

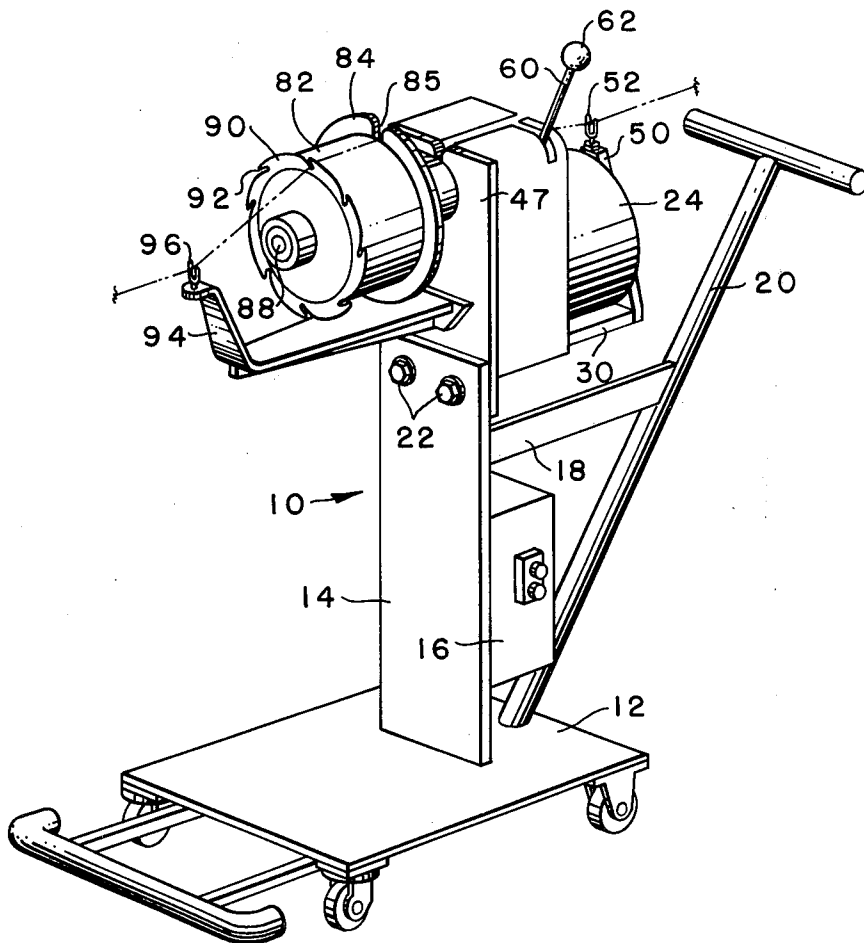
[54] YARN ACCUMULATOR 3,637,149 1/1972 Frei..... 242/47.12 X  
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 [73] Assignee: Deering Milliken Research Corporation, Spartanburg, S.C. 3,796,386 3/1974 Tannert ..... 242/47.01  
 3,822,833 7/1974 Fecker ..... 242/47.12  
 [22] Filed: Apr. 1, 1974  
 [21] Appl. No.: 456,696  
 Primary Examiner—Stanley N. Gilreath  
 Attorney, Agent, or Firm—H. William Petry; Earle R. Marden

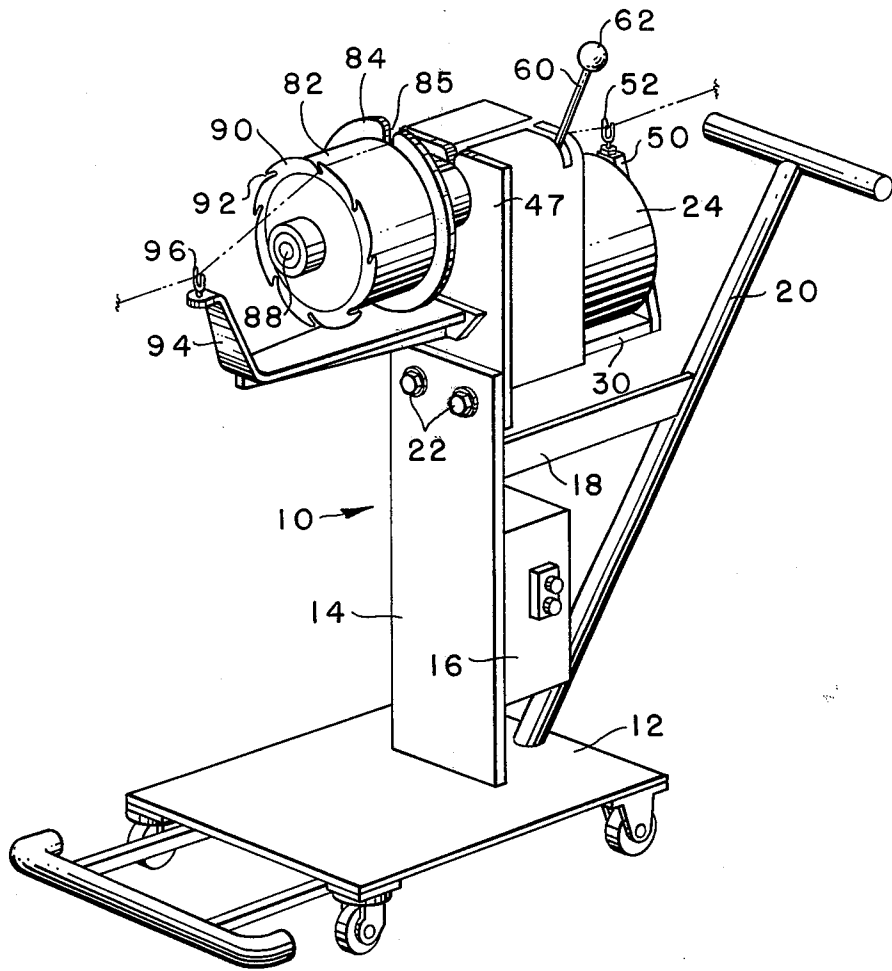
[52] U.S. Cl. .... 242/47.01; 242/18 R  
 [51] Int. Cl.<sup>2</sup> ..... B65H 51/20  
 [58] Field of Search ..... 242/47.01-47.13,  
 18 R, 47

[56] **References Cited**  
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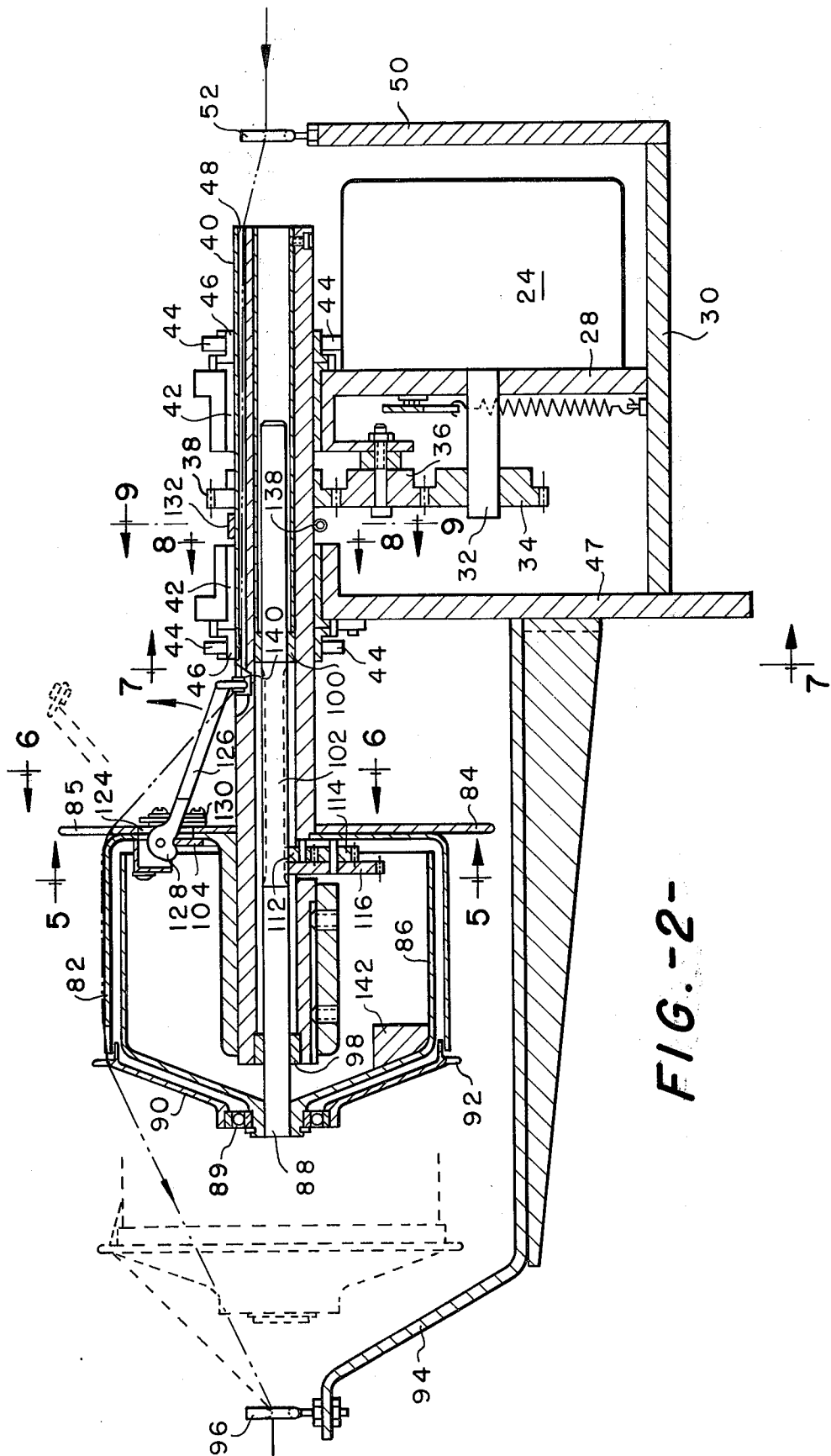
[57] **ABSTRACT**  
 Semi-automatic apparatus to accumulate and pay out yarn to a yarn processing machine which is operating continuously. The apparatus employs a retractable accumulator or storage drum on which yarn is wound to supply the yarn processing machine while a new yarn package is placed in the creel to supply the machine.

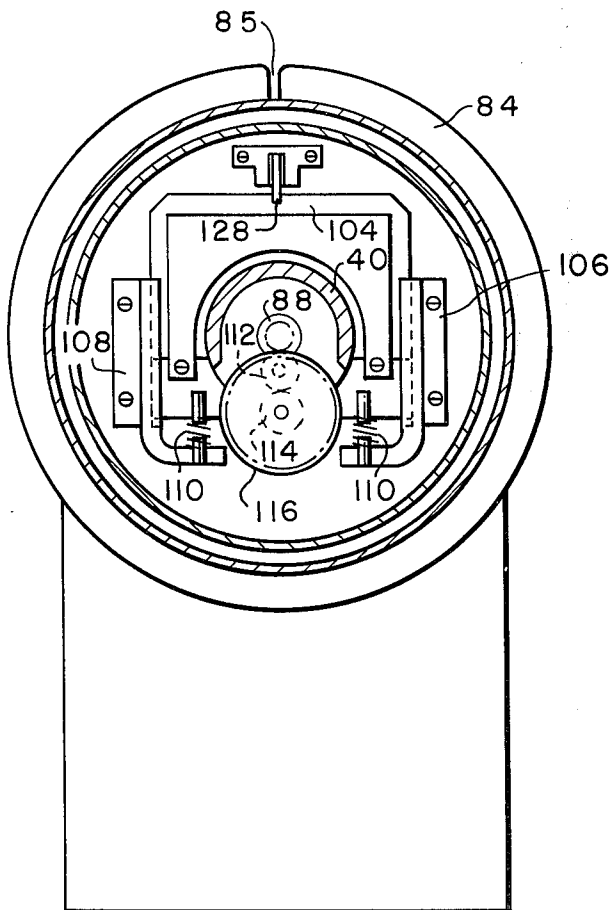
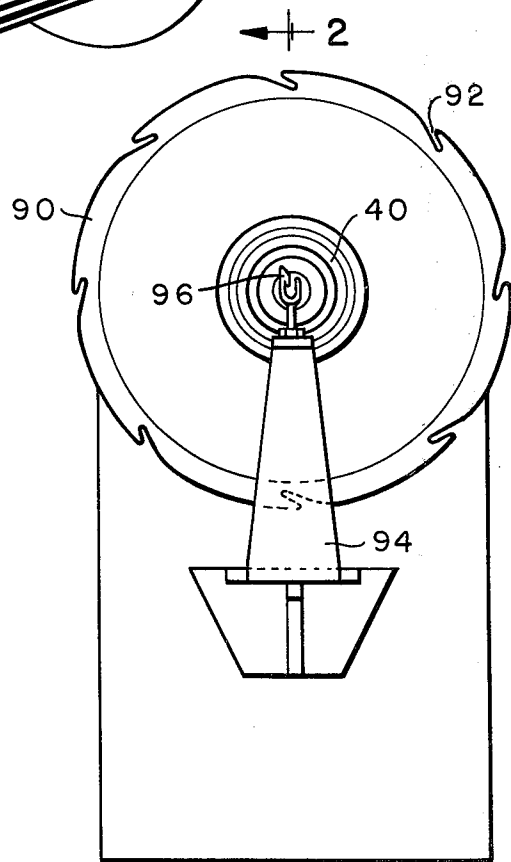
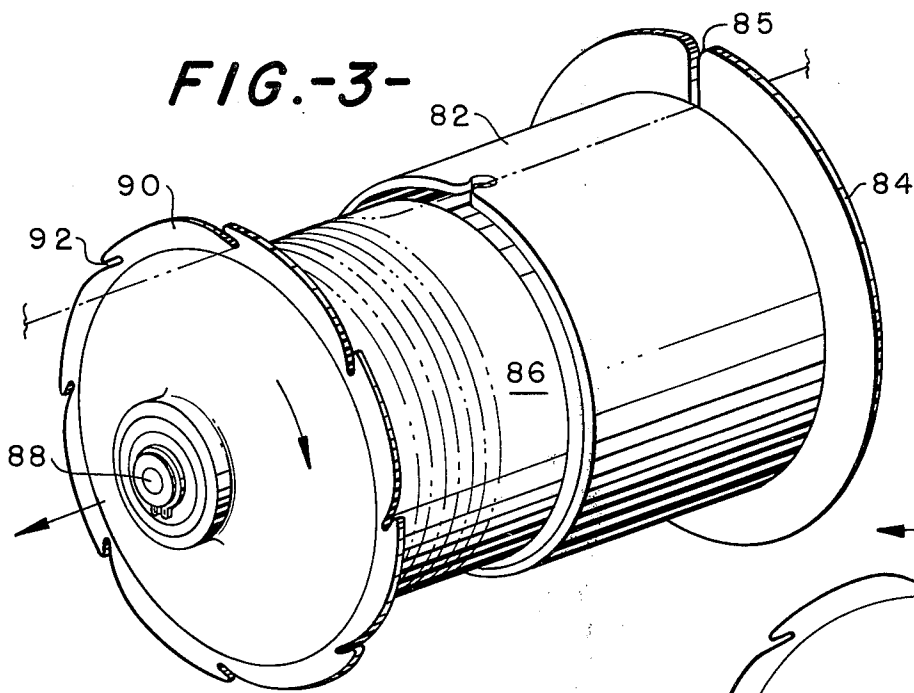
11 Claims, 12 Drawing Figures





**FIG. -1-**





**FIG.-5-**

**FIG.-4-**

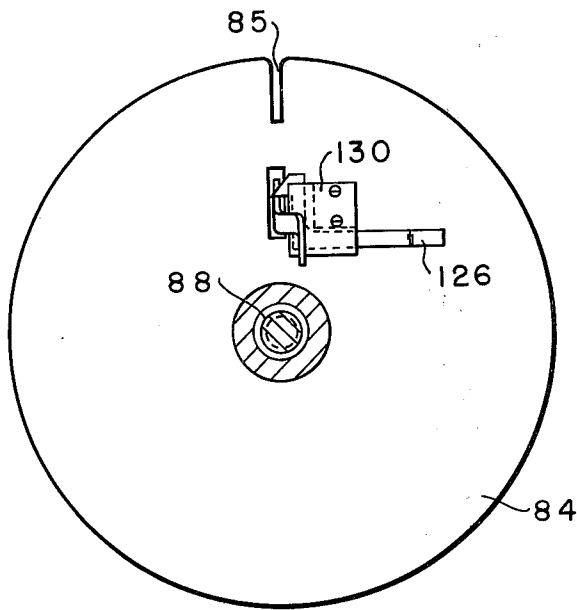


FIG. -6-

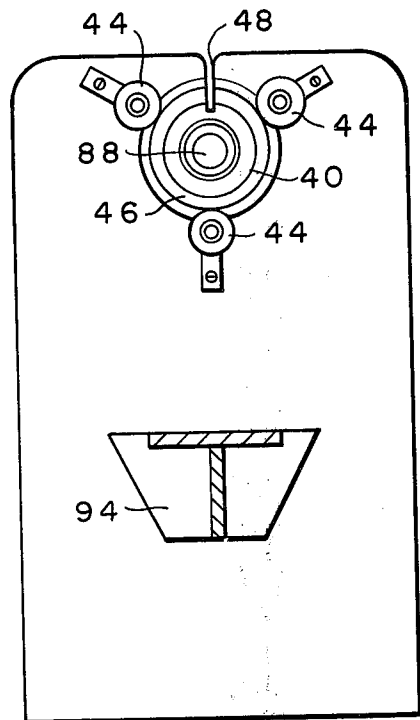


FIG. -7-

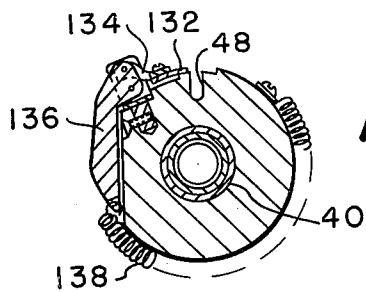


FIG. -9-

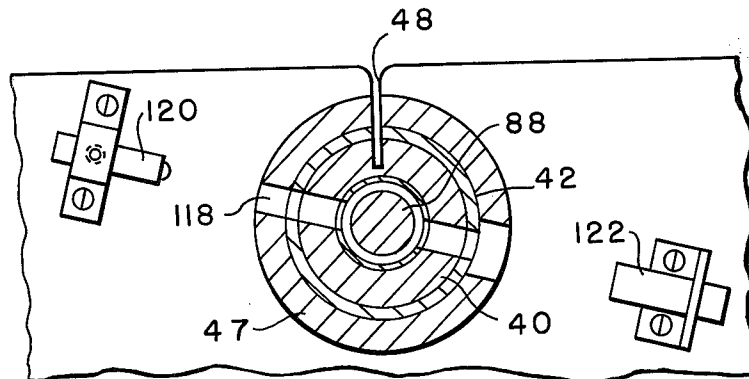
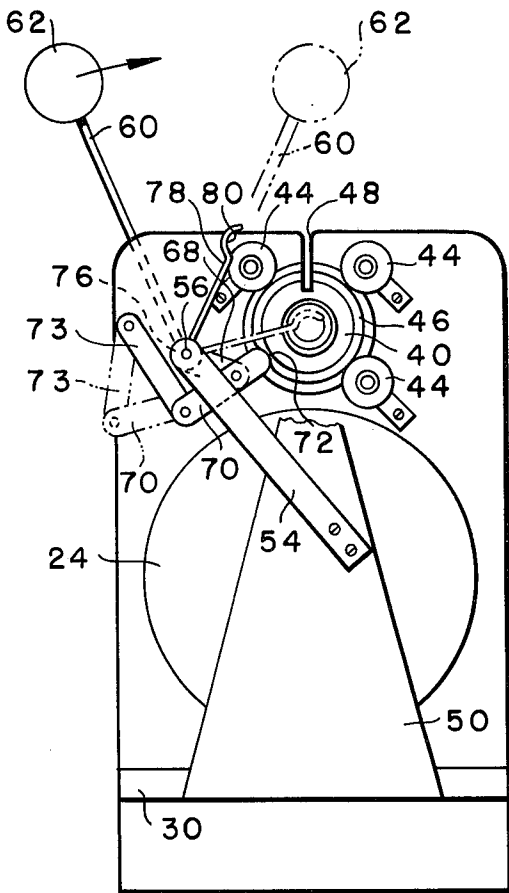
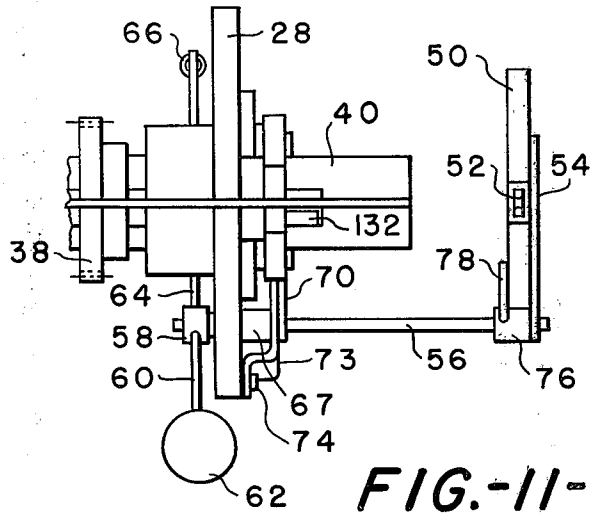


FIG. -8-

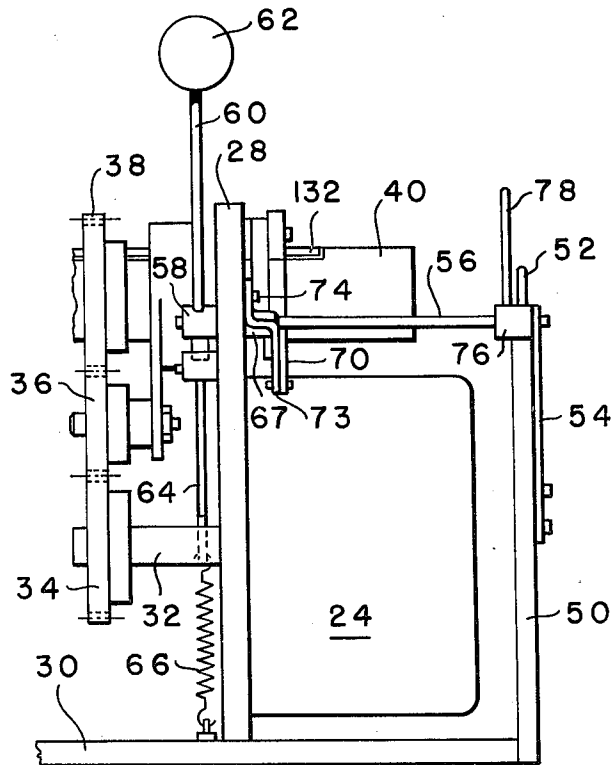


**FIG. -10-**



**FIG. -11-**

**FIG. -12-**



## YARN ACCUMULATOR

In processing yarn through a machine in a continuous fashion, it is customary to "double creel" supply packages by tying the leading end of the second package to the trailing (or "tail") end of a running package so that when yarn has been depleted from the first package, it automatically transfers to the second. There are numerous occasions of a supply yarn package having no "transfer tail," either because the tail being covered by subsequent winding or being broken through handling. In some cases, all of the supply yarn can be utilized from a tailless package merely by allowing the package to run completely empty, creel in a full package and rethread the machine. However, on some multiple-end processing machines, rethreading a new end is very difficult, time consuming and, in some cases, impossible. Some rather primitive means for induced creeling have been devised whereby an almost empty tailless package may be removed from the creel and the position re-creeled without losing the running end of yarn. One method of current practice requires two persons; one diverts the running end around a forefinger, pencil or other smooth object, walks away from the normal yarn path removing yarn from the supply package at a greater than normal upwinding speed, allowing the yarn to slide around the pencil at its normal feed rate into the machine. This accumulates a surplus of yarn of a sufficient length to supply the machine as the person slowly walks back to the creel position at machine feed rate. During the walking back period, the second person removes the nearly empty package and creels in a full package. This method, although it is usually about 75% successful, has several disadvantages. Due to certain feed rate speeds, a considerable length (30-50 yards) must be strung out, thus entailing the crossing of cross aisles between machines. (Sometimes a third party is recruited to "direct traffic" while the accumulated yarn is across an aisle.) Yarn usually contacts the floor, causing it to become soiled, snagged or broken. In some locations, there is not sufficient space for paying out surplus yarn, and, on occasion, a "helper" may not be readily available when a package (or packages) needs creeling out.

It is therefore an object of the invention to provide a new and novel apparatus to accumulate yarn to supply a continuously operating yarn processing machine when a new yarn package is being creeled in.

Other objects and advantages of the invention will become clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings, in which:

FIG. 1 is an overall perspective view of the new and improved yarn accumulator;

FIG. 2 is a cross-sectional view of the yarn accumulator taken on line 2-2 of FIG. 4;

FIG. 3 is a blown-up view of the yarn accumulator drum in its extended position;

FIG. 4 is a left hand end view of FIG. 2;

FIG. 5 is a cross-sectional view taken on line 5-5 of FIG. 2;

FIG. 6 is a view taken on line 6-6 of FIG. 2 showing the yarn latch;

FIG. 7 is a view taken on line 7-7 of FIG. 2 showing the mandrel support;

FIG. 8 is a cross-sectional view taken on line 8-8 of FIG. 2 showing the retractable tube detector system;

FIG. 9 is a cross-sectional view taken on line 9-9 of FIG. 2 illustrating the yarn notch cover;

FIG. 10 is a right hand elevation view of FIG. 2 with parts broken away for clarity;

FIG. 11 is a top view of FIG. 10; and

FIG. 12 is a left hand elevation view of FIG. 10.

FIG. 1 illustrates the overall machine 10 which is mounted on the dolly 12 by means of an upright support 14 on which is mounted the control box 16 and a horizontal support member 18. The horizontal support member 18 is connected at its outer end to the dolly handle 20. The machine 10 is connected to the upright support 14 by suitable means such as bolts 22.

The machine 10 is driven by motor 24 mounted by suitable bolts to the wall member 28 (FIG. 2) integrally connected to the frame 30. The motor 24 through motor shaft 32, gear 34, gear 36 and gear 38 drives the rotatable shaft 40. Shaft 40 rotates in sintered sleeve bearings 42 and support rollers 44 located against collars 46 and which rotate with the shaft 40 and maintains the longitudinal position thereof. For reasons hereinafter explained the wall members 28 and 47, bearings 42, gear 38 and the shaft 40 have an elongated notch 48 therein.

Connected to the frame member 30 is an upright triangular member 50 on top of which is mounted a pigtail yarn guide 52. Secured to the outside thereof is a support member 54 (FIG. 10) which rotatably supports a shaft 56 which projects inwardly through the wall member 28 and has a collar 58 (FIG. 12) attached thereto. Attached to the top portion is a shaft 60 with a handle knob 62 thereon while attached to the bottom is a lever 64 and a spring 66 to bias the handle in either the off or on position. Attached to the other side of the wall member 28 to the shaft 56 is another collar 67 to which is integrally attached a lever 68. Pivotaly connected to the lever 68 is a lever arm 70 which has a rounded portion 72 which engages a notch in the collar 46 to align the notches 48 of the various members while the other end is pivotaly connected to another lever arm 73. The lever 73 is pivotaly connected to the wall member 28 at 74. Attached to the shaft 56 adjacent the lever member 54 is another collar member 76 to which is attached a yarn retainer 78 which has a semi-circular yarn engaging portion 80 at the end thereof. Yarn retainer 78 maintains the yarn in elongated notch 48 during winding while levers 54, 68 and 70 move the rounded portion 72 into the notch in collar 46 to align and maintain the alignment of the notches during operation of the machine.

Also driven by the motor 24 is the winding drum 82 which has a flange 84 attached thereto with a yarn slot 85 therein and is driven by the shaft 40. Mounted within the winding drum 82 is a storage drum 86 which is fixed at one end to non-rotatable traversing shaft 88 on the outer end of which is mounted, by suitable ball bearings 89, a freely rotating flyer 90 having yarn slots 92 therein. Mounted outboard of the flyer 90 on a suitable support 94 is a pigtail guide 96.

Shaft 88 is supported inside the rotating shaft 40 by sleeve bearings 98 and 100 and has a center portion 102 machined with gear teeth and then threaded with screw threads. Mounted against the bulkhead of the winding drum 82 is a yoke 104 (see FIGS. 2 and 5) slidably mounted in guides 106 and 108 and spring loaded toward the up position by springs 110. Mounted to the yoke 104 is a gear 112 in mesh with the gear teeth of

the shaft 88 which rotates as the winding drum rotates. Driven by the gear 112 is a second gear 114 which has a disc 116 connected thereto with threads on the periphery thereof engaging the threads on the outer surface of the shaft 88. It can be seen that the gears 112 and 114 along with disc 116 are in effect planet gears revolving around the sun gear section of the shaft 88. Assuming that the winding drum is rotating in a clockwise direction, then the gear 112 also rotates in the clockwise direction and will cause the disc 116 through gear 114 to rotate in the counterclockwise direction as it moves around the shaft 88. The number of gear teeth on the gears 112 and 114 is identical and is greater than the number of teeth on the gear portion 102 of the shaft to cause the screw threads on the disc 116 to move the shaft 88 to the left incrementally on each rotation of the shaft 40 for reasons hereinafter explained. The selection of the number of gear teeth of the various gears depends on the amount of desired traverse of the shaft 40 for each rotation thereof.

In order to stop where the traverse of the shaft 88 reaches the outer desired limit, a hole 118 is provided through the frame member 47, sleeve bearing 42 and shaft 40 at an angle of approximately 30° from the horizontal centerline of the shaft 40 (FIG. 8). Mounted on one side of the hole 118 is a light source 120 and mounted on the other side of the opening is a photocell 122. When the shaft 40 has traversed to the point where the end thereof has cleared the opening 118, the photocell will see the light source and in response thereto actuates a relay to open the circuit to the motor 24 to stop the operation of the accumulator.

Pivotaly secured in an opening 124 in the flange 84 is a yarn guide member 126 which has a cam surface 128 on one end thereof and is secured in the down (or solid line position) by a spring loaded latch member 130 (FIG. 6) mounted on the outside face of the flange 84. When the yarn guide member is pivoted to the up position the cam surface 128 will push the yoke 104 downward against the bias of springs 110 to cause the threads of the disc 116 to be disengaged from the shaft 88 to allow the shaft 88 and associated drum to be manually returned to its nested or starting position.

FIG. 9 shows in cross-section an arrangement to maintain the yarn in the elongated notch 48. A notch cover 132 is secured to a lever member 134 which in turn is secured to a pivotally mounted lever arm 136. The lever arm 136 is connected to a lightly tensioned spring 138 which maintains the slot or notch 48 open when the shaft 40 is not rotating but allows the cover 132 through the linkage 134 to slide over the notch 48 when the shaft 40 is rotating due to the centrifugal force in the lever 136 causing it to pivot outwardly from the shaft 40.

#### OPERATION

When a yarn package is at the point that it has to be replaced with a new full yarn package the accumulator 10 is moved into close proximity thereto and the running end to the continuously operating yarn consuming machine is threaded into the accumulator. This is accomplished by initially running the yarn through the pigtail guide 52, flange slot 85, over the flyer 90 and out pigtail guide 96. Then yarn guide member 126 (now in dotted position) is depressed to the solid line position causing the yarn to enter ceramic eyelet 140 and be pushed down into the elongated notch 48. Then

the motor is started to rotate the winding drum 82. As the drum begins to rotate the yarn is caught in one of the notches 92 of the flyer 90. Yarn is then held back by the counter inertia of the flyer and is pulled down and deposited onto the surface of storage drum 86 which is counter balanced against rotation by a suitable counterweight 142. Since the rotational winding speed of the winding drum 82 is substantially greater than the speed of yarn being unwound over end from the storage drum 86, yarn is wrapped around the storage drum. As described previously, to prevent the yarn from overlapping on the storage drum, the shaft 88 is traversed outwardly as the winding drum rotates to lay the yarn down side by side on the storage drum 86. When the storage drum reaches its outer traversing limit the light source 120 and photocell 122 will stop the motor 24. Yarn removal from the creel package then ceases while the processing machine continues to use yarn that has been accumulated on the storage drum 86. In the meantime the operator is replacing the almost empty yarn package with a full package and tied the end to the end of yarn of the running length of yarn. Then the yarn guide member 126 is raised to release the yarn and when yarn is completely wound off the storage drum it is released from the machine 10.

When the yarn has been released from the machine and the cam surface 128 has slid the yoke 104 downwardly to release the screw threads of the disc 116 from the screw threads of the shaft 88, the shaft 88 and drum 86 can be manually returned to the nesting position so that the accumulator 10 will be ready for the next yarn package replacement operation.

The above-described machine allows a single operator to easily and efficiently replace the almost empty yarn packages of a creel which is supplying yarn to a continuously operating machine with a minimum amount of yarn breaks.

Although I have described specifically the preferred embodiment of my invention, I contemplate that changes may be made without departing from the scope or spirit of the invention, and I desire to be limited only by the scope of the claims.

That which is claimed is:

1. A machine to supply yarn to a continuously operating yarn consuming machine comprising: a frame, a first hollow shaft member rotably supported in said frame, a hollow winding drum mounted on said first shaft member, a second shaft member slidably mounted in said first shaft member, means to move said second shaft member in a linear direction, a storage drum mounted on said second shaft member having a portion thereof projecting into said winding drum, means to supply yarn to said winding drum, flyer means mounted on said storage drum means to rotate the winding drum to cause the yarn from said winding drum to wind on said storage drum in a side by side relationship, and means to guide yarn away from said storage drum to a point of use.

2. The machine of claim 1 wherein said means to supply yarn to said winding drum includes an elongated notch in said hollow shaft member.

3. The machine of claim 2 wherein said means to supply yarn includes a means to retain the yarn in said elongated notch when said hollow shaft member is rotating.



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4. The machine of claim 2 wherein said means to retain yarn includes a slide and lever means operably associated with said hollow shaft member.

5. The machine of claim 4 wherein said second shaft member is mounted inside said first shaft member and has a threaded portion and said means to move said second shaft member in a linear direction includes another threaded member in contact with said second shaft member and operably associated with said drive means.

6. The machine of claim 5 wherein a means is operably associated with said second shaft member to stop said drive means when said second shaft member has moved to a predetermined position.

7. The machine of claim 1 wherein the central portion of said second shaft member has gear teeth thereon with the outer surface thereof threaded, said drive means including a disc member with threads on the outer periphery to cause said second shaft member to move outwardly from said winding drum as said winding drum rotates.

8. The machine of claim 7 wherein said drive means includes a gear meshed with the gear portion of said second shaft member, a second gear in mesh with first gear and said disc member being connected to said second gear.

9. The machine of claim 8 wherein said yarn supply means includes an elongated notch in said hollow shaft member and a pivotally mounted means to guide yarn into the elongated notch.

10. The machine of claim 9 wherein said disc member is secured in a slidably mounted yoke member, said yoke member being biased by springs to cause said disc member to engage the threaded portion of said second shaft member.

11. The machine of claim 10 wherein said pivotally mounted means has a cam portion connected thereto in engagement with said yoke member to slide said disc member against the bias of the springs away from the threaded portion of said second shaft member.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,915,403 Dated October 28, 1975

Inventor(s) Herbert R. King

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, Claim 1, line 56, insert --,-- between "drum" and "means".  
line 28, "surfae" should be --surface--.

Signed and Sealed this  
twenty-third Day of March 1976

[SEAL]

*Attest:*

**RUTH C. MASON**  
*Attesting Officer*

**C. MARSHALL DANN**  
*Commissioner of Patents and Trademarks*