Aug. 3, 1965 S. FÜRST ETAL 3,198,446

DEVICE FOR PREVENTING DOUBLE THREADS
IN AUTOMATIC COIL WINDING MACHINES

Filed June 19, 1962 2 Sheets-Sheet 1

FIG. 1

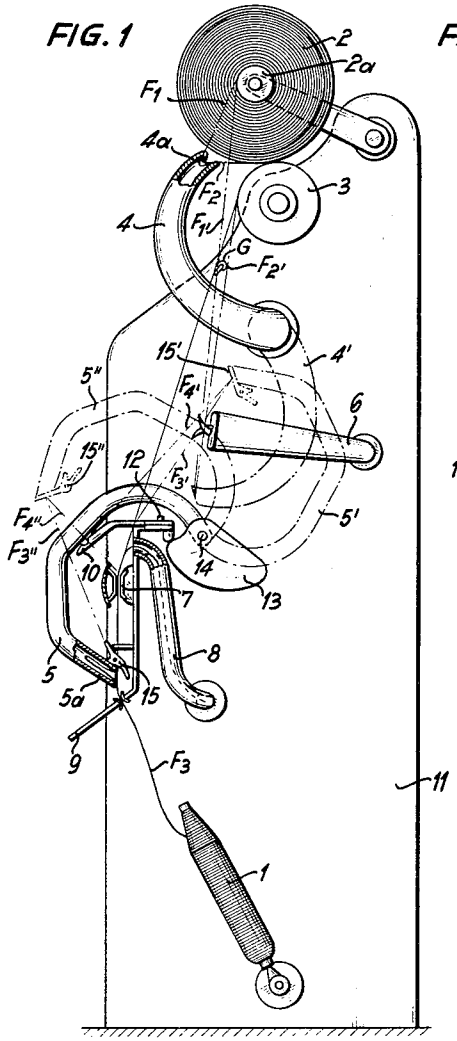
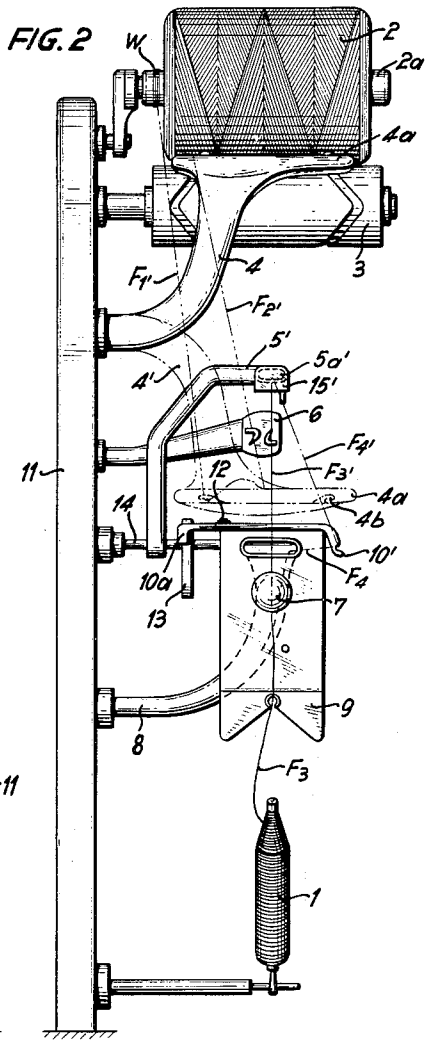



FIG. 2



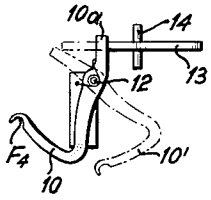




FIG. 3

INVENTORS:

Stefan Fürst
and
Wilhelm Maasson

Aug. 3, 1965 S. FÜRST ETAL 3,198,446

DEVICE FOR PREVENTING DOUBLE THREADS
IN AUTOMATIC COIL WINDING MACHINES

Filed June 19, 1962 2 Sheets-Sheet 2

FIG. 4

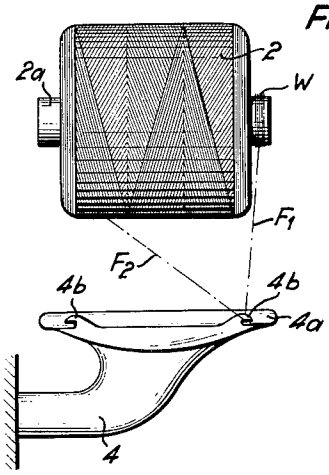



FIG. 5

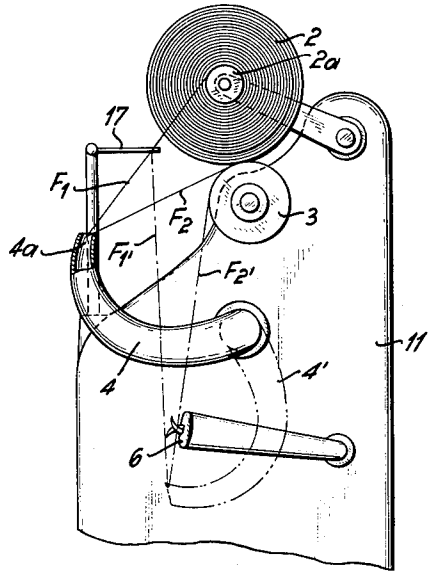



FIG. 6

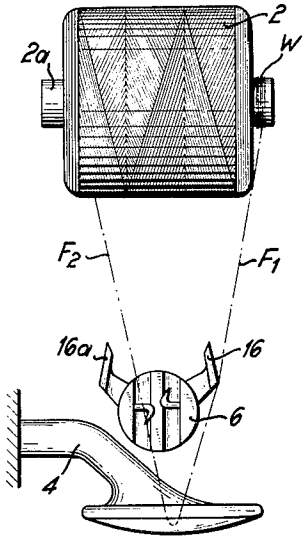
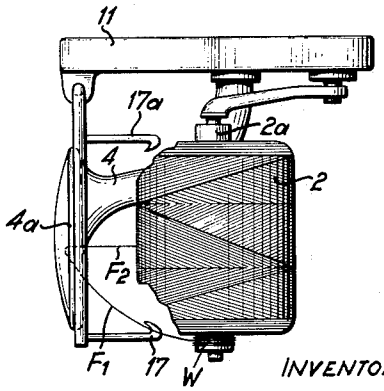



FIG. 7




INVENTORS:

Stefan Fürst

and

United States Patent Office 3,198,446
Patented Aug. 3, 1965



3,198,446

# DEVICE FOR PREVENTING DOUBLE THREADS IN AUTOMATIC COIL WINDING MACHINES

Stefan Fürst, Monchen-Gladbach, and Wilhelm Maassen, Monchen - Gladbach - Hardt, Germany, assignors to Walter Reiners, Monchen-Gladbach, Germany

Filed June 19, 1962, Ser. No. 203,540
Claims priority, application Germany, June 19, 1961, R 30,564
8 Claims. (Cl. 242—35.6)

Our invention relates to machines for winding yarn from spinning cops or other yarn-supplying coils into larger yarn packages, such as cross-wound "cones" or "cheeses," of the particular shape and size desired for further fabrication of the yarn. In a more particular aspect, our invention relates to coil-winding machines of the automatic type in which, upon depletion of a yarn supply coil or in the event of yarn breakage between the supply coil and take-up spool, an automatic yarn-seeking device operates to locate the yarn ends from the new or undepleted supply coil and from the take-up spool respectively and conveys the two yarn ends to a knotting device where the two yarn ends are tied together, whereafter the winding operation continues.

In such automatic machines it may happen occasionally that a double thread or loose thrum occurs at the knot, due to the fact that the yarn-seeking device has conveyed a doubled thread from one side, be it the side of the supply coil or the side of the take-up spool, toward the knotter. This undesirable phenomenon may result if, in the event of yarn breakage or depletion of the supply coil, the yarn end does not remain on the periphery of the take-up spool but is flung laterally beyond the axial extent of the spool where it may sometimes become wound upon the core sleeve of the cheese or other package being wound. When under such conditions the yarn-seeking device, for example a suction nozzle, fetches the yarn end from the take-up spool and conveys it to the knotter, thus unwinding some amount of yarn from the periphery of the package, the laterally deflected yarn portion, which perhaps is wound upon the core, may remain adherent to the core or may be wound a further amount onto the core due to the fact that during yarn-seeking operation the yarn package is rotated in the reverse direction. Although the diameter of any turns of yarn thus wound upon the spool core laterally of the yarn package is much smaller than the unwinding diameter of the package proper, there results a yarn loop so that the yarn-seeking device supplies two thrums or a double thread to the knotter.

A similar fault may happen when the yarn end is being fetched from the supply coil. The yarn coming from the supply coil passes through a yarn tensioner before travelling over a yarn guide onto the take-up spool. When the yarn-seeking device seizes the yarn end from the supply coil it may happen that a portion of the broken thread remains caught in the tensioner or in the yarn-catching means, for example a suction nozzle, that seeks the yarn end near the tensioner. Consequently the yarn-seeking device may form a yarn loop also at this location, thus conveying to the knotter the thread portion coming from the supply coil as well as the thrum extending from the yarn-seeking device to the tensioner or the yarn-catching means of the tensioner.

The knots tied by the knotter under the above-mentioned conditions comprise double threads or loose thrums which constitute severe faults that may cause stoppage and defective products during further fabrication in textile manufacture because such faulty spot must no longer be present in the yarn during warping, let alone subsequent weaving or knitting of the yarn.

It has been attempted to avoid the formation of double



threads by preventing the lateral deflection of the yarn from the take-up spool and the catching of the yarn from the supply coil in the tensioner or in the yarn-catching means correlated to the tensioner. The means heretofore devised for this purpose, although improving the machines by minimizing the frequency of double-thread formation, have failed to fully and reliably eliminate such faults.

It is an object of our invention, therefore, to provide a device which more reliably or fully avoids the formation of double threads in an automatic coil-winding machine equipped with a yarn-seeking device for locating broken or new yarn ends and supplying these yarn ends to a knotting device.

To this end, and in accordance with a principle of our invention, the occurrence of double threads at the knotter is excluded by deflecting the undesired yarn thrum of the yarn end to such an extent that this particular thrum cannot be seized by the knotting device, thus limiting the knotting device to engaging only the one yarn portion that extends to the take-up spool or supply coil. For realizing this principle, our invention takes advantage of the fact that when a yarn loop is being formed in the yarn-seeking device, the two thrums or thread portions of the loop possess respectively different directions so as to form an angle between each other.

According to more specific features of our invention, we provide the machine with a deflector member which protrudes into the angle between the two thrums of a yarn loop seized by the yarn-seeking device and which guides the undesired one of the two thrums away from the action range of the knotting device. The deflector member may be located at any desired place between the supply coil or take-up spool on the one hand and the knotting device on the other hand, provided its arrangement is such that it deflects the undesired yarn thrum sufficiently far in the lateral direction to prevent the knotter device from seizing this particular thrum.

According to another feature of our invention, it is preferable in many cases to mount the deflector member at the gripper end of the yarn-seeking device. When employing a suction member as yarn-seeking device, two deflector members, preferably of hook-shaped design, may be mounted on the suction mouthpiece or nozzle, the distance between the two deflector members being preferably equal approximately to the active width of the suction nozzle. According to another, alternative feature of the invention, the deflector member is mounted at the knotter device in such a position that only the thread portion leading to the yarn body proper of the supply coil or take-up spool can pass to the knotting device.

The above-mentioned and further objects, advantages and features of our invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from, and will be described in, the following with reference to the embodiments of devices according to the invention illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a lateral view of a winding station which may form part of a multi-station machine and is equipped with a device for the prevention of double threads according to the invention.

FIG. 2 is a front view of the same winding station.

FIG. 3 is plan view of a deflector member which forms part of the device according to FIGS. 1 and 2.

FIG. 4 shows a front view of components of FIG. 2 in a different operating position.

FIG. 5 is a lateral view of another device according to the invention.

FIG. 6 is a schematic top view of still another device according to the invention; and

FIG. 7 is a plan view of the device shown in FIG. 5.

The same reference characters are applied to corresponding components respectively in all illustrations. The yarn is denoted by F with added subscripts to denote respectively different yarn positions occupied in different stages of operation.

As shown in FIGS. 1 and 2, the yarn passes from a supply coil **1**, here consisting of a cop, to a take-up spool **2** here constituted by a cylindrical cross-wound package or cheese. The take-up spool is driven by peripheral engagement with a yard-guiding drum **3**. For this purpose the core sleeve *2a* of the spool **2** is revolvably seated on a pivot pin mounted on an arm *2b* whose pivot shaft *2c* is freely rotatable in the frame structure **11** of the machine. The periphery of the spool **2** rests under its own weight upon the guiding drum **3**. The shaft *3a* of the guiding drum is driven at constant speed during winding operation, thus imparting constant peripheral speed to the spool **2** in the wind-up direction. During the yarn-seeking and knotting operation described below, the spool **2** is somewhat lifted from the drum **3** and thus at standstill, or it may rotate in the unwinding direction while the yarn end is being pulled toward the knotting device. The guiding drum **3** is provided with a yarn-guiding groove *3b* which extends around and along the drum **3** and forms a curve closed upon itself so that the yarn, as it passes through the groove onto the spool **2** is reciprocated along the spool while being wound upon the spool.

The yarn coming from the supply coil **1** first passes through a yarn cleaner **9** and then through a yarn tensioner **7** so that the portion of yarn between the tensioner **7** and the yarn guiding drum **3**, this portion being shown by a full line in FIG. 1, is taut during winding operation. This yarn portion is contacted by a yarn guard G which constitutes a spring mounted at one end and resting at its other with resilient force against the taut yarn. When the yarn breaks or becomes slack because of any other fault or depletion, the yarn guard G, no longer restrained by the yarn, deflects to the left and thereby releases the yarn-seeking and knotting operations still to be described. Such release may be effected in known manner either by release of a mechanical latch or by the actuation of a guard-responsive contact which in turn controls a clutch for initiating the seeking and knotting operations.

Mounted between the supply coil **1** and the take-up spool **2** are the yarn-end seeking devices **4** and **5** for locating and seizing broken yarn ends. The yarn-seeking device for seizing the upper yarn, that is the yarn end leading to the take-up spool **2**, is denoted by **4**. The device for correspondingly seeking the yarn end coming from the supply coil **1** is denoted by **5**. Both devices convey the seized yarn ends to a knotting device **6** where the ends are tied together.

In the illustrated embodiment, the two yarn-seeking devices **4** and **5** consist of suction tubes whose respective mouth pieces or nozzles which constitute yarn-seizing ends thereof are denoted by *4a* and *5a* respectively. The other ends of the two devices are pivotally mounted on the frame structure **11** and are connected with a source of negative pressure, for example a conduit connected to a blower. The nozzle opening *4a* of the tubular suction member **4** is substantially as wide as the axial length of the take-up spool **2** so as to be capable of seizing the yarn end at any peripheral location of the spool.

As soon as the yarn tears or is absent for any reason between the yarn tensioner **7** and the take-up spool **2**, the yarn end leading to the supply coil **1** is held fast in the tensioner **7** and the remaining free end portion of the yarn is sucked into a catch nozzle **8** in known manner. The catch nozzle **8** is also connected with the above-mentioned source of negative pressure within the frame structure **11** of the machine. The yarn end leading to the take-up spool **2** normally is wound upon the periphery of the spool where it can readily be found and seized by the nozzle *4a*. However, it may happen, as shown in FIGS. 2, 4, 6 and 7, that the yarn does not remain on the periphery of the take-up spool but is flung laterally beyond the axial extent of the spool or is even wound upon the core sleeve *2a* where it then forms a winding W (FIGS. 4, 6).



As mentioned, the breakage or absence of yarn also causes the yarn guard G to put the yarn seeking devices **4** and **5** in operation. The device **4** turns from the position shown at **4'** in dot-and-dash lines in FIG. 2 to the full-line position **4** according to FIG. 1 in order to suck the yarn from the periphery of the spool **2**. If a winding W was formed, a loop occurs in the suction nozzle and, when supplied to the knotter **6**, causes the formation of a double thread as explained above.

According to the invention, however, two hook-shaped deflector members *4b* are mounted on the suction nozzle *4a* (FIGS. 2, 4). The distance of members *4b* from each other is approximately equal to the width of the nozzle opening and thus corresponds approximately to the axial extent of the takeup spool. As a result, the yarn thrum $F_1$ (FIGS. 4, 6) coming from the winding W or from any place laterally of the yarn package proper, is retained in one of the hooks, whereas the yarn end $F_2$, coming from the yarn package itself and to be conveyed to the knotter, is guided to a location approximately in the middle of the suction nozzle, this position being shown at $F_{2'}$ in FIG. 2. FIG 4 shows the beginning of the separation effected by the hook-shaped deflector member *4b* between the two yarn thrums $F_1$ and $F_2$. Since the winding W is located on the right side of the spool body **2**, the yarn thrum $F_2$ was first located at the right side of the yarn package so that both yarn thrums were initially seized by the suction nozzle *4a* at the right side of the yarn package. However, while the direction of the yarn thrum $F_1$ relative to the winding W remains virtually the same, the starting point of the yarn thrum $F_2$ moves progressively toward the left because of the reverse rotation of the spool **2** occurring when the suction nozzle **4** is being turned downwardly toward the knotter. As apparent from FIG. 4, this imposes upon the yarn a strong pulling component toward the left which causes the yarn thrum $F_2$ to glide out of the hook member *4b* and to become located approximately in the middle of the suction nozzle *4a*. This is the position shown by dot-and-dash lines at $F_{2'}$ in FIG. 2. Consequently the yarn portion $F_2$ leading to the take-up spool is separated from the yarn thrum $F_1$ leading to the winding W, and only the thread $F_2$, as shown in FIG. 2, is supplied to the knotter **6**.

The end of a broken thread leading to the supply coil **1** is seized by the yarn seeking device **5** between the yarn cleaner **9** and the tensioner **7**, as is shown in FIG. 1. The seeking device **5** then passes from the full-line position shown in FIG. 1 to the position **5'** shown by the full lines in FIG. 2 which is also entered by dot-and-dash lines at **5'** in FIG. 1. During this swinging motion, the device **5** passes through the position **5''** shown in FIG. 1. In position **5''** the yarn thrum $F_3$ leading to the supply coil **1** forms an angle with the yarn thrum $F_{4''}$. A deflector member **10** protrudes into this angle so that the yarn thrum $F_{4'}$ is kept away from the knotter **6** as shown in FIG. 2. The deflector member **10** is adjustably mounted on the machine frame structure **11** which carries a pivot pin **12** about which the member **11** is rotatable. The pivotal displacement of deflector member **10** from the position shown in FIG. 1 to the position **10'** shown in FIG. 2 is controlled in dependence upon the movement of the yarn seeking device **5**, by means of a cam disc **13** (FIGS. 1, 2, 3) which is mounted on the pivot shaft **14** about which the yarn seeking device **5** is rotatable. During upward motion of the device **5**, the cam **13** turns the arm **10***a* and thereby the entire deflector member **10**, according to FIG. 3, from the full-line position to the position **10'**. The member **10** then entrains the yarn $F_4$ (FIG. 3) and places it into the position shown at $F_{4'}$ in FIGS. 1 and 2. The yarn thrum

$F_4$, thus is also guided past the knotter **6** whereas the thrum $F_3$ is placed into engagement with the knotter **6** and thus can be tied together with the yarn end $F_2$.

As mentioned, the yarn seeking device **5** is likewise designed as a suction member. The nozzle **5***a* is provided with a lid **15** which is spring biased to normally close the nozzle and which is opened by abutting against a stop when the device **5** is in the yarn seeking position shown in FIG. 1. After the yarn $F_3$ is seized and the device **5** starts moving upwardly, the lid **15** moves to closed position as shown at **15''** and **15'** in FIG. 1 so that the yarn is held not only by suction but also by the mechanical clamping effect of the lid **15**.

The angular separation of the two thrums formed in the event a loop occurs in the yarn seeking device, can also be effected by a deflector member mounted on the knotting device. An embodiment of this type is shown in FIG. 6. Mounted at the knotting device **6** are two wing-shaped deflector members **16** and **16***a*. The deflector member **16** prevents the yarn thrum $F_1$, coming from the winding W, from entering into the action range of the knotter **6**, whereas the yarn thrum $F_2$ leading to the periphery of the yarn package proper is guided to the knotter.

Another embodiment of the deflector member is illustrated in FIGS. 5 and 7. This deflector member comprises two stationary hooks **17** and **17***a* mounted beside the take-up spool **2** near the respective axial ends of the yarn package, both hooks pointing inwardly. In the event of loop formation in the suction nozzle **4***a*, the yarn thrum $F_1$ leading to the winding W is kept laterally at such a distance that it cannot enter into the seizing range of the knotter **6**. As a result, only the yarn thrum $F_2$ leading to the take-up spool itself passes into the action range of the knotter. The position of the yarn seeking device **4** shown by full lines in FIG. 5 represents an intermediate stage occurring after the yarn loop is seized, whereas the dot-and-dash position **4'** and the yarn locations $F_1'$ and $F_2'$ indicate ultimate positions reached when the yarn $F_2'$ passes into the knotting device **6**.

It will be understood that the above-described devices according to the invention for the prevention of double threads at the knots formed in automatic coil winding machines, can be employed together with any suitable means for driving and controlling these machines and their accessory yarn-seeking components, and since further such drives and controls, not essential to the invention proper, are known in a variety of constructions, they are not further described herein. If desired, however, reference with respect to suitable drive means for the take-up drum and for the yarn seeking devices and their control, may be had to U.S. Patents Nos. 2,936,130 and 2,769,599 or to U.S. patent applications Serial No. 841,980, filed September 24, 1959, now Patent No. 3,059,867 of S. Fürst; Serial No. 15,503, filed March 16, 1960, now Patent No. 3,030,040 of W. Reiners; and Serial No. 64,197, filed October 21, 1960, now Patent No. 3,092,340 of S. Fürst, all of these patents and applications filed by or assigned to the patentee of the present invention. Corresponding drive and control means as components of a multi-station winding machine to which the present invention is advantageously applicable are also known from the machines sold under the trademark Autoconer by American Schlafhorst Company, Charlotte, North Carolina.

To those skilled in the art, it will be obvious upon a study of this disclosure that with respect to structural detail and arrangement our invention permits of various modifications and hence can be given embodiments other than particularly illustrated and described herein, without departing from the essential features of our invention and within the scope of the claims annexed hereto.

We claim:

**1.** In a yarn-coil winding machine having first means for accommodating a yarn supply, second means for holding a take-up spool to receive a yarn package being wound, a knotter located between and spaced from said first and second means, and a yarn-end seeker member for usually seizing a yarn end coming from one of said respective means and passing it along a specific path to said knotter, the combination of a device for preventing the knotting of double yarns in the event of loop formation at the yarn-end seizing location of said seeker member, said device comprising deflector structure protruding into the bight angle of the yarn-end loop between first and second portions of the loop, the first portion of the loop extending along said specific path to said knotter, said deflector structure being engageable with the second portion of the loop to divert the same from said specific path and hold it away from said knotter, whereby only the first portion of the loop is knotted.

**2.** In a device according to claim **1** for preventing the knotting of doubled yarn ends in yarn-winding machines, said deflector structure comprising a hook-shaped member having a freely projecting hook end protruding into said bight angle for retaining said second thread portion.

**3.** In a device according to claim **1** for preventing the knotting of doubled yarn ends in yarn-winding machines, said yarn-end seeker member having a yarn-seizing end movable from one of said means to a position in which the yarn entrained by said yarn-seizing end is engageable by said knotter, said deflector structure being mounted on said yarn-seizing end to move together therewith.

**4.** In a device according to claim **1** for preventing the knotting of doubled yarn ends in yarn-winding machines, said yarn-end seeker member having a yarn-seizing suction nozzle movable from one of said means to a position in which the yarn entrained by said suction nozzle is engageable by said knotter, said suction nozzle having transversely to the direction of motion a width corresponding to that of the area within which the yarn end is to be sought, and said deflector structure comprising two deflector members located at, and protruding from, said suction nozzle, said two deflector members being spaced from each other a distance approximately equal to said width of said nozzle.

**5.** In a device according to claim **1** for preventing the knotting of doubled yarn ends in yarn-winding machines, said deflector structure being mounted at said knotter.

**6.** In a device according to claim **1** for preventing the knotting of doubled yarn ends in yarn-winding machines, said deflector structure comprising two wing-shaped deflector members mounted on opposite sides respectively of said knotter relative to the symmetry axis of the yarn path.

**7.** In a yarn-coil winding machine having first means for accommodating a yarn supply, second means for receiving a yarn package being wound, a knotter located between and spaced from said first and second means, a yarn-end seeker member for usually seizing a yarn end coming from one of said respective means and for passing it along a specific path to said knotter, and a machine frame structure on which said first and second means as well as said knotter and seeker member are mounted, the combination of a device for preventing the knotting of double yarns in the event of loop formation at the yarn-end seizing location of said seeker member, said device comprising deflector structure mounted on said frame structure and protruding into the bight angle of the yarn-end loop and situated at a location between first and second portions of the loop, the first portion of the loop extending along said specific path to said knotter, said deflector structure being engageable by the second portion of the loop to divert the same from the specific path and hold it away from said knotter, whereby only the first portion of the loop is knotted.

**8.** In a device according to claim **7** for preventing the knotting of doubled yarn ends in yarn-winding machines,

said yarn-end seeker member having a gripper end movable from one of said means to a position in which the yarn entrained by said gripper end is engageable by said knotter, said deflector structure being movable relative to said machine frame structure, and mechanism connected with said structure and controllable by said seeker member for moving said deflector structure to active position in dependence upon movement of said seeker member.



**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,175,710 | 3/16 | Colman | 242—35.6 |
| 1,267,977 | 5/18 | Colman | 242—35.6 |

MERVIN STEIN, *Primary Examiner.*

RUSSELL C. MADER, *Examiner.*