Oct. 23, 1962 S. FÜRST 3,059,868

YARN-WINDING APPARATUS WITH ROTARY YARN GUIDE

Filed March 26, 1959 4 Sheets-Sheet 1

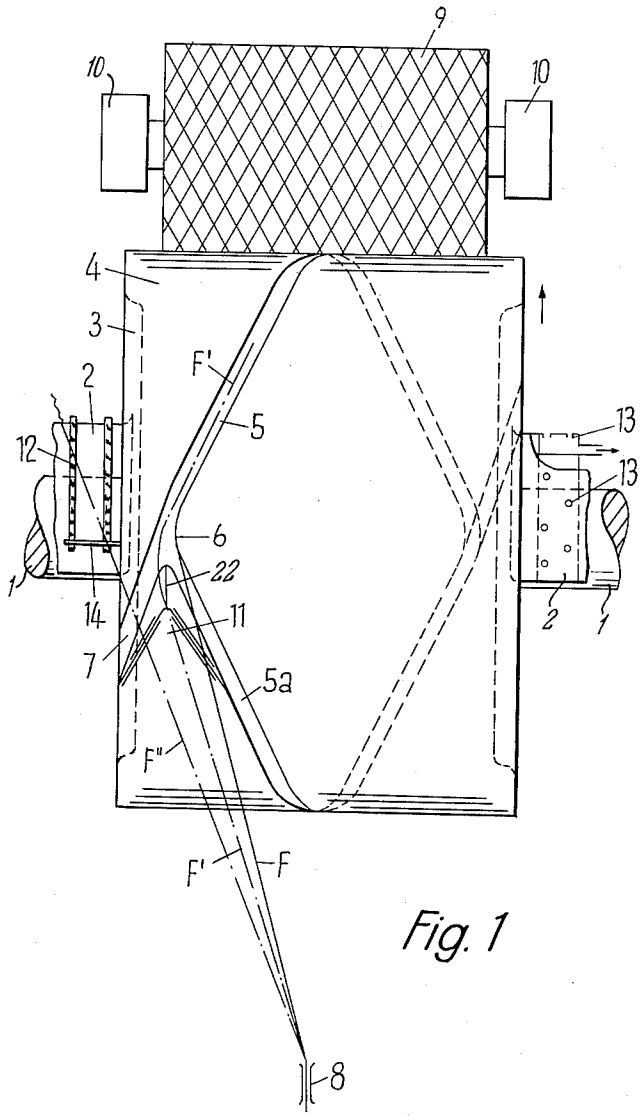


Fig. 1

Oct. 23, 1962 S. FÜRST 3,059,868

YARN-WINDING APPARATUS WITH ROTARY YARN GUIDE

Filed March 26, 1959 4 Sheets-Sheet 2

Fig. 3

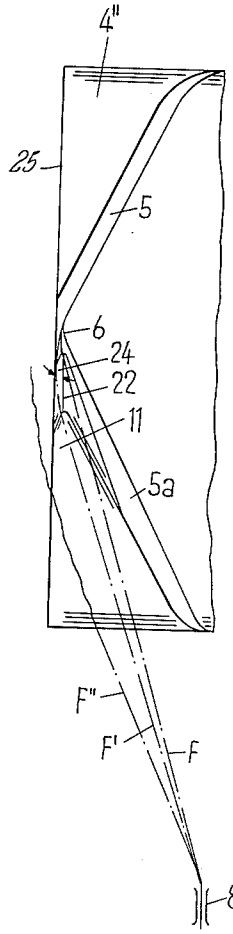
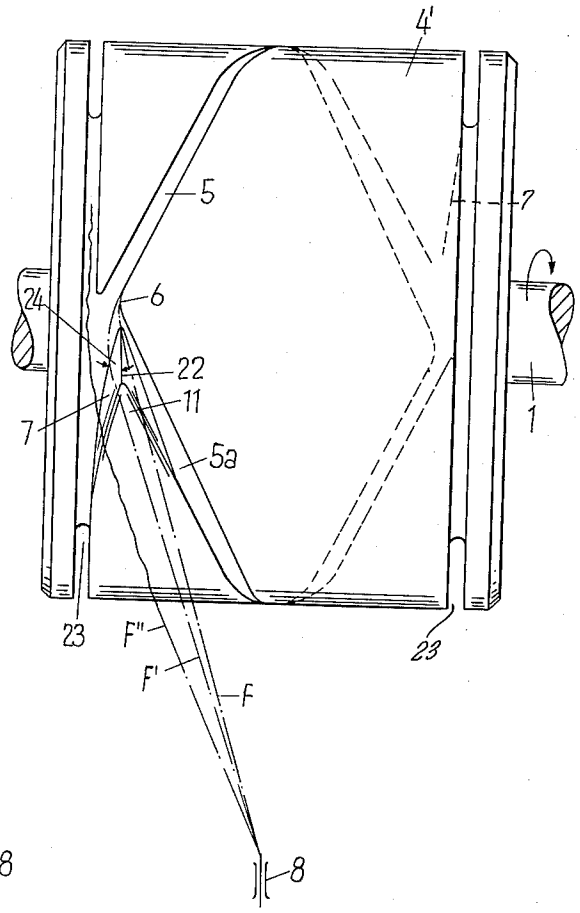


Fig. 2



Oct. 23, 1962 S. FÜRST 3,059,868

YARN-WINDING APPARATUS WITH ROTARY YARN GUIDE

Filed March 26, 1959 4 Sheets-Sheet 3

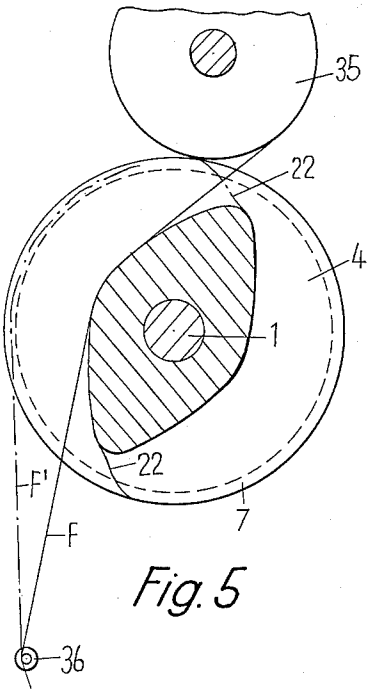


Fig. 5

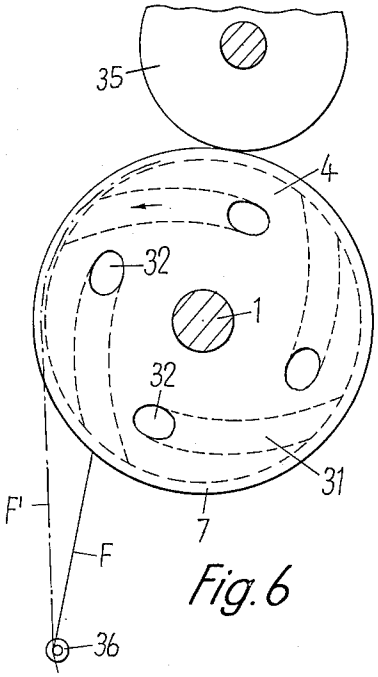


Fig. 6

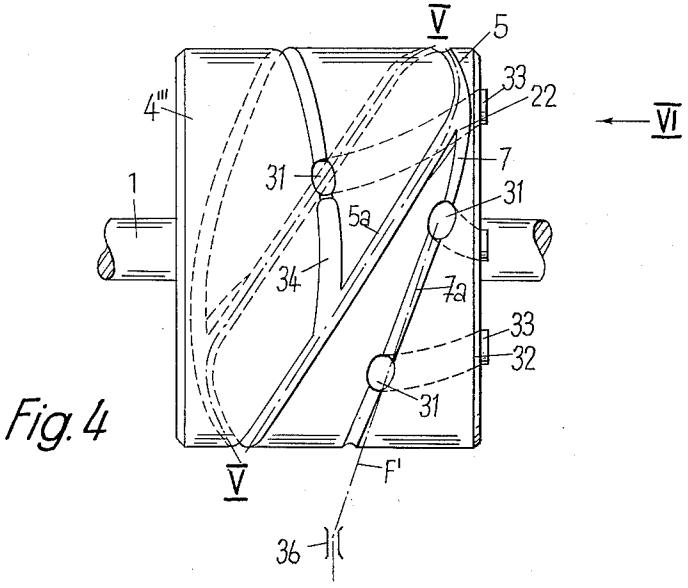


Fig. 4

Oct. 23, 1962 S. FÜRST 3,059,868

YARN-WINDING APPARATUS WITH ROTARY YARN GUIDE

Filed March 26, 1959 4 Sheets-Sheet 4

FIG. 7

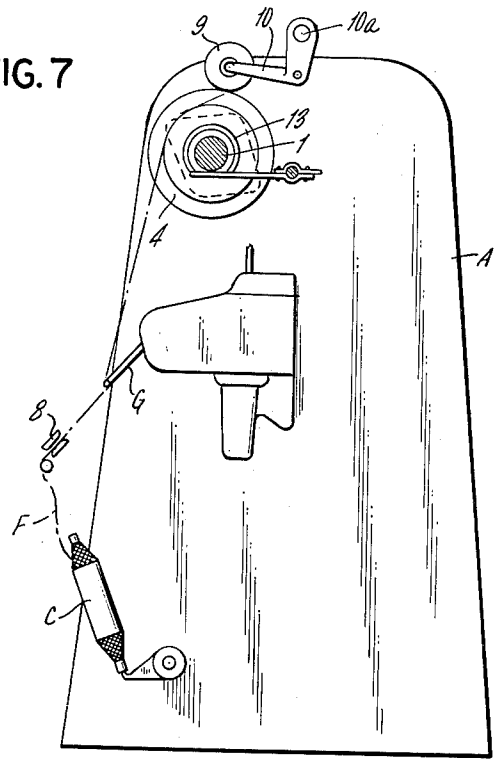


FIG. 8

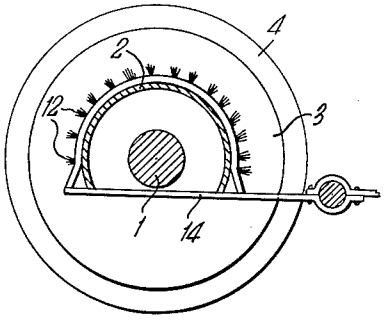
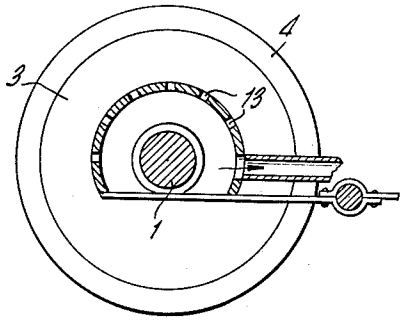


FIG. 9



United States Patent Office 3,059,868 Patented Oct. 23, 1962

3,059,868
YARN-WINDING APPARATUS WITH ROTARY YARN GUIDE

Stefan Fürst, Monchen-Gladbach, Germany, assignor to Walter Reiners, Monchen-Gladbach, Germany

Filed Mar. 26, 1959, Ser. No. 802,222
Claims priority, application Germany Apr. 5, 1958
10 Claims. (Cl. 242—43.2)

My invention relates to apparatus for re-winding yarn from supply coils, such as spinning cops, onto a take-up spool for the purpose of producing a wound yarn package of a shape and size desired for further use of the yarn. More particularly, my invention concerns yarn-winding apparatus in which the take-up spool is driven by peripheral engagement with a rotating yarn guide of drum shape on which the yarn passes through a guiding groove or slot that forms a loop closed upon itself around and along the cylinder surface of the drum so that the yarn is reciprocated along the take-up spool as the yarn passes upon the spool.

Such yarn-winding devices, as a rule, are provided with a sensing member which, in response to depletion of the supply coil or tearing of the yarn, causes the winding operation to stop until a new supply coil is substituted or the damage repaired. In some cases however, the yarn may tear close to the take-up spool and it may then happen that a length of yarn wraps itself around the guiding drum or into the groove of the drum before the winder is stopped. Such wrapping may take place so rapidly that the yarn is kept under sufficient tension to prevent the response of the above-mentioned sensing member, thus resulting in a defective yarn package on the take-up spool. In any such event, a relatively long period of stoppage is required to permit an attendant to remove the wrap. In general, several yarn-guiding drums are mounted on a single drive shaft so that, for removing a wrap of yarn from any one guiding drum, the entire shaft assembly must be stopped, thus enforcing a stoppage of a number of adjacent stations.

It is an object of my invention to prevent the yarn, in the event of breakage, from wrapping itself about the rotating yarn guide or into the guiding grooves or slots of the guide, thus facilitating and expediting the return to normal operating conditions.

Another object of my invention is to provide the rotary yarn guide with deflector means which, in response to instantaneous drop in yarn tension due to yarn breakage, fling the yarn laterally out of the guiding groove and away from the active peripheral surface of the guiding drum to thus prevent wrapping.

Still another object of my invention is to give the above-mentioned tension-responsive deflector means a design of utmost simplicity and minimum space requirements that does not require the use of additional mechanisms or moving parts.

A further object of my invention, akin to those mentioned, is to devise a rotary yarn-guiding drum for winding machines that is inherently protected from forming about itself a wrap of yarn in the event of yarn breakage, and that can be used not only in new machines but is also applicable in existing machines as a replacement for the conventional yarn-guiding drum.

In order to achieve these objects and in accordance with one of the features of my invention, I provide the guiding groove, at one or both reversing localities of the loop formed by the groove, with a lateral opening or lead-off groove through which the end of a broken length of yarn can fling outwardly and away from the guiding groove upon occurrence of yarn breakage.

According to another feature of my invention I provide

the guiding drum with an integral deflector member located at one or both reversing points of the loop and in the vicinity of the above-mentioned lateral opening or lead-off groove, the deflector member being outside of the normal yarn path and being engaged by the yarn only when the yarn loses tension and thus moves under its own inertia into the active range of the deflector member.

The invention will be further described with reference to the embodiments of yarn-winding devices according to the invention illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a front view of a winding device whose guiding drum is bordered by stationary cover members.

FIG. 2 is a front view of a yarn guiding drum with lateral retainer grooves.

FIG. 3 is a partial view of a third winding drum.

FIG. 4 illustrates a fourth embodiment of a yarn-guiding drum with shallow grooves forming a continuation of the lead-off grooves;

FIG. 5 is a cross section of the drum along the yarn-guiding groove, the section line being indicated at V—V in FIG. 4; and

FIG. 6 is a lateral view of the drum in the direction of the arrow VI indicated in FIG. 4.

FIG. 7 is a schematic lateral view of a winding machine equipped with a device according to FIGS. 1 to 6.

FIG. 8 is a view of guide drum of FIG. 1 seen from the left; and FIG. 9 shows the same drum from the right of FIG. 1.

According to the schematic diagram of FIG. 7, generally applicable to devices of the kind here described, the machine frame structure A carries an exchangeable supply coil C, such as a spinning cop from which the yarn F passes along a tension-sensing yarn guard G and through a yarn tensioner 8 to a rotating guiding drum 4 onto a take-up spool 9 which is journaled on a holder 10 pivoted at 10*a* to the frame structure A. The guiding drum 4 is secured to a drive shaft 1 and, during operation of the winder, rotates normally at constant speed. The package of yarn being wound on spool 9 rests against the periphery of drum 4 under its own weight and the weight of the pivoted holder 10. As a result, the spool 9 is frictionally entrained by the drum 4. As apparent from the other illustrations described below, the drum 4 is provided with a guiding groove that extends about the periphery of the drum and is closed upon itself. The configuration and arrangement of the groove loop, as a whole, is such that during rotation of the guiding drum 4 the incoming yarn is reciprocated along the spool 9 in order to produce a cross-wound package of yarn.

In the embodiment of the yarn-guiding drum 4 illustrated in FIG. 1, an arcuate or circular cover sheet 2 of metal, stationarily mounted, surrounds, or partially surrounds, the shaft 1 and extends into a lateral cavity 3 of the guiding drum 4 so that the end of the sheet 2 is covered by the protruding portion of the drum. The stationary protecting cover or sheet member 2 is located laterally and axially adjacent to the guiding drum to receive any yarn and flung out of the guiding groove. The cover member 2 thus keeps the yarn end away from the rotating parts, particularly the guiding drum 4 and its drive shaft 1, so that the yarn end cannot again be entrained. The stationary cover member 2 preferably extends beneath the peripheral edge of the drum 4 so as to reliably receive the yarn end and preventing it from placing itself against the rotating shaft 1. After the yarn end is flung away from the guiding groove 5, 5*a*, the winding operation is stopped by the automatic stopping device until the two yarn ends are tied together and the winder is again started by manual or automatic control devices.

The drum 4 is provided with a yarn-guiding groove which comprises the two groove portions 5 and 5*a* merging with each other in a curved reversing zone 6 which hereinafter is briefly called "reversing point." There are two such reversing points on opposite axial sides respectively of the drum. According to the invention, a lead-off groove 7 is provided at each reversing point 6 and extends laterally of the main groove portions 5, 5*a* approximately in the same direction as the groove portion 5. As shown, however, a slight bend in groove 7 toward the groove portion 5*a* is preferable.

The above-mentioned lead-off groove 7, merging with the loop formed by the guiding groove 5, 5*a*, extends laterally away from the loop toward the adjacent peripheral edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn being wound, extends from the reversing point 6 to the take-up spool 9. During rotation of the guiding drum 4 and in the event of yarn breakage, the yarn under the effect of its own momentum and because of its practically tension-less condition, tends to continue its stroke of reciprocating movement and thus is flung laterally beyond the reversing point 6 of the guiding groove with the result of entering into the lead-off groove 7. With such an orientation of the lead-off groove, the body of the drum forms a deflector structure 11 of substantially triangular shape between the lead-off groove and the other portion of the guiding groove; and this triangular structure 11 operates as a deflector member for imparting laterally acting force upon the yarn end to promote the operation just described.

When starting the winding operation of the winding station, the yarn F coming from the tensioner 8 passes through the groove portions 5*a* and 5 to the take-up spool 9 rotating on the holder 10. As long as the yarn F is under tension, i.e. is connected with the wound-up amount of yarn on the take-up spool 9, the traveling yarn runs in the lower groove portion 5*a* as well as in the upper groove portion 5 and, due to rotation of drum 4, is being reciprocated along the take-up spool. If the tension in the yarn decreases excessively due to occurrence of yarn breakage in the vicinity of the guiding drum, the yarn, when in the outermost position F' of normal operation, tends to continue its sidewise travel and thus will run or switch off into the lead-off groove 7 which guides it to the position F'' at the edge of the guiding drum. The triangular structure 11 located between the groove portion 5 and the lead-off groove 7 then acts as a deflector and flings the yarn end to the position F'', with the edge 22 of triangle 11 serving as a deflector edge. The flinging motion thus imparted to the yarn toward the left-hand side of the device causes it to glide upon the cover 2 which keeps the yarn away from the shaft and the drum thus preventing the yarn from being wrapped about the shaft. If desired, the yarn end can be caught by yarn-catching means such as a brush 12 (FIGS. 1, 8) mounted on cover member 2. In lieu thereof, the cover 2 may be provided with openings 13 through which a current of suction air is effective as is shown on the right-hand side of FIG. 1 and in FIG. 9. If desired, a clamping or holding device 14 (FIG. 1) for the flung-out end of the yarn can be used to advantage. It will be understood that while the winder may be provided with respectively different yarn-catching means on axially opposite sides of the drum as shown, it is generally preferable to use one and the same kind of catching means on both sides of the drum.

My invention is predicated upon the following observations. Tests have shown that in the event of yarn breakage, the yarn end coming from the supply coil C and passing through the guiding groove of the rotating yarn guide 4 will temporarily lose its tension for a short interval of time, but nevertheless continues travelling forward during this interval because of the kinetic energy inherent in the yarn. During the interval of continuing forward travel, the friction of the yarn on the walls of the guiding groove and/or the entrainment of the yarn by the current of air produced by the rotating guiding drum 4, are still active to cause the yarn to be pulled off the supply coil C. It has further been found that, by virtue of the momentary loss or drop of tension in the yarn, it is possible to deflect the yarn out of the guiding groove at one of the reversing points 6 of the loop formed by the groove in the vicinity of the drum edge. Such a deflection, however, requires the application of a force acting upon the yarn in the lateral direction.

Observation has further shown that during winding operation, the yarn F, entering into the groove of the rotating yarn guide 4, is guided by a side wall of this groove from the entering point of the yarn to the reversing point 6 of the guiding-groove loop, but that the yarn is not in contact with the groove wall shortly behind the reversing point 6, but has the tendency to continue travelling in its original direction for some short distance behind the reversing point. As a result, the yarn, during normal winding operation, bulges away from the reversing point 6 of the guiding groove so that the peak of the bulge is located laterally away from the groove wall at the reversing point. However, when the yarn tears and loses tension, the yarn end is flung outwardly a larger distance than during normal winding operation in which the yarn is continuously kept under tension.

My invention takes advantage of the above-mentioned difference in size of the bulge formed by the yarn when in sound condition as compared with the larger bulge formed when the yarn is torn. That is, when the yarn breaks and thus forms a larger than the normal bulge at the reversing point 6 of the guiding groove, the yarn comes within the active range of the lateral lead-off groove 7 or deflector member 11. This requires, as a rule, that the guiding or flinging force acting upon the yarn be smaller than the force resulting from the tension in the yarn during normal operation. Since the yarn tension can readily be adjusted, the just-mentioned requirement can be met without difficult, aside from the fact that this requirement becomes more and more negligible with increasing normal travelling speed of the yarn, i.e. with increasing rotating speed of the yarn-guiding drum 4.

According to still another feature of my invention, the above-mentioned deflector structure 11 formed by the drum body between the lead-off groove and the guiding groove is provided with a leading edge 22 in order to improve the above-mentioned switching operation that causes the yarn, when broken, to be shifted out of the guiding groove 5, 5*a* and into the lead-off groove 7.

As mentioned, during operation of the device, the yarn F coming from the tensioner 8 passes through the groove portions 5 and 5*a* to the take-up spool 9. During such forward travel and simultaneous reciprocating movement of the yarn F, it forms a slight bulge at the reversing point 6 of the groove. The size of the bulge depends upon the yarn tension and the inertia of the yarn. When the yarn tears, the tension is extremely slight or negligible, and the bulge becomes considerably larger. As long as the yarn remains in sound condition, the bulge is negligible and the yarn is continuously guided back and forth along the take-up spool by the groove portions 5 and 5*a*. However, when the yarn is broken, its bulge at the reversing point 6 becomes so large that it is guided by the edge 22 into the lead-off groove 7. The best position of the edge 22 can be most readily determined by a test in which the yarn position is made visible by the means known for such purposes, for example by a stroboscope or by electronic-flash photography. Such observation indicates the size of the maximum bulge of the unbroken thread and the minimum bulge of the broken thread. The edge 22 is located between the two limits thus determined, preferably midway between them.

In yarn guiding drums according to the invention as described above with reference to FIG. 1, as well as in

those shown in FIGS. 2 to 6, the edge 22 of the deflector may commence at the bottom of the guiding groove or a short distance, for example 1 to 2 mm., ahead or behind the reversing point 6 of the guiding groove. The edge is preferably given a length between 10 and 50 mm., preferably about 30 mm. and rises gradually from the groove bottom to the outer peripheral surface of the drum. It is preferable to have the edge extend approximately in a plane perpendicular to the axis of the guiding drum. The edge may be given a slight upgrade toward the middle of the drum, the grade amounting to approximately 2 to 3 mm. for an edge length of about 30 mm. The lead-off groove 7 should extend at an angle (24 in FIGS. 2 or 3) of less than 30°, preferably about 15° or less, with respect to the deflector edge 22. Preferably, the lead-off groove is made shallower than the adjacent portion 5 of the guiding-groove with which it is approximately aligned and becomes progressively shallower with increasing distance from the reversing point 6.

According to a further feature of my invention illustrated in FIG. 2, the lead-off groove 7 joins a ring-shaped retainer groove 23 which extends peripherally around the guiding drum in a radial plane outside of the drum zone containing the loop of the guiding groove. The annular groove receives the deflected yarn end during rotation of the drum upon occurrence of yarn breakage, and thus prevents the yarn from entering between the take-up spool and the surface of the yarn-guiding drum which may result in formation of a wrap.

In the embodiment shown in FIG. 2, the yarn-guiding drum 4' is provided with peripheral retainer grooves 23 on both sides respectively of the loop formed by the groove portions 5, 5a and close to the axial end faces of the drum. The lead-off grooves 7 open into the respective retainer grooves 23. When the yarn F, due to breakage, is flung laterally by the action of the lead-off groove 7 and passes through position F' to the position F'', it is caught and kept in the adjacent retainer groove 23 until the winding station is to be stopped or the broken yarn ends are to be knotted together. The deflector edge 22 commences at the bottom of the groove 23 below the reversing point 6 and extends along a curved path to the cylinder surface of the drum in a direction substantially tangential to the reversing point 6 and inclined to the normal plane through the center of the drum. The lead-off groove 7 forms together with the edge 22 an angle 24 smaller than 30° and preferably smaller than 15°. The deflector edge 22 is not a straight line but has slightly curved shape, as above mentioned.

Devices according to the invention can be used in conjunction with already existing machines. Some existing machines, however, do not permit the use of guiding drums with an additional peripheral groove as shown in FIG. 2 or with additional cover sheets 2 as shown in FIG. 1. In such cases a design according to FIG. 3 is preferable. As shown in FIG. 3, the yarn is led-off to the edge of the guiding drum through a lateral opening, thus virtually omitting the guiding groove, as is shown in FIG. 3. Where no additional space is available, the deflector edge 22 can be located nearly at the lateral end face 25 of the drum 4''.

As mentioned above, a guiding drum in devices according to the invention may be provided with an additional shallow groove to form a continuation of the lateral lead-off groove. Any broken yarn ends passing from the lead-off groove into the shallower continuing groove is located close to the peripheral drum surface and hence is no longer held fast by the air current which rotates together with the drum in the interior of the relatively deep yarn-guiding groove. In the shallow continuing groove, the yarn end becomes subjected to the air current which is entrained by the cylinder surface of the rotating drum and which somewhat penetrates into the shallow groove. As a result, such yarn ends will lift themselves out of the yarn-guiding drum. If desired, the removal of yarn ends can be effected or facilitated by blowing air out of the interior of the guiding drum into the shallow groove.

The shallow groove thus forms a continuation of the above-mentioned lead-off groove 7 and has smaller depth than the lead-off groove. After the yarn end is caught by the lead-off groove 7 or the deflector member 11, it passes into the shallow groove from which the yarn end or yarn residue can be more readily eliminated than from the deeper guiding groove. In general, the yarn end or yarn residue can be more readily removed from the guiding drum, the farther the end is removed from the axis of the drum. For that reason, the removal of yarn ends from a deeper yarn-guiding groove is more difficult than from the shallow groove.

The shallow continuing groove is preferably so shaped that it extends from the lead-off groove 7 toward the middle of the guiding drum and, if the drum is provided with a centrally located threading-in groove, merges with the latter groove. As a result, any broken yarn ends passing through the lead-off groove into the shallow groove are conveyed to the middle of the drum so that, unless in the meantime the yarn end has been eliminated from the shallow groove, it will again pass into the guiding groove and out of the lead-off groove. Such repetition, in the relatively rare cases where the yarn end is not eliminated from the drum during the first try, more reliably secures the desired operation.

It is further of advantage to connect the shallow continuing groove with one or more air ducts which open into the groove, preferably at the bottom thereof, and which is supplied with blowing air from the interior of the drum for the purpose of blowing any yarn end or residue out of the shallow groove, thus completely eliminating the danger of wrap formation. For the purpose just mentioned, the guiding drum may be designed as a blower so that it inducts air due to the drum rotation and conveys the air through the air duct or ducts into the shallow groove.

The improvement features just mentioned are embodied in the device described presently with reference to FIGS. 4 to 6.

The lateral lead-off groove 7 merges with a shallow groove 7a which extends back to the middle zone of the drum. The groove 7a is very shallow, preferably not more than 5 mm. deep. Air ducts communicate through openings 31 with the shallow groove 7a and supply it with a current of blowing air. The inlet ducts 32 for air are located at an axial end face of the drum. If desired, small vanes may be additionally mounted on the drum in order to scoop air into the ducts. However, in lieu of such vanes, provision may be made for supplying a current of blowing air from the source of compressed air with which the winding machines are provided in most cases. If the yarn-guiding drum is provided with a threading-in groove 34, as shown in FIG. 4, the end of the shallow groove 7a may open into the threading groove 34. In FIGS. 5 and 6 the take-up spool is denoted by 35 and the yarn tensioner by 36. The yarn path of the normal yarn is denoted by F, and the path of the broken yarn by F'.

When placing the device according to FIGS. 4 to 6 into operation, the yarn F is guided by the drum 4''' as it passes onto the take-up spool 35. In the event of yarn breakage, the yarn deflects into the lead-off groove 7 which merges with the shallow continuing groove 7a. This deflection takes place in the same manner as described above in conjunction with the embodiments of FIGS. 1 to 3. When the yarn passes by one of the openings 31, particularly when the yarn end itself reaches such an opening, the current of blowing air emerging from the openings 31, lifts the yarn slightly out of the shallow groove 7a. The yarn end then drops off and can no longer be caught or clamped by the drum. In this manner, the occurrence of yarn wraps about the

guiding drum due to tearing of the yarn is securely prevented.

The transfer of a broken yarn end to form the lead-off groove through the continuing groove to the centrally located threading-in groove is aided by the fact that the yarn end has the inherent tendency to move to the middle of the drum because the tensioner 8 (FIG. 1, 7) or other yarn-guiding member from which the yarn passes onto the drum 4 is located centrally in front of the drum, whereas the lead-off groove 7 is located near an axial end of the drum. Any yarn end extending from the tensioner to the lead-off groove has an angular position with respect to the drum axis and hence tends to shift its position to that corresponding to the shortest distance of the tensioner from the drum. This contributes to moving a broken yarn end to the middle if the end is not blown away or otherwise removed from the drum.

As mentioned, the continuing groove *7a* is very shallow. Its depth is between 1 and 10 mm., preferably about 4 to 6 mm. The bottom of the shallow groove may gradually rise from the depth of the lead-off groove 7 up to the cylinder surface of the drum and, if desired, may follow a helix up to the point where the shallow groove terminates at the middle of the drum or in the above-mentioned threading-in groove.

The provision of a shallow groove as a continuation of the lead-off groove has the further advantage of forcing the yarn to a position in which it is prevented from entering between the cylindrical outermost surface of the yarn-guiding drum and the take-up spool, before the take-up spool, by operation of the conventionally provided fault-sensing yarn guard (G in FIG. 7) is lifted off the drum. Such clamping of the yarn between the drum surface and the take-up spool, in most cases, results in the formation of undesired wraps.

The devices according to the invention described above prevent in a simple manner and without the aid of additional mechanisms any formation of wraps. As a result, the efficiency of the winding machine is improved, because it is subject to a much smaller number of stoppages per unit of time than the known machines, particularly if the yarn material being processed has relatively low tearing strength. By virtue of the simple design, the devices are reliable in operation and require virtually no particular attendance or maintenance work. These advantages are achieved without additional mechanisms and exclusively by the groove arrangement explained above. The invention is applicable with guiding drum having mutually intersecting guiding grooves as well as with drums whose yarn-guiding grooves do not intersect. The invention is further applicable to individually driven guiding drums as well as to multi-station machines in which a number of such drums are mounted on a common drive shaft or otherwise provided with a single drive.

I claim:

1. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having near each of said reversing points a lead-off groove merging with said loop and extending laterally away therefrom toward the adjacent edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn, extends from said reversing point to the spool, whereby in the event of yarn breakage the yarn end is caused to fling through said lead-off groove away from said guiding groove, said guiding drum having two annular peripheral retainer grooves in respective radial planes located on opposite axial sides respectively of said guiding-groove loop, and said lead-off grooves extending from said reversing points into said respective retainer grooves.

2. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having near each of said reversing points a lead-off groove merging with said loop and extending laterally away therefrom toward the adjacent edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn, extends from said reversing point to the spool, whereby in the event of yarn breakage the yarn end is caused to fling through said lead-off groove away from said guiding groove, said drum comprising a shallow groove which forms a continuance of said lead-off groove and has smaller depth than the latter, and said drum having air ducts connecting its interior with said shallow groove for blowing air into said shallow groove to remove therefrom any yarn residues.

3. In a winder according to claim 2, said drum having air induction means so as to inherently form a fan for blowing air through said ducts into said shallow grooves.

4. In a winder according to claim 2, said drum having air intake means on an end face of said drum, said intake means communicating with said ducts for blowing air through said ducts due to rotation of said drum.

5. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having near each of said reversing points a lead-off groove merging with said loop and extending laterally away therefrom toward the adjacent edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn, extends from said reversing point to the spool, whereby in the event of yarn breakage the yarn end is caused to fling through said lead-off groove away from said guiding groove, comprising a drive shaft on which said drum is coaxially mounted, a stationary cover member surrounding said shaft adjacent to said drum for preventing yarn from wrapping itself onto said shaft, said drum having an undercut cavity in its end face adjacent to said member, and said member extending into said cavity.

6. A winder according to claim 5, comprising yarn-catching means mounted on said cover member.

7. In a winder according to claim 5, said cover member having perforations, and air-suction duct means communicating with said perforations for retaining caught yarn residues on said sheet.

8. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which

the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having near each of said reversing points a lead-off groove merging with said loop and extending laterally away therefrom toward the adjacent edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn, extends from said reversing point to the spool, whereby in the event of yarn breakage the yarn end is caused to fling through said lead-off groove away from said guiding groove, said drum comprising a shallow groove which forms a continuance of said lead-off groove and has smaller depth than the latter, and said drum having in its middle a yarn threading-in groove, said shallow groove extending from said leaf-off groove to said threading-in groove for returning torn yarn ends back to the threading-in groove.

9. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having near each of said reversing points a lead-off groove merging with said loop and extending laterally away therefrom toward the adjacent edge of the drum surface substantially in the direction of the one adjacent loop portion that, when traversed by the yarn, extends from said reversing point to the spool, said lead-off groove defining together with the other adjacent loop portion of the guiding groove an intermediate triangular structure, said structure having at its apex a normally inactive deflector edge in proximity of the guiding groove, said apex being directed in the rotating direction of said drum, said guiding drum having yarn-catching means on at least one axial side of said drum, said yarn-catching means having a surface of high friction for holding the flung-out yarn laterally of the drum, whereby in the event of yarn breakage the yarn end is deflected by said edge to fling through said lead-off groove away from said guiding groove.

10. A yarn winder comprising a take-up spool, a driven rotary yarn-guiding drum with which the spool is peripherally engageable to be entrained thereby, yarn-tensioning means whence the yarn passes under tension over the drum periphery onto the spool, said drum having on its cylinder surface a yarn-guiding groove which forms a loop closed upon itself and extends about and along the drum surface so as to have reversing points between which the yarn is caused to reciprocate along the spool while passing through a portion of the groove loop onto the spool, said drum having yarn-end flinging means for preventing the yarn coming from said tensioner from passing between said take-up spool and said drum in the event of yarn breakage and a resulting drop in said tension, whereby in the event of yarn breakage the yarn end is flung away from said guiding groove, said yarn-end flinging means comprising a yarn ejector groove merging with said loop and extending laterally away therefrom toward the edge of the drum surface, and means for training the ejected yarn end along a path perpendicular to the drum axis but axially spaced from the portion of the drum surface engageable by said take-up spool.

References Cited in the file of this patent

UNITED STATES PATENTS

868,013	Rivett et al.	Oct. 15, 1907
1,975,037	Durand	Sept. 25, 1934

FOREIGN PATENTS

746,066	Germany	May 31, 1944
728,529	Great Britain	Apr. 20, 1955