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YARN POSITIONING AND TYING DEVICE

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Fig. 2.

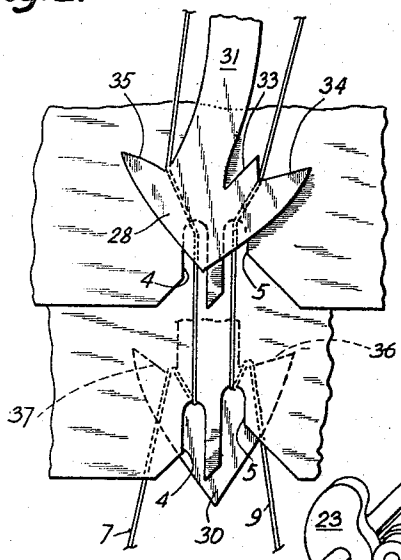


Fig. 3.

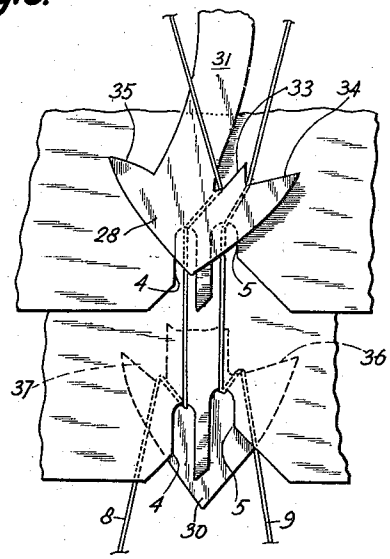
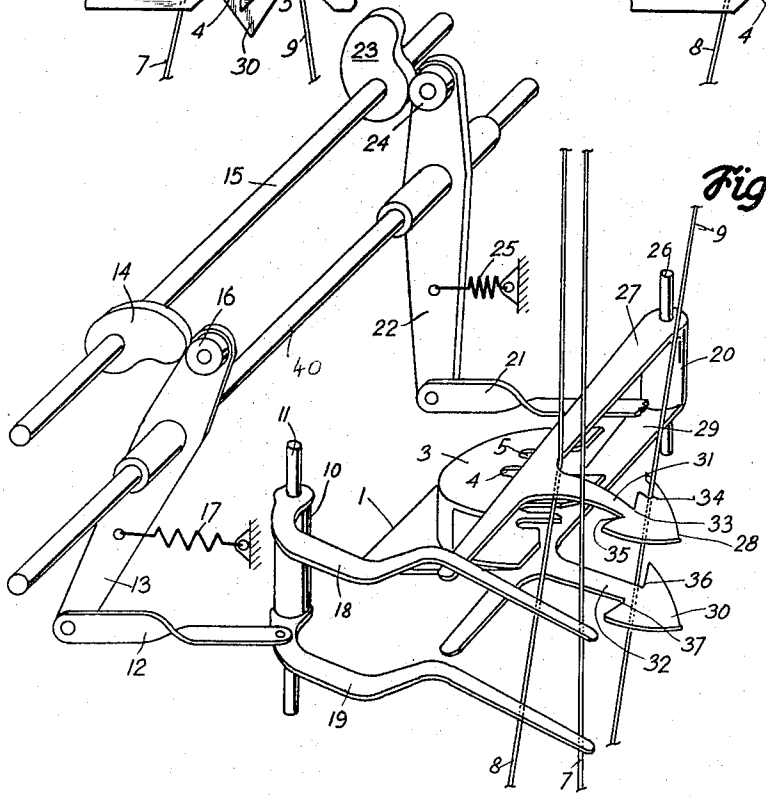


Fig. 1.



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YARN POSITIONING AND TYING DEVICE

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The present invention relates to a yarn end tying apparatus, and more particularly to apparatus provided in automatic winding machines for tying the yarn of a wound bobbin either to a broken yarn end of a supply cop, or to the new yarn end of a new supply cop.

It is known to equip automatic yarn winding machines with a tying device for each winding unit. Yarn ends inserted into the tying device are tied together in a knot which is necessary either if the yarn breaks during the winding, or in the event that the yarn of the supply cop is exhausted. In both cases, the yarn ends which have to be tied together must be inserted into corresponding receiving means of the tying device.

Known apparatus serving this purpose are rather complicated, expensive to manufacture, and difficult to maintain and service.

It is one object of the invention to overcome the disadvantages of known yarn and tying apparatus, and to provide a simple and efficient yarn end tying apparatus.

Another object of the invention is to provide a single yarn inserting means for inserting either a broken yarn end, or a new yarn end from a new cop, as well as the yarn end of a wound bobbin, into a typing device so that the respective yarn ends are automatically tied together.

With these objects in view, the present invention is concerned with a yarn end tying apparatus which is particularly suited for use with a winding apparatus which winds yarn from a cop onto a bobbin.

One embodiment of the invention comprises a conventional tying device having first and second receiving means for yarn ends, preferably a pair of recesses; yarn inserting means mounted for movement toward and away from the tying device and having two first yarn holding means, preferably recesses, passing the first receiving recess, and a second yarn holding means, preferably a recess, passing the second receiving recess during movement of the inserting means toward the tying device; and means for moving the inserting means.

In the event that a yarn breakage has occurred, a broken yarn end from the supply cop is located in the path of movement of one of the first yarn holding recesses, and in the event that the supply cop has been exhausted and a new cop has been substituted, a new yarn end is located in the path of movement of the other first yarn holding recess. Either the broken yarn end or the new yarn end, which are not disposed in the same location, is engaged by one or the other first holding recess and inserted into the first receiving recess. At the same time, another yarn end leading to the wound bobbin, located in the path of movement of the second yarn holding recess, is engaged by the same and is inserted into the second receiving recess. Thereupon, the tying device performs its function and ties either the broken yarn end, or the new yarn end, as the case may be, to the yarn end leading to the wound bobbin.

In the preferred embodiment of the invention, the yarn inserting means includes an arm, the two first holding recesses are located on opposite sides of the arm, and the second holding recess is located outwardly of one of the first holding recesses on one side of the arm. Yarn control means are located on the other side of the yarn and movable toward and away from the same and the holding recesses. Drive means, preferably including cams

and cam followers are connected with the inserting means and the control means for operating the same in a timed sequence. A broken yarn end is located on the above-mentioned side of the arm where a first holding recess and a second holding recess are provided, while a new yarn end of a new cop is located on the other side of the arm, and is engaged by the control means and pushed toward the arm to be caught by the first holding recess on the respective side of the arm and placed in the first receiving recess.

In the preferred embodiment, the yarn inserting means includes two arms of which the above described arm is located in a higher position above the tying device, while another arm is located below the same and has only one first and one second holding recess on opposite sides thereof. The yarn control means also include a higher arm and a lower arm respectively cooperating with the higher and lower arms of the yarn inserting means when a new yarn end is to be tied to the yarn end of the bobbin.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary perspective view illustrating a yarn end tying apparatus according to an embodiment of the invention;

FIG. 2 is a fragmentary exploded plan view illustrating a position of the yarn inserting means when a new yarn end has to be inserted into the tying device after replacement of an exhausted cop; and

FIG. 3 is a fragmentary exploded plan view illustrating the position of the inserting means for introducing a broken yarn end into the tying device.

Referring now to the drawings, an automatic yarn winding machine which is provided with the apparatus of the invention, comprises several winding units mounted on the same frame and being of identical construction. Each winding unit is provided with an apparatus of the invention, and consequently the apparatus illustrated in FIG. 1 is provided for a single winding unit, while each other winding unit of the winding machine, will be provided with a corresponding apparatus.

Each winding unit is provided with a yarn tying device of known construction which has two yarn receiving recesses **4** and **5**, each of which has a narrow inner end for guiding a yarn, and an outwardly flaring inlet portion, as best seen in FIGS. 2 and 3. FIGS. 2 and 3 show the the same recesses **4** and **5** and the same yarn tying device **3** in two staggered and exploded positions.

When two yarn ends are placed in receiving recesses **4** and **5**, the tying device **3** will form a knot tying the two yarn ends together. Tying devices serving this purpose are known, and are not an object of the invention.

During normal winding operations, the yarn will move substantially along the path **8** from a cop to a bobbin being wound. In the event of a yarn breakage, the broken yarn end extending from the cop will also substantially extend along the path **8**. In the event that a new cop has been substituted for an exhausted cop, the new yarn end will substantially extend along the path **7**. The yarn end of the bobbin being wound, irrespective of whether after a yarn breakage or after the exhaustion of a supply cop, will be located along the path **9**.

Since either the broken yarn end extending along path **8**, or the new yarn end extending along path **7**, has to be tied to the yarn end **9** of the bobbin, it is necessary to place either the broken yarn end or the new yarn end in receiving recess **4**, and the bobbin yarn end **9** in receiv-

ing recess 5 so that winding can be continued either from the old cop or from a new cop to the bobbin.

The yarn ends are inserted into the respective receiving recesses 4 and 5, by yarn inserting means. In the illustrated embodiment, the yarn inserting means includes a pair of levers 27 and 29 connected by a sleeve 20 and mounted for turning movement on a shaft 26. An arm 21 is secured to the lower lever 29 and pivotally connected to a double armed lever 22 which is mounted on a shaft for turning movement, and is biased by a spring 25 to engage the peripheral cam track of a cam 23 secured to a shaft 15 and rotating with the same. Consequently, during rotation of shaft 15 and cam 23, the cam follower roller 24 will be displaced, cam follower lever 22 will oscillate, and levers 27 and 29 will perform an angular motion. Lever 27 has a first arm 31 and lever 29 has a lower second arm 32. Each arm 31 and 32 has an end portion 28 or 30 in the shape of an arrowhead. Head portion 30 has two recesses 36 and 37 located on opposite sides of arm 32. Head portion 28 has two first recesses 35 and 33 located on opposite sides of arm 31, and one second recess 34 located outward of recess 33 on the same side of arm 31.

During angular oscillating movement of the inserting means caused by cam 23, the first recesses 33 and 35, and the first recess 37, will move along a path passing the receiving recess 4 of the tying device 3, as best seen in FIGS. 2 and 3. The second recess 34 and the second recess 36 will move along a path passing the second receiving recess 5 of the tying device.

Yarn control means are provided which cooperate with the inserting means. A pair of levers 18 and 19 are connected by a sleeve 10 which is mounted for turning movement on a shaft 11. A link 12 connects arms 18, 19 with a double-armed cam follower lever 13 which has a cam follower roller 16 and is mounted on the same shaft 40 on which double-armed cam follower lever 22 is mounted. Another cam 14 is rotated by drive shaft 15 and causes oscillation of cam follower lever 13 which is biased by a spring 17.

Due to the fact that cams 14 and 23 are fixed to the same drive shaft 15, the oscillations of levers 13 and 22, and therefore the movement of the inserting means including arms 31, 32 and heads 28, 30, and of the control means including arms 18 and 19, take place in a timed relationship. However, while heads 28 and 30 move toward and away from the tying device 3, arms 18 and 19 move in a transverse direction toward the arms 31 and 32 and heads 28, 30, and away from the same.

During the normal winding operation, the yarn extends from a supply cop to a bobbin substantially along a path 8, and on the same side of arm 31 where two holding recesses 33 and 34 are provided. The yarn moves along the respective other side of arm 32 where holding recess 32 is provided. Due to this position of the yarn, which is also restrained by the arms 27 and 29, ballooning of the yarn is prevented during winding operations.

The cop from which the yarn is unwound is located below the apparatus shown in FIG. 1, and the wound bobbin is located above the same. The yarn passes from the supply cop through the illustrated yarn end tying apparatus in upward direction to a clearer, scanner, the winding drum, and finally to the wound bobbin.

Yarn tying after a yarn breakage

Usually a yarn breakage occurs in the clearer or behind the same so that the broken yarn end extending from the supply cop remains in the position 8. Automatic mechanism, which is not an object of the invention, finds the broken yarn end on the wound bobbin, and pulls the respective yarn end down to the position 9 in which yarn end 9 leading to the bobbin is located in the region of the holding recesses 34 and 36. The broken yarn end 8 is located along the path of movement of recesses 37 and 33, since the corresponding portions of the broken yarn ends 8, 9 are located on opposite sides of arms 31 and 32. The automatic mechanism which is actuated when the yarn breaks, causes a single revolution of drive shaft 15 which may be obtained by one revolution clutch connecting shaft 15 to a motor. Cam 14 causes an angular oscillation of arms 18 and 19 of the yarn control means toward arms 31 and 32 so that the broken yarn end in the position 8 may be pushed closer to arm 32, if necessary. Arm 18 has no effect on the portion of the yarn located on the other side of the upper arm 31.

Immediately thereafter, cam 23 causes an angular movement of the inserting means toward the time device. The broken yarn end 9 extending from the bobbin is engaged by the recesses 34 and 36 and moved into receiving recess 5 of tying device 3, as shown in FIG. 3. Holding recess 33 engages the broken yarn end extending from the cop along path 8, and recess 37 engages the same broken yarn end, and during the further movement of the inserting means toward the tying device 3, the yarn end 8 is inserted into the receiving recess 4, as best seen in FIG. 3. Thereupon, the tying device 3 automatically ties the yarn ends 9 and 8 together, and the inserting device performs an opposite stroke so that the tied yarn is moved out of recesses 4 and 5. Since the tied broken yarn end 9 is located on the right side of arm 31, and the tied broken yarn end 8 is located on the other side of arm 32, the proper winding position of the yarn passing over opposite sides of arms 31 and 32 is again obtained. The rotation of the winding roller is again started, and the winding operation continues.

In the event that the supply cop is exhausted, it is automatically ejected in the usual manner under the control of a stop motion, and a new supply cop is substituted for the exhausted cop. The new yarn end of the new cop is held by suitable means in a substantially vertical position to extend along path 7 on the same side of arms 31 and 32. Rotation of shaft 15 is automatically started so that control levers 18 and 19 swing toward arms 31 and 32 and push the new yarn end toward the arms 31 and 32 so that yarn end 7 is located in the path of movement of recesses 35 and 37. The movement of the yarn inserting means toward the tying device 3 is started, holding recesses 37 and 35 engage the yarn end 7, and during further movement of the inserting means, the recesses 35 and 37 pass beyond the recess 4, as best seen in FIG. 2, so that the yarn end 7 extending from the new supply cop, is inserted into the yarn receiving recess 4. The broken yarn end extending from the wound bobbin has been placed as described above in the position 9 located in the region of the holding recesses 34 and 36. During the movement of the inserting means toward the tying device, the yarn end 9 is placed in the receiving recess 5, and automatically tied to the yarn end 7. Winding operations can now be continued, with the tied yarn in the proper position located on the right side of arm 31, and on the left side of arm 32.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of yarn tying apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a yarn end tying apparatus for tying the end of yarn wound on a bobbin, either to a broken yarn end of a supply cop, or to the yarn end of a new supply cop, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can be applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are

intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Yarn end tying apparatus comprising, in combination, a tying device having first and second receiving means for yarn ends and adapted to tie yarn ends in said first and second receiving means to each other; yarn inserting means mounted for movement toward and away from said tying device and having two first yarn holding means passing said first receiving means, and a second yarn holding means passing said second receiving means during movement of said inserting means; and drive means for moving said inserting means so that a broken yarn end located in the path of movement of one of said first yarn holding means, or a new yarn end located in the path of movement of the other of said first yarn holding means, is engaged by the respective first holding means and inserted into said first receiving means while another yarn end located in the path of movement of said second yarn holding means is engaged by the same and inserted into said second receiving means whereby either a broken yarn end or a new yarn end is tied by said tying device to said other yarn end.

2. An apparatus according to claim 1 wherein said first and second receiving means of said tying devices are first and second receiving recesses having narrow inner yarn guiding portions, and outer flaring yarn receiving portions; and wherein said two first yarn holding means are holding recesses, and said second yarn holding means is a holding recess, said holding recesses being adapted to engage and hold broken yarn ends and to place the same in said first and second receiving recesses during movement of said yarn inserting means toward said tying device, and of said holding recesses beyond said inner ends of said receiving recesses.

3. An apparatus according to claim 1 wherein said yarn inserting means includes a first inserting member having said two first yarn holding means and said second yarn holding means, and a second inserting member having another first yarn holding means and another second yarn holding means respectively moving along paths leading to and beyond said first and second receiving means.

4. An apparatus according to claim 3 and including a pair of control arms operated by said drive means in timed relationship with the movement of said yarn inserting means, said arms being adapted to move a new yarn end into the region and paths of movement of said first yarn holding means.

5. An apparatus according to claim 1 and including yarn control means for moving said new yarn end into the path of movement of said other of said first yarn holding means so that the same engages said new yarn end during movement toward said tying device; and wherein said drive means operates said yarn control means in timed relation with the movements of said yarn inserting means.

6. Yarn end tying apparatus comprising, in combination, a tying device having first and second receiving means for yarn ends and adapted to tie yarn ends in said first and second receiving means to each other; yarn inserting means including an inserting member having an arm, two first yarn holding recesses on opposite sides of said arm, and a second yarn holding recess outwardly of one of said first holding recesses on one side of said arm, said yarn inserting means being mounted for movement toward and away from said tying device along a path disposed so that said first holding recesses pass said first receiving means and said second holding recesses passes said second receiving means; yarn control means located on the other side of said arm movable toward and away from said arm and said holding recesses; and drive means for moving said inserting means and yarn control means in a timed sequence so that a broken yarn end located on said one side of said arm in the path of movement of said one first yarn holding recess is engaged by the same and inserted into said first receiving means, or so that a new yarn end located on the other side of said arm is moved by said yarn control means into the region of the other first holding recess, engaged by the same and inserted into said first receiving means while another yarn end located in the path of movement of said second yarn holding recess is engaged by the same and inserted into said second receiving means whereby either a broken yarn end or a new yarn end is tied by said tying device to said other yarn end.

7. An apparatus according to claim 6 wherein said yarn inserting means includes another yarn inserting member having another arm, and other first and second holding recesses on opposite sides of said other arm so that a broken yarn end or a new yarn end are engaged also by said first holding recess of said other inserting member, and said other yarn end is also engaged by said second holding recesses of said other inserting member, said other first and second holding recesses passing said first and second receiving recesses, respectively, during movement of said yarn inserting means; wherein a tied yarn is located on said one side of said first mentioned arm, and on the respective other side of said other arm; and wherein said yarn control means include a pair of arms located on said other sides of said arms of said inserting means for pushing broken yarn ends toward said first mentioned arms and into the path of movement of said first holding recesses located on said other sides of said first mentioned arms.

8. An apparatus according to claim 7 wherein said first mentioned arms of said yarn inserting means are respectively located above and below said tying device; and wherein said arms of said yarn control means are respectively located above and below said arms of said inserting means and also above and below said tying device.

9. An apparatus according to claim 8 wherein said arms of said inserting means are mounted for angular movement; wherein said arms of said control means are mounted for angular movement; and wherein said drive means are connected with said arms of said inserting means and controls means for oscillating the same in timed relationship.

10. An apparatus according to claim 6 wherein said drive means include a drive shaft, a pair of cams secured to said drive shaft for rotation, cam follower means cooperating with said cams, respectively, and being connected with said yarn control means and with said yarn inserting means for moving the same in timed relationship.

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