm whereby when the apparatus is in motion the unwound portion of the twine will be wound around the spool at an angle to the longitudinal axis thereof.

2. An apparatus for forming an open mesh cover winding on a spool of twine having a rotatively mounted spindle for carrying the spool of twine and a flyer arm adapted to rotate about the said spool characterized in that the flyer arm is fitted to a rotatively mounted hollow spindle, a frame supporting a series of rotatively mounted pulleys, a series of pulleys rotatively mounted on a carrier movably supported on the frame, a cord having one end connected to a fixed member and looped around the series of fixed and movable pulleys and having its opposite end threaded through the hollow spindle and detachably connected to the outer end of the twine on the spool whereby portion of the twine will be unwound from the spool and be wound about the pulleys when the movable pulleys are moved away from the fixed pulleys.

3. An apparatus for forming an open mesh cover winding on a spool of twine consisting of a frame, a hollow spindle rotatively mounted on the frame and having a flyer arm fitted thereto, mechanism for imparting rotation to the hollow spindle, an inclined spool carrying spindle rotatively supported in advance of the flyer arm, gearing for imparting rotation to the inclined spool carrying spindle, a guide bar located above the inclined spool carrying spindle, series of fixedly and movably mounted pulleys, a cord having its rear end connected to a fixed member and looped around the series of fixedly and movably mounted pulleys, the free end of said cord passing through the hollow spindle, and means on the apparatus for detachably connecting the free end of the cord or flexible member thereto.

4. In an apparatus according to claim 3, vertical guide members, a series of pulleys supported on a transverse spindle at the upper end of the vertical guide members, a carrier reciprocally mounted on the vertical guide members and having a series of pulleys rotatively mounted thereon, an arm projecting from the carrier, a reciprocally mounted rod disposed parallel to the guide members, an abutment on the upper part of the reciprocally mounted rod and disposed in the path of movement of the arm on the carrier, a rock-shaft on the frame, a loose connection between a lower part of the rod and an arm on the rockshaft, and an arm on the rock shaft located above the pawl for engaging with the belt shifting rod, constructed and arranged whereby when the carrier is nearing the upper end of its travel the arm thereon will contact with the abutment and raise the rod to impart an oscillating movement to the rockshaft to cause the arm thereon to bear upon and release the pawl engaging the belt striking rod.

5. In an apparatus according to claim 2, a bracket projecting laterally from the carrier, a pawl on the bracket, a spring acting on the pawl to force the engaging end thereof toward an adjacent vertical guide member on the frame, a pin projecting from the pawl, a cam shaped abutment near the upper part of the said frame and arranged in the path of movement of the pin on the pawl, a catch pivotally mounted on the bracket and adapted to engage the pin on the pawl to hold the latter away from the guide member, a pin projecting from the catch, a cam shaped abutment arranged in the path of movement of the pin on the catch and adapted to actuate the same to release the pawl when the carrier is nearing the lower end of its travel, and recesses in the vertical guide member adapted to engage the pawl to arrest the movement of the carrier.

6. In apparatus according to claim 2, an arm projecting forwardly from the carrier, a standard on the rear of the frame supporting the flyer arm, a pulley on the standard for guiding the pull cord and twine unwound from the spool, a bracket supporting a transverse pin, fixed and movable clamping plates on the pin, a collar on the pin, a spring disposed between one of the clamping plates and the collar on the pin, a bevelled plate between the collar and the bracket supporting the pin, a pivoted lever connected to the bevelled plate and having an arm arranged in the path of movement of the carrier whereby when the carrier descends and depresses the lever the bevelled plate will be thrust upwardly to force the clamping plates toward each other and to frictionally engage the twine passing therebetween.

7. An apparatus for forming an open mesh cover winding on a spool of twine comprising a rotatively mounted spindle for supporting the spool of twine, a hollow shaft having means for imparting rotation thereto synchronously with and at a higher rate of speed than the rotation imparted to the spindle supporting the spool, a flyer arm mounted on the hollow shaft and arranged adjacent to the spool carrying spindle, a flexible member passing through the hollow shaft and adapted to be connected to the outer end of the twine forming the spool, means for exerting a pull on the flexible member to unwind portion of the twine from the spool, and means whereby when the twine is connected to the flyer arm and the said flyer arm and spool carrying spindle are in motion the portion of the twine unwound from the spool will be wound around the same to form the open mesh cover winding thereon.

8. In an apparatus according to claim 1, aligned slots in one side of the hollow spindle and in the flyer arm mounted therein, a gear wheel on the hollow shaft having a slot formed radially therein in alignment with the slot in the hollow spindle, and slots in bearings for the hollow spindle said slots being arranged whereby the flexible member can be inserted into the hollow spindle.

9. An apparatus for forming an open mesh cover winding on a spool of twine and having a flyer arm adapted to rotate about a spool supported on a rotary spindle, characterized in that the flyer arm is mounted on a hollow spindle, a cord passing through the hollow spindle and adapted to be connected to the free end of the twine on the spool, two series of relatively movable pulleys around which said cord is wound whereby when the two series of pulleys are moved apart a portion of the twine will be unwound from the spool, and means for guiding the unwound twine over the flyer arm whereby when the apparatus is in motion the unwound portion of the twine will be wound around the spool at an angle to the longitudinal axis thereof.

10. An apparatus for forming an open-mesh cover winding on a previously wound spool of twine comprising a rotatable support on which the previously wound spool is adapted to be placed, means for unwinding the outer portion of the twine from the spool and maintaining said unwound portion tensioned, means for rotating the spool support, and means for rewinding the unwound portion of twine about the spool at an angle to the longitudinal axis thereof and transversely of the original windings.

11. An apparatus for forming an open-mesh cover winding on a previously wound spool of twine comprising a rotatably mounted spindle on which the wound spool can be placed, a flyer arm mounted on a hollow spindle and arranged to rotate about the spool-carrying spindle, means for unwinding the outer portion of the twine from a spool on the spool-carrying spindle and maintaining said unwound portion under tension, means for attaching the unwound portion of the twine to said flyer arm, and means for moving said flyer arm relatively to said spool to wind said unwound portion of the twine about the spool at an angle to the axis thereof and transversely of the original windings.

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