United States Patent

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[33] **Japan**
[31] **42/53186**

[54] **DEVICE FOR USE WITH YARN CLEARER AUTOMATIC WINDERS**
6 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **242/35.6**
[51] **Int. Cl.** **B65h 54/22**
[50] **Field of Search** 28/64; 242/35.6, 35.5, 36, 37

[56] **References Cited**
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ABSTRACT: An improved yarn clearer device for use with an automatic winder having a plurality of winding units and knotting devices. A yarn clearer is mounted for movement from a normal working position wherein it clears yarn before same is wound on a package to a position adjacent to the knotting device when the supply yarn breaks or is exhausted. The end of yarn retrieved from the package is led to the knotting device and passes through the displaced yarn clearer after which the yarn clearer is returned to the normal working position without any of the yarn escaping out of the yarn clearer whereby the yarn clearer inspects the yarn just after completion of the yarn piecing operation of the knotting device.

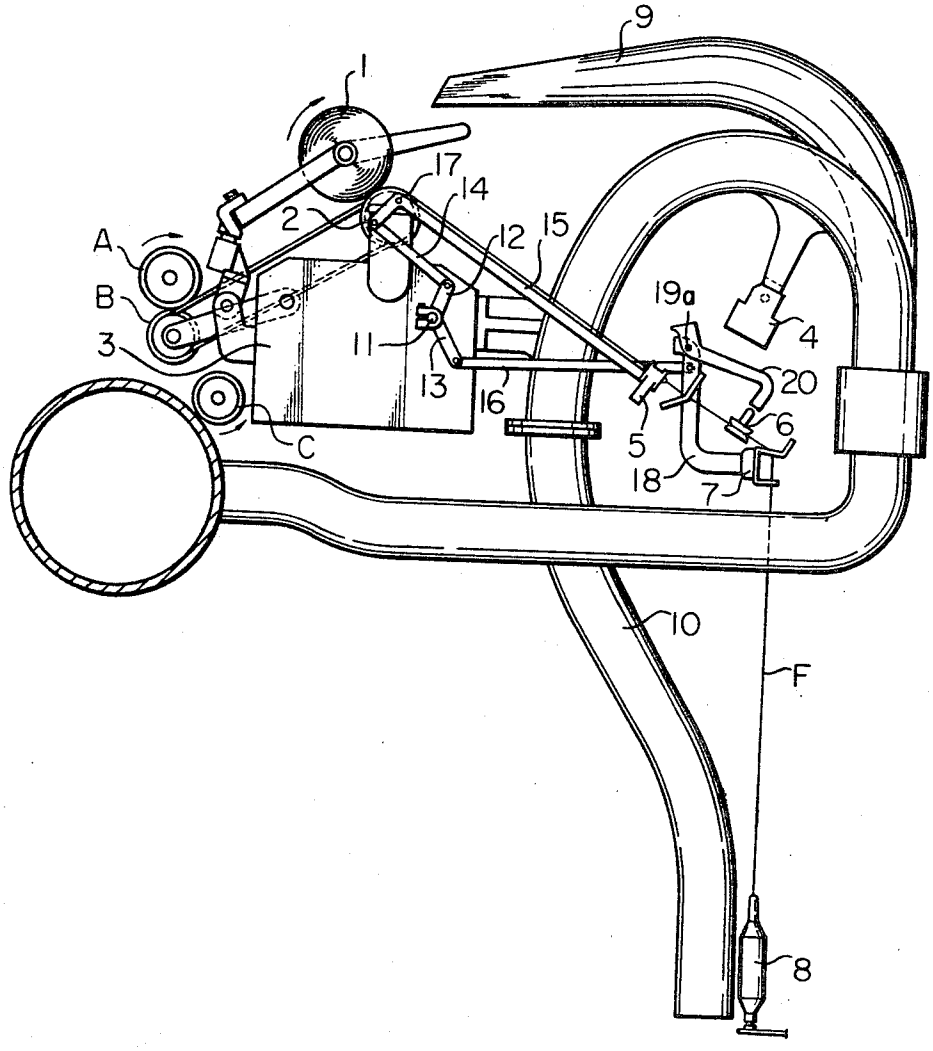


Fig. 1

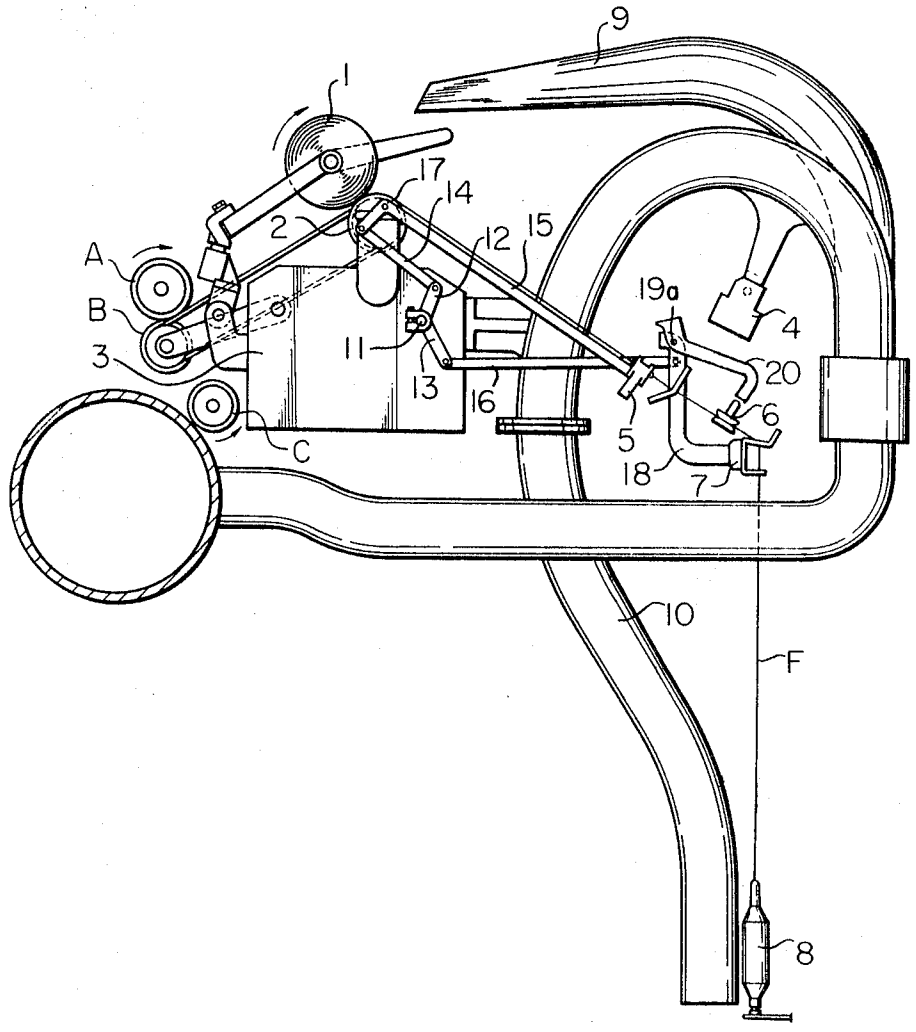


Fig. 2

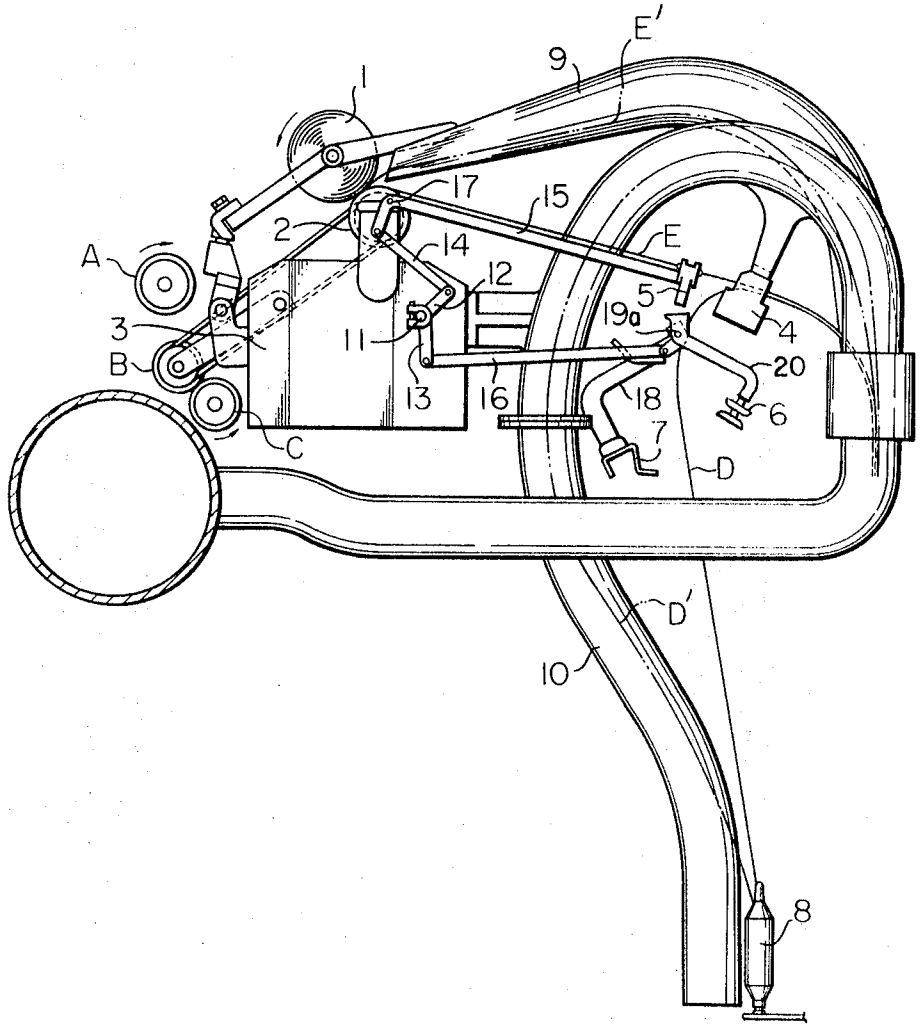
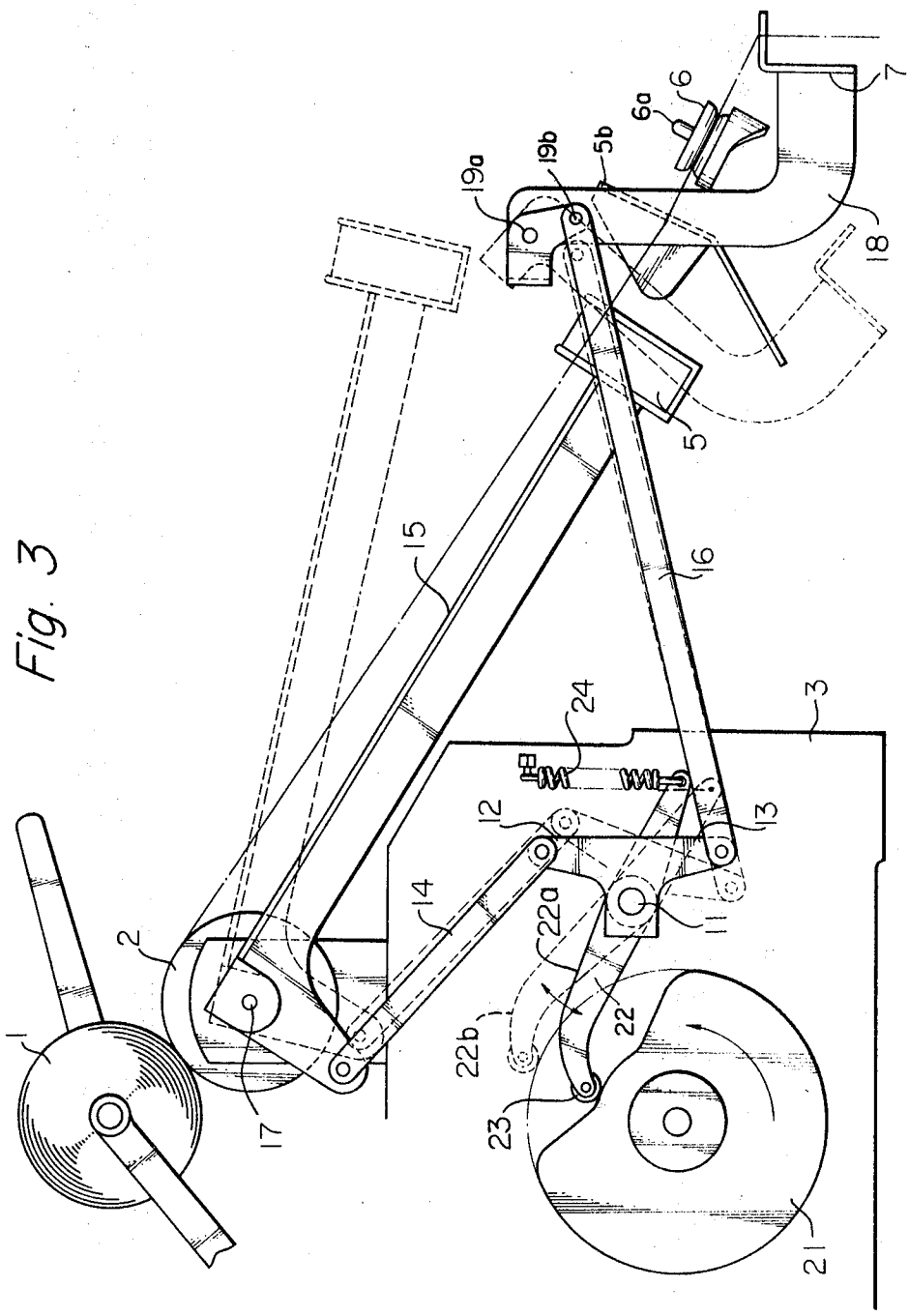


Fig. 3



DEVICE FOR USE WITH YARN CLEARER AUTOMATIC WINDERS

The present invention relates to an improved yarn clearer device for use with an automatic winder, more particularly relates to a yarn clearer device of an automatic winder which is provided at each winding unit with a yarn-retrieving mechanism utilizing suction air which retrieves yarn ends from a supply cop and from a winding package and guides both yarn ends to the knotting device when yarn on the supply cop breaks or the supply cop is exchanged due to exhaustion of yarn on said supply cop, such as the winding machine of the U. S. Pat. No. 3,399,840, filed on May 21, 1964. The term of "yarn retrieving by suction air" in this specification means the function of taking the end of yarns from a supply cop and also from a package both supported by a winding unit of the winder and of carrying both ends to the automatic knotting device mounted on the winding unit by utilizing only suction air without any operation by mechanical means.

Generally, in an automatic winder provided with a yarn-retrieving mechanism by suction air, for example the automatic viz of the above-mentioned U.S. Pat. No. 3,399,840, filed on May 21, 1964 the automatic knotting device is disposed at a position which is out of the winding passage of the supply yarn, and the yarn does not pass through the yarn clearer at a time just after the completion of the yarn-piecing operation by the knotting device. Consequently, a faulty yarn connection such as the knotting of a doubled yarn, or slubs may be wound into the winding package at the time just after the completion of the yarn-piecing operation by the knotting device, viz the winding yarn is not inspected by the yarn clearer until tied supply yarn is carried into the yarn clearer after being released from the knotting device.

The principal object of the present invention is to provide an improved yarn clearer device which eliminates the above-mentioned drawbacks.

To achieve the object of the invention, and in accordance with a feature of the present invention, the yarn clearer of the present invention is mounted on each winding unit which is provided with a knotting device at the position out of the passage of the supply yarn. The yarn clearer is always positioned at the passage of the supply yarn during the normal winding operation of the winder, however when the supply yarn breaks or is exhausted, the yarn clearer is displaced to a position on the yarn passage on which a yarn end from the package is led to the knotting device from the above-mentioned normal position so as to pass the led yarn through the displaced yarn clearer. This displacement of the yarn clearer is operated in relation with the operation of the knotting device. And just after completion of the knot-tying operation of the knotting device, the pieced yarn passes the yarn clearer afterwhich the yarn clearer is returned to its normal position while the pieced yarn is still passing through the yarn clearer, thereby winding of the above-mentioned faulty yarn into the package can be satisfactorily prevented.

The invention is illustrated by way of an example in the accompanying drawings wherein;

FIG. 1 is a side view of a part of the winding unit during the winding operation according to the present invention,

FIG. 2 is a side view of a part of the winding unit during the operation of the knotting device according to the present invention,

FIG. 3 is a partial sectional view of a program cam, showing the mechanism for actuating the turning motion of the supporting member for supporting the yarn clearer when yarn on the supply cop breaks or the supply cop is exchanged.

Referring to the drawings, an embodiment of the yarn clearer device of the invention is applied for an automatic winder comprising a driving drum **2** positively driven by a driving mechanism A, B and C as shown in FIGS. **1** and **2**, a yarn end retrieving pipe **10** for taking an end of a yarn from a supply cop **8** supported by the winding unit, a yarn end retrieving pipe **9** from a package **1** which is driven by contact with

the drum **2** and a knotting device **4** disposed to the winding unit under the retrieving pipe **9** and **10** so as to receive retrieved yarn ends coming out from both pipes as shown in FIG. **2**. A shaft **11** is connected to a cam box **3** and is turned a predetermined angle by an actuating means hereinafter described when yarn on the supply cop breaks or the supply cop is exchanged. Referring to FIG. **3**, the actuating means comprises a programming cam **21** and an actuating mechanism which is illustrated in the specification of the U.S. Pat. No. 3,399,840 filed on May 21, 1964 and the attached drawings of FIGS. **4** and **5** of the above-mentioned specification. The cam box **3** corresponds to the cam box **6** of the above-mentioned U.S. Patent. Levers **12** and **13** are secured to the shaft **11**. A lever **22** in the cam box **3** is rigidly secured to the shaft **11** and a roll **23** is rotatably mounted to one end of the lever **22** and the other end of lever **22** is connected with an end of a spring **24** in such a way that the roll **23** always contacts the surface of the cam **21** by the pulling action of the spring **24**, and the other end of the spring **24** is secured to the cam box **3**. Consequently, the lever **22** swings around the axis of the shaft **11** from the position shown by the solid line **22***a* to the position shown by the dotted line **22***b*. A link piece **14** and a bell crank lever **15** are connected to the lever **12** in sequence in such a way that the lever **15** can swing around a branch shaft **17**, and a link piece **16** is connected to the lever **13** as shown in the drawing. A yarn clearer **5** is mounted on a free end of the lever **15**. An armed lever **18** is connected to a free end of the link piece **16** by a pin **19***b* and a yarn guide **7** is secured to the free end of armed lever **18**. Further a tension lever **20** is rigidly mounted on a pin **19***a* so that the lever **20** swings together with the motion of the armed lever **18**.

The tension lever **20** is so designed that a bottom end thereof is capable of pushing the head of a disc pin **6***a* against a spring (not shown) which always urges a bottom disc to a top disc of the tension device **6**. In other words, the bottom end of the lever **20** opens the tension disc **6** when the yarn guide **7** is displaced to a position outside of the normal winding passage of the supply yarn (FIG. **2**), while the bottom end of the tension lever **20** is removed out of contact with the disc pin **6***a* when the yarn guide **7** is returned to its normal working position so that the tension disc **6** is closed (FIG. **1**).

As shown in FIG. **1**, the yarn supplied from the cop **8** is fed to the package **1** by passing through the yarn guide **7**, tension device **6**, and yarn clearer **5** in that sequence during the normal winding operation, and defective yarn such as slub is detected and severed by the yarn clearer. On the other hand, when yarn on the supply cop breaks or the supply cop is exchanged, the shaft **11** is turned by the actuating means enclosed in the cam box **3**, consequently, the bell crank lever **15** is turned counterclockwise around the branch shaft **17** by the turning motion of the lever **12** and the link piece **14**, and then the bell crank lever **15** is displaced upward in such a way that the bell crank lever is positioned at a place between the package **1** and the knotting device **4** as shown in FIG. **2**. The armed lever **18** is turned in the clockwise direction around the pin **19***a* by the turning motion of the lever **13** and the related motion of the link piece **16** as shown in FIG. **2**, thereby the yarn guide **7** is displaced to the position outside of the normal winding passage of the supply yarn so that the yarn can be guided easily to the tension device **6** after the completion of the knotting device, and the tension device **6** is opened by the pushing motion of the tension lever **20** for receiving the supply yarn from the supply cop.

On the other hand, a yarn from the package **1** is led into the yarn end retrieving pipe **9**, which is displaced adjacent to the package **1** as shown by dotted line E′ in FIG. **2** by a segment gear (not shown) and, next the yarn sucked into the pipe **9** is taken from the pipe **9** through the longitudinal slit by yarn tension caused by the suction air flowing towards the root portion of the pipe **9** and the yarn is led to the knotting device **4**. By the above-mentioned displacement of the yarn, the yarn is also led to the yarn clearer **5** as shown by solid line E in FIG. **2**. The yarn end taken from the supply cop is led into the yarn retriev-

ing pipe **10** through a longitudinal slit disposed to the pipe **10** by suction air, next the yarn is taken from the pipe **10** through the longitudinal slit by yarn tension caused by the suction air flowing towards the root portion of the pipe **10** and led to the knotting device **4** as shown by the solid line D.

After completion of the operation of the knotting device, the shaft **11** which is actuated by the operation of the knotting device is turned to the normal position corresponding to the normal winding operation of the winding unit. By the above-mentioned return motion of the shaft **11** caused by the rotation of the programming cam **21**, the above-mentioned link mechanism of lever **12**, link piece **14** and bell crank lever **15** are returned to their normal working positions. Consequently the yarn clearer **5** is returned to its normal working position shown in FIG. **1**, and also the yarn guide **7** returned to their normal working position shown in FIG. **1**. During the above-mentioned return motion of the elements, the yarn after completion of the operation of the knotting device passes through the yarn clearer **5**, viz the yarn does not escape from passing through the yarn clearer.

As mentioned above, when the yarn clearer **5**, yarn guide **7**, and the tension device **6** are returned to their normal working position shown in FIG. **1**, the normal winding operation is started again. Therefore, when the yarn clearer **5** finds a faulty yarn such as slub or double knotted yarn, the faulty yarn is severed by the yarn clearer **5**, and then the above-mentioned operation of the knotting device **4** and yarn clearer **5** are repeated. Consequently, the winding of faulty yarn into the package **1** is completely prevented because the supply yarn to the package **1** is always passed through the yarn clearer even just after the completion of the operation of the knotting device.

While the invention has been described in conjunction with certain embodiment thereof it is to be understood that various modifications and changes may be made without departing from the spirit and scope of the invention.

What we claim is:

1. In combination with an automatic yarn-winding machine having a winding unit comprising a yarn guide for guiding yarn to be wound from a supply cop onto a yarn package, a yarn-knotting device operable to knot together yarn ends and cooperative with a yarn retrieval mechanism operable to retrieve yarn ends from both the yarn package and supply cop and deliver same to said knotting device, and a yarn-tensioning device disposed along the path of travel of the yarn to be wound to suitably tension the yarn during the winding operation, an improved yarn-clearing mechanism comprising: a movably mounted yarn clearer device operable when in a first working position to effectively clear yarn travelling therepast and operable when in a second working position to receive from said yarn-knotting device knotted together yarn to be cleared; and moving means for effecting alternate movement of said yarn clearer device to said first and second working positions in accordance with the operation of said winding unit.

2. A combination according to claim **1**; wherein said moving means includes a linkage system connected to move said yarn clearer device to said first and second working position, and cam means operative in accordance with the operation of said winding unit to effect movement of said linkage system accompanied by a corresponding movement of said yarn clearer device to said first and second working positions.

3. A combination according to claim **1**; wherein said winding unit includes detecting means for detecting the yarn during the winding operation and actuating said moving means whenever an absence of yarn is detected.

4. A combination according to claim **1**, wherein said moving means comprises a movably mounted programmed cam movable in accordance with the operation of said winding unit, a cam follower, means for maintaining said cam follower in camming contact with said programmed cam, and a plurality of pivoted together levers operative to transmit the motion of said cam follower to effect movement of said yarn clearer device.

5. A combination according to claim **1**; including means for movably mounting said yarn guide, and means for effecting movement of said yarn guide into and out of the path of travel of the yarn to be wound in synchronism with the movement of said yarn clearer device to said first and second working positions, respectively.

6. A combination according to claim **1**; including means for rendering said yarn-tensioning device ineffective in synchronism with the movement of said yarn-clearer device to said second working position.