United States Patent [19]

Fink

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[54] **CONTINUOUS YARN WINDING APPARATUS**

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[52] **U.S. Cl.** ..... **242/18 A,** 242/18 PW

[51] **Int. Cl.** **B65h 54/02**

[58] **Field of Search** ..... 242/18 A, 25 A, 18 PW

[56] **References Cited**

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[57] **ABSTRACT**

Method and apparatus are disclosed for transferring yarn from a completed yarn package to an empty reel in a continuous yarn winding process whereby a plurality of yarn winding arbors are rotated around a centrally located drive roller. Rotation is caused by interaction of spring tensioned arbors along a cam guide which positions the arbors relative to the drive roller.

2 Claims, 5 Drawing Figures

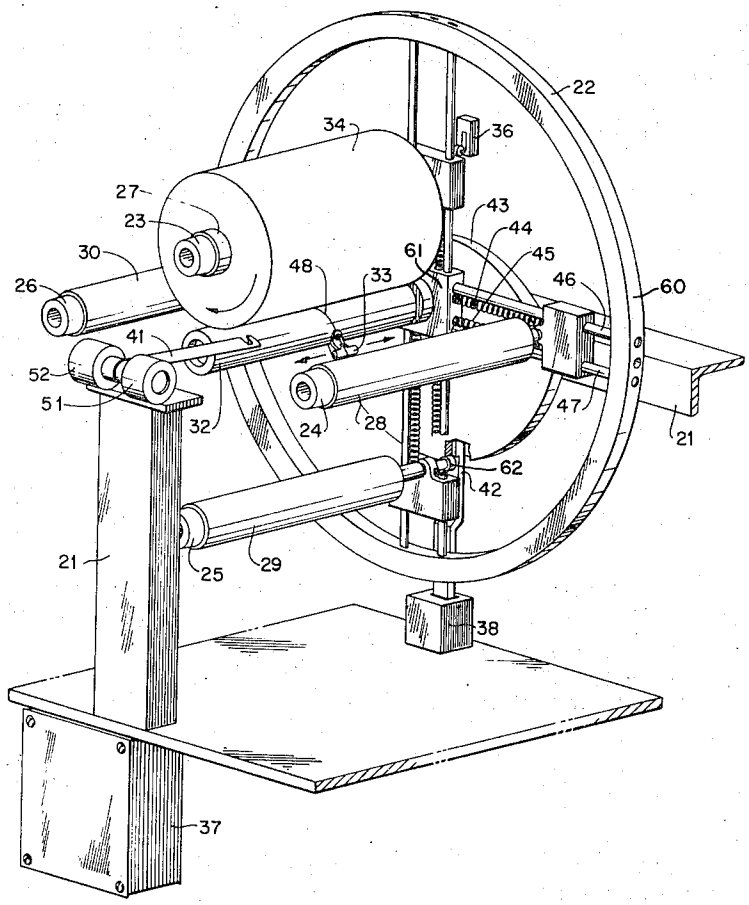

FIG. 1

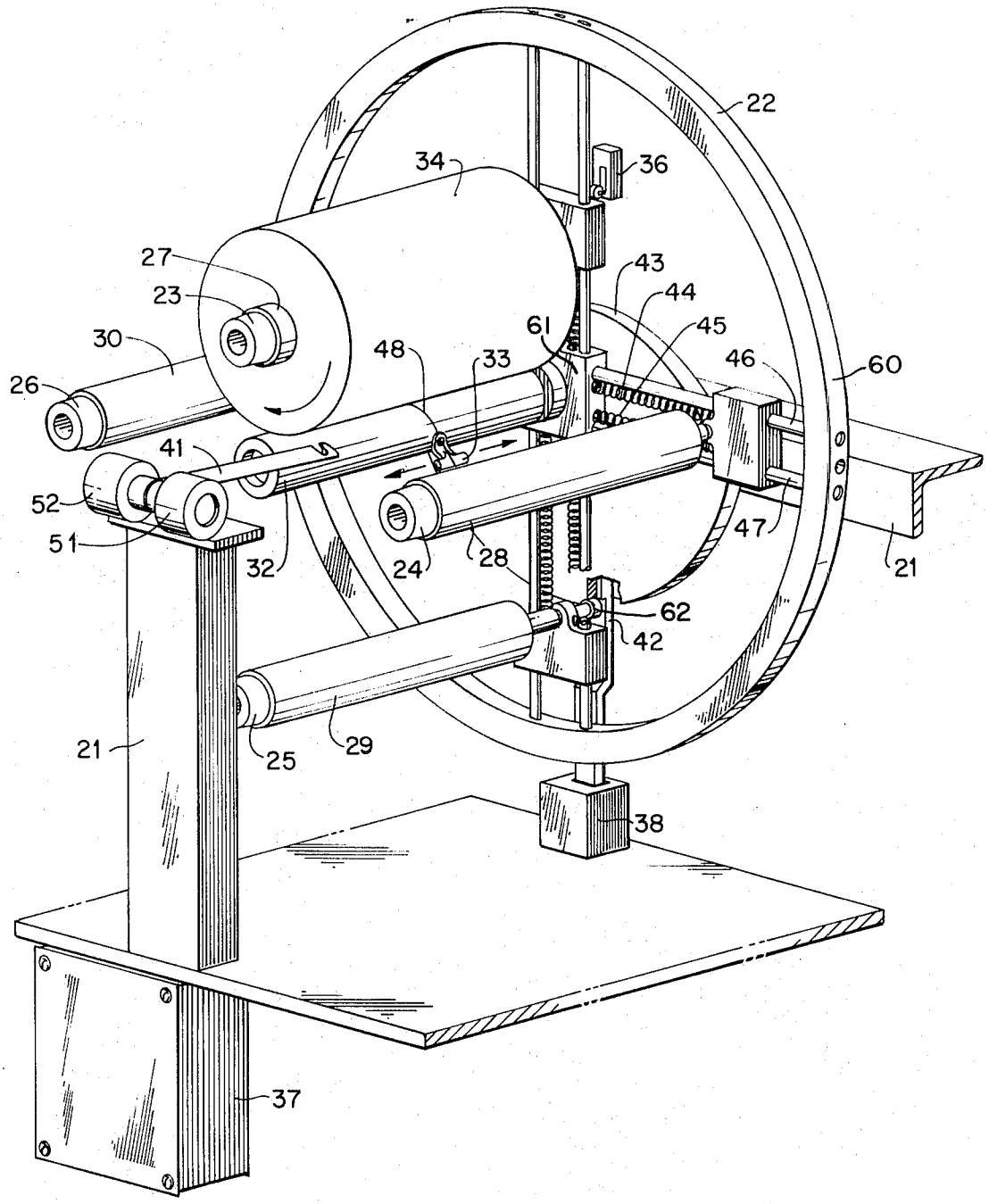

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FIG. 2

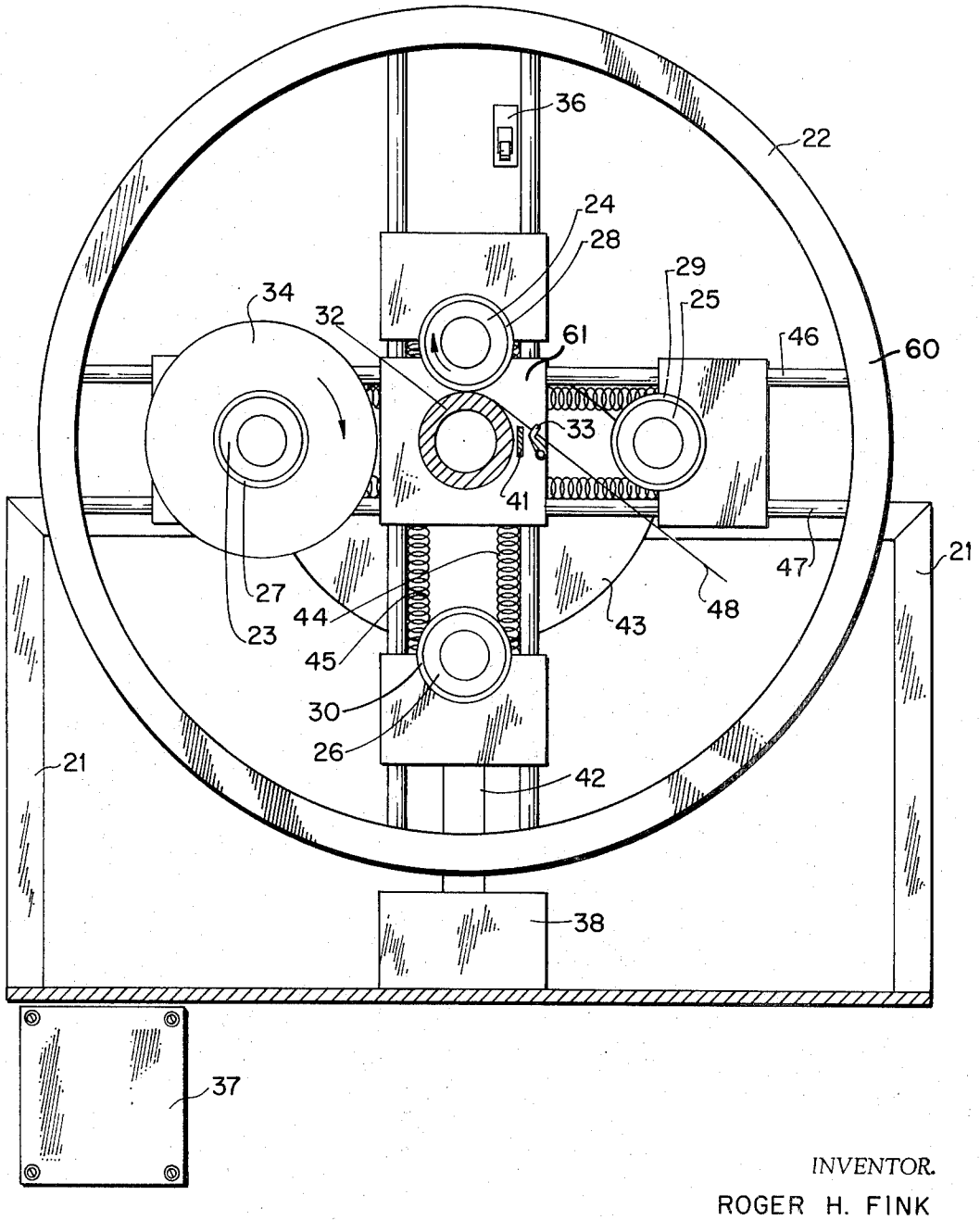

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FIG. 3

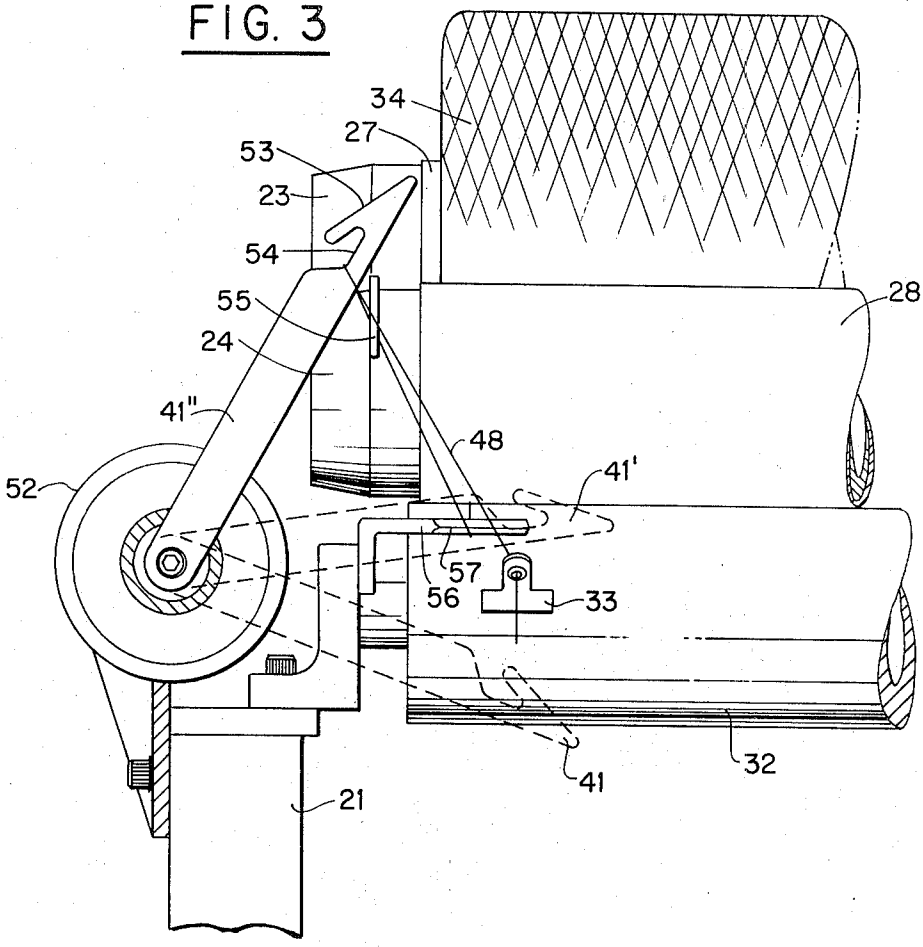

FIG. 4

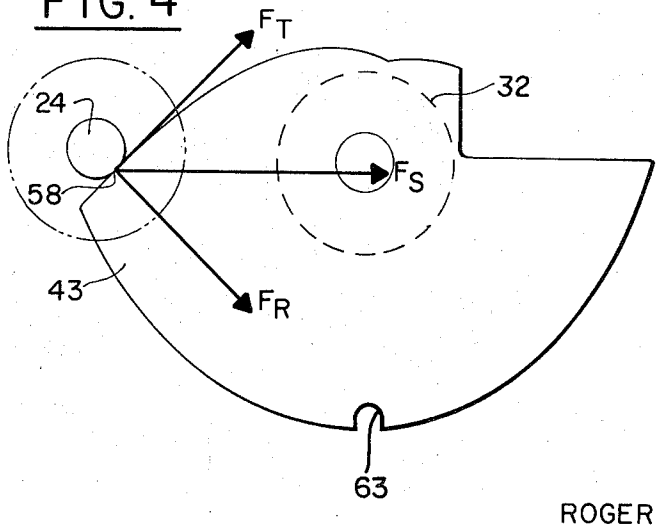

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FIG. 5

	TURRET ROTATION	YARN CAPTURE	TAIL FORMATION
TURRET DETENT 38	▨		
ROTARY SOLENOID 51		▨	▨
ROTARY SOLENOID 52			▨

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CONTINUOUS YARN WINDING APPARATUS

The present invention relates to a method and apparatus for transferring yarn from a completed yarn package to an empty reel in a continuous yarn winding process. It has become apparent in recent years that it is advantageous to maintain as nearly constant conditions as possible while processing synthetic yarns. Reasons for attempting to normalize the conditions are many and varied. For example, variations in yarn filament dimensions and crystallinity changes resulting from nonuniform tensions and pressures effect the characteristics of the finished yarn. Oftentimes, these characteristic changes do not become apparent until the yarns have been implemented into an end product. The deviations are especially amplified during attenuation and/or texturing operations.

Furthermore, continuous winding has the advantage of more effective utilization of processing machinery by increasing output per period of time since downtime between doffing the packages is virtually eliminated.

Therefore, an object of this invention is to provide a method and apparatus for normalization of yarn winding conditions.

A further object of this invention is to provide apparatus to continuously wind yarn in as nearly constant conditions as possible to minimize yarn processing deviations.

A further object of this invention is to provide a method of transferring yarn from a completed package of predetermined size to an empty reel in a continuous yarn winding process.

There have been numerous proposals for achieving continuous winding, involving complicated cam and gear arrangements and various other transfer mechanisms. The present invention incorporates simple, proven mechanical elements to effect a durable and reliable continuous winding apparatus. Utilization is made of a central peripheral nip-drive roller to which a series of yarn winding arbors are sequentially brought into contact. The yarn winding arbors are attached to a rotatable turret mounted on the winding frame concentric with the drive roller. The spacial relationship of the arbors to the drive roller is determined by a cam guide attached to the frame of the apparatus. Means are provided for restraining yarn from being traversed by a conventional yarn package forming traverse means upon completion of a yarn package disengaging the yarn from the completed package, winding a number of loops for transfer tail purposes on an arbor brought into contact with the drive roller, and then reengaging the traversing mechanism to begin winding a new package. Further means are provided for disengaging the completed package from the drive roller in preparation for doffing.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective showing the apparatus in full package position.

FIG. 2 is an elevational end view of the apparatus with the turret rotated 90° from FIG. 1

FIG. 3 is a partial side view showing the yarn deflection guide in its extended position, with an intermediate position and normal position outlined.

FIG. 4 is a rear view of the arbor cam guide showing the cam guide spring and weight interaction.

FIG. 5 describes the multiple function program timing sequence.

Referring to FIGS. 1 and 2, it will be seen that the winding mechanism chosen for purposes of illustration includes as components thereof, an equipment frame 21, a turret 22 with moveable rotatable windup arbors 23 through 26, a drive roller 32 concentrically located with said turret 22, a reciprocating traverse guide 33 through which yarn 48 advances between drive roller 32, and package 34 on arbor 23, a yarn deflecting device 41, and a multiple function programmer 37. The turret 22 comprises a rim 60 attached to a hub 61 by a series of spokes as represented by 46 and 47. The spokes act as windup arbor guides as shown in FIG. 1.

In operation, when package 34 has reached a predetermined size, limit switch 36 is tripped, actuating multiple function programmer 37. Programmer 37 may consist of any number of types of conventional timing devices for actuating the various elements to be explained herein. Upon actuation by limit switch 36, programmer 37 activates detent solenoid 38 which pulls cam rod 42 from its locking detent position and allows turret 22 to be rotated. Rotation is produced by the interaction of cam guide 43 and arbor 24, said arbor 24 being pulled toward the drive roller 32 by means of springs 44 and 45 along arbor guides 46 and 47, to be more fully explained. Rotational movement is also enhanced by the weight of package 34 producing a moment force acting upon turret 22 around the driver roller 32. Simultaneously, arbor 24 is being brought into a ready position for receiving yarn 48.

Package 34 remains in contact with drive roller 32 until arbor 24 with empty package support reel 28 is brought into position, brought up to speed, and yarn 48 is deflected by yarn deflecting guide 41 (shown here in normal running position) to reel 28. Package 34 is then disengaged from the drive roller and made ready for doffing.

In FIG. 3, yarn 48 is shown passing through traversing mechanism 33 over drive roller 32 onto package 34 in its rotated position. Arbor 24, with its empty package support reel 28, is in contact with drive roller 32. The yarn deflecting guide is shown in its extended position, denoted 41'' with an intermediate position denoted by the broken outline 41' in normal running position denoted 41. As turret 22 (FIG. 1) rotates about the drive roller 32, package support reel 28 comes into contact with drive roller 32. Programmer 37 then activates rotary solenoid device 51, bringing yarn deflection guide 41 into its intermediate position 41'. As yarn 48, being guided by traversing mechanism 33, approaches the deflection guide 41', it slides over edge 53 and falls into notch 54, which restrains movement along package 34. Programmer 37 then actuates rotary solenoid device 52, rotating the deflection guide to its extended position 41'', carrying the yarn 48 upward and into the path of yarn snaring device 55 located on arbor 24. Simultaneously, the yarn is guided onto package 34 by cutter guide 56. As the yarn crosses into the path of yarn snaring device 55, it is caught and the resulting tension in yarn 48 from the rotational pull of package 34 and the snaring device 55 causes the yarn to be carried to surface 57 of cutter guide 56. The yarn deflection guide remains in its extended position 41' while a number of convolutions of the yarn are formed on arbor 24 to form a tail for the package to be formed on support reel 28. Programmer 37 then de-activates

solenoid devices **51** and **52**, rotating the deflection guide back to its normal position **41**, whereupon traversing mechanism **33** begins feeding the yarn **48** directly onto package support reel **28**.

FIG. **4** shows the relationship between cam guide **43** and arbor **24**. When detent cam rod **42** (FIG. **1**) is retracted, roller **62** on arbor **25** is urged from detent notch **63** in cam guide **43**. The tangential component of the interacting force caused by springs **44** and **45** acting at point **58** between arbor **24** and cam guide **43** initiates rotation of turret **22** in a counterclockwise direction, while the radial component of this force pulls arbor **24** and package support tube **28** along guides **46** and **47** (see FIG. **1**) and into contact with drive roller **32**. Furthermore, as full package **34** is rotated from its top dead center position, it adds an additional rotation producing torque on turret **22**. When rotation has been completed, full package **34** and empty package support tube **28** are in contact with drive roller **32**, ready for transfer of yarn.

FIG. **5** illustrates the timing sequence of multiple function programmer **37**. When limit switch **26** has actuated programmer **37**, said programmer activates turret detent solenoid **28** for a sufficient amount of time to allow rotation of turret **22** through 90°. Rotary solenoid **51** is then activated for a length of time sufficient to capture yarn **48** during a stroke of the traversing mechanism **33**. Both rotary solenoids **51** and **52** are actuated for the time required to transfer yarn to arbor **24**, severe the yarn, and form a tail on said arbor.

What is claimed is:

1. A continuous yarn winding apparatus comprising a frame, an incrementally rotatable turret attached to said frame by a hub and series of spokes; an arbor driving roller attached to said frame concentric to the turret; first and second yarn winding arbors slidably attached to said spokes to move in and out of engagement with said arbor driving roller; yarn traversing means adjacent said driving roller for depositing yarn from a yarn supply onto the winding arbors to form a yarn package; spring means for urging the winding arbors toward said hub and into engagement with said arbor driving roller; a cam guide having an arbor engaging face continuous through the rotational increment of the turret from an outermost position of the second winding arbor to a position adjacent said driving roller the interaction of the cam guide and spring means tending to cause rotation of the turret around the arbor driving roller while simultaneously guiding the second winding arbor along the spokes and into contact with the arbor driving rollers; turret detent means for restraining rotation of the turret with said second yarn winding arbor in the outermost position until a yarn package has been formed on said first yarn winding arbor; and means for transferring yarn from the yarn traversing means to the second yarn winding arbor after it has engaged the driving roller.

2. The continuous yarn winding apparatus of claim **1** wherein said means for transferring yarn comprises, a yarn deflecting arm rotatably mounted on said frame and movable into the part of the yarn being wound onto said first yarn winding arbor from said yarn traversing means; a first rotary solinoid device for rotating, when actuated, said yarn deflecting arm to an intermediate position, restraining the yarn from said traversing means; a second rotary solinoid device for further rotating, when actuated, said yarn deflecting arm into an extended position to divert said yarn to the second yarn winding arbor.

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