Oct. 12, 1971 R. JAEGGLI 3,611,694

METHOD OF AND APPARATUS FOR THREADING IN THREADS ON DRAWTWISTING OR DRAW-WINDING MACHINES, AND IMPROVED KNOT USED IN THE PERFORMANCE OF SAID METHOD

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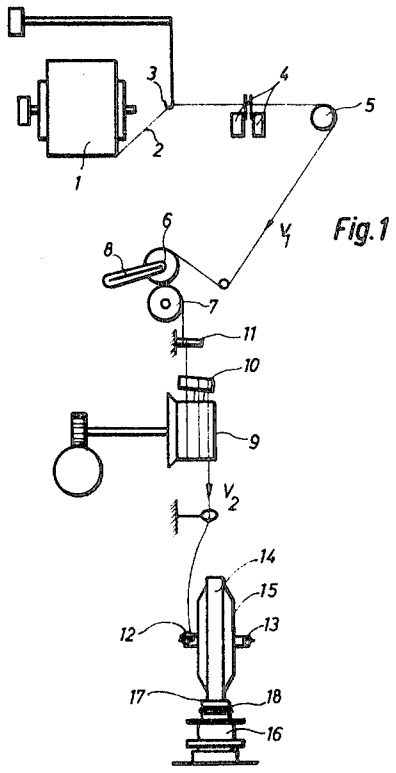


Fig.1

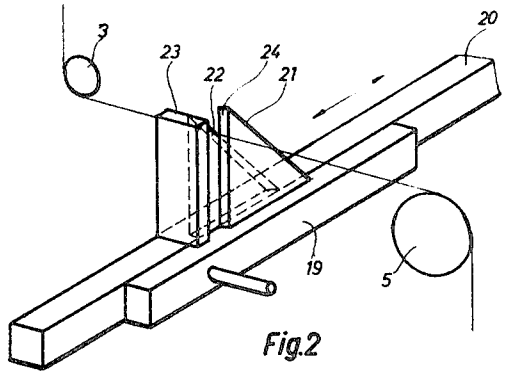


Fig.2

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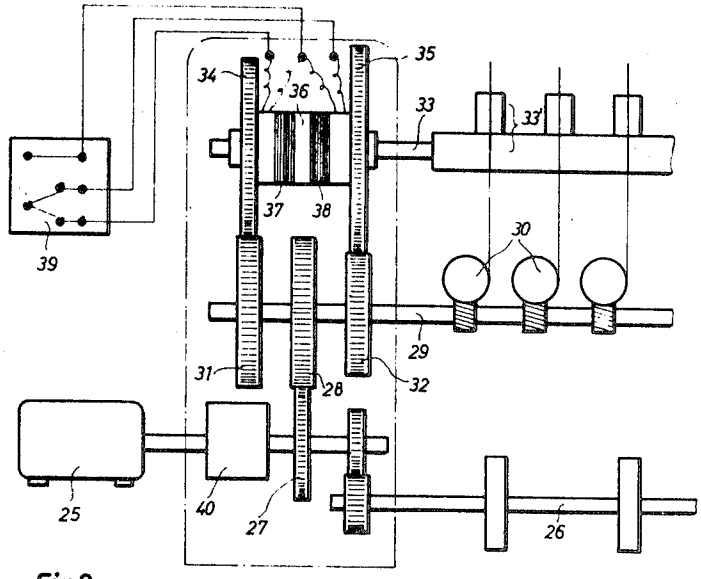


Fig.3

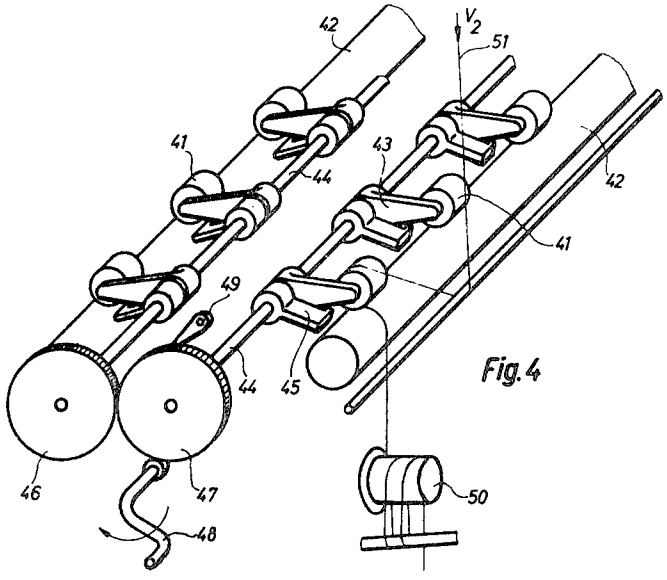


Fig.4

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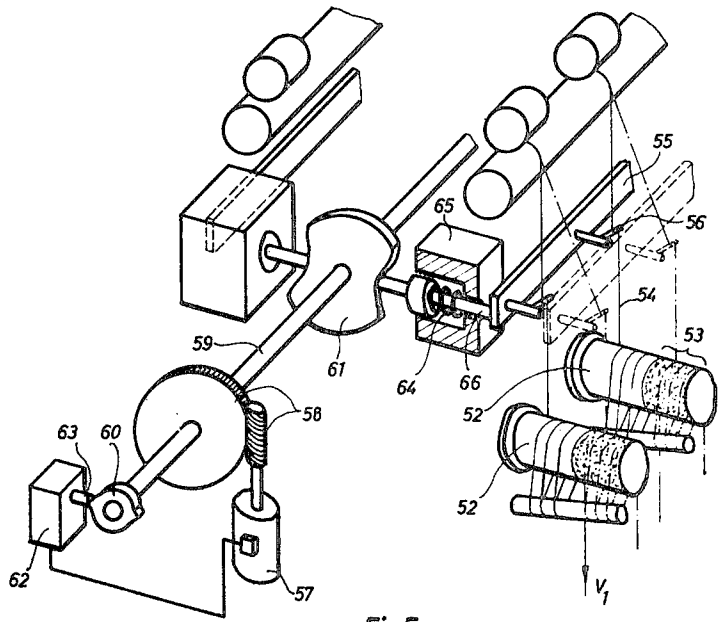


Fig.5

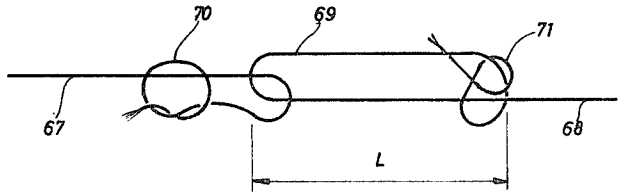


Fig.6

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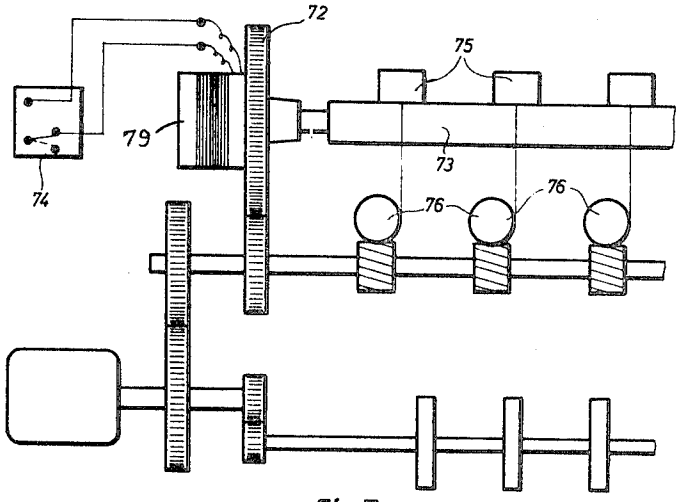


Fig. 7

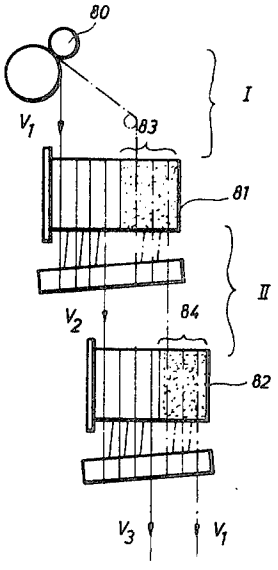


Fig. 9

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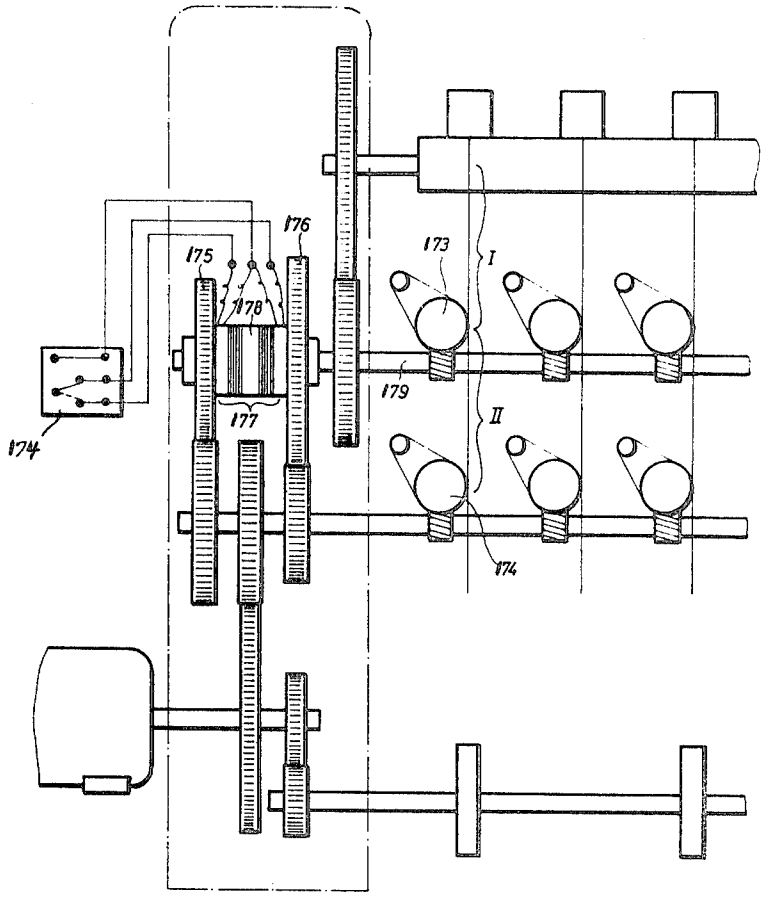


Fig. 8

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Patented Oct. 12, 1971



3,611,694

# METHOD OF AND APPARATUS FOR THREADING IN THREADS ON DRAWTWISTING OR DRAW-WINDING MACHINES, AND IMPROVED KNOT USED IN THE PERFORMANCE OF SAID METHOD

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Claims priority, application Switzerland, Aug. 8, 1968, 12,118/68
Int. Cl. D01h 1/22, 1/30, 15/00
U.S. Cl. 57—34 25 Claims

## ABSTRACT OF THE DISCLOSURE

There is disclosed an improved method of and apparatus for threading in threads on drawtwisting or draw-winding machines or similar machines. According to the invention the thread is severed between an undrawn creel package which is becoming exhausted and a thread feed mechanism and the thread end running or extending towards the feed mechanism is held in a ready or preparatory position. The creel package which is being exhausted is replaced by a full creel package and a connection is established between the thread end of the full creel package and the aforementioned thread and extending towards the feed mechanism. According to an important aspect of the invention, the drawing ratio imparted to the thread is reduced during such time as the previously established thread connection passes through a drawing zone. There is also disclosed an improved knot for the connection of the thread ends which provides one technique of reducing this drawing ratio without the aid of mechanical means.

## BACKGROUND OF THE INVENTION

The present invention relates to a new and improved method of threading in threads on drawtwisting or draw-winding or similar machines, further concerns an apparatus for implementing the inventive method.

In known drawtwisting or draw-winding processes the undrawn thread normally passes from a creeled package via thread brakes and thread guides into a feed mechanism driven at constant circumferential speed. Subsequently this thread is wrapped in a plurality of wraps around a draw roll also driven at constant speed. Between the feed mechanism and the draw roll the thread is drawn to several times its original length. Thereafter the drawn thread is wound onto a spindle or onto a cross-wound bobbin. Drawing also may be effected in more than one drawing zone as well as with the help of drawing pins and heating devices.

Normally the creeled bobbins hold a quantity of thread sufficient for filling a plurality of drawtwisting or draw-winding bobbins. It is a known procedure to stop the drawtwisting or draw-winding machine for doffing the full packages and donning empty tubes and to restart the machine without the need of re-threading all the threads. This procedure, however, is applicable only, as long as the creel packages do not need to be changed. If a creeled package is emptied so far that the rest of the undrawn thread left on it will not yield another full drawtwisting or draw-winding bobbin, then the thread is severed and a new package is creeled in. After creeling the machine is started up and each thread is threaded into all working elements manually. This operation requires more personnel than otherwise needed for controlling machine operation. Another disadvantage of the procedure mentioned is that at least the first set of drawtwisting or draw-winding



bobbins produced from a new set of creel packages will not contain the same length of thread as the threads successively must be threaded in at one position after the other. A procedure, however, also is known in which the threads are threaded in while the machine is running slowly and are wound onto waste packages, waste cones or similar devices. Threading in the threads while the machine runs slowly at crawling speed, however, requires still more manual work.

Furthermore, in the textile industry techniques are known for winding the innermost thread end of a package so that it is easily accessible as a thread reserve or transfer tail and can be connected to the outermost thread end of a subsequent package in further processes. Also on drawtwisting machines the winding of transfer tails onto the tubes is known. This procedure is, however, not applicable for producing undrawn thread packages for three reasons:

(a) The innermost layers of the undrawn thread packages usually are of a somewhat different quality. They must be considered as waste and must be eliminated.

(b) The thread packages must be free of knots which is not ensured as the length contained on the undrawn thread packages is variable.

(c) The known connecting knots result in thread breakages if the thread is drawn under normal drawing conditions.

## SUMMARY OF THE INVENTION

Accordingly, it is a primary objective of the present invention to reduce the manual work and maintain constant thread length on each thread package produced on a drawing machine. This goal is achieved, and the aforementioned disadvantages are eliminated, by means of the method according to the invention for threading in threads on drawtwisting, draw-winding or similar machines, in which, starting from an undrawn creel package, while all threads are severed between the creel package which is becoming exhausted and the thread feed mechanism, and while all thread ends running towards the feed mechanism are held ready, the creel packaeg being exhausted is replaced by a full package, then a connection between the two thread ends is established, and thereafter the drawing ratio imparted to the thread is reduced while the previously established connection passes through the drawing zone.

The apparatus for implementing the method according to the invention is generally manifested by means for temporarily reducing the drawing ratio.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic view of the thread path on a drawtwisting machine;

FIG. 2 is a perspective view showing details of a thread cutting and holding device;

FIG. 3 is a schematic side view of a drive cabinet of a drawtwisting machine;

FIG. 4 is a perspective view of a lifting device for the pressure roll of a thread feed or delivery mechanism;

FIG. 5 is a perspective view of a drawing zone;

FIG. 6 illustrates details of a preferred form of knot connecting two thread ends;

FIG. 7 is a side view of an alternative design of the drive cabinet shown in FIG. 3;

FIG. 8 is a side view of another embodiment of the drive cabinet shown in FIG. 3; and

FIG. 9 depicts an alternative design of drawing zone according to FIG. 5.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, it will be recognized from FIG. 1 that an undrawn thread **2** pulled off a creeled package **1**, composed of one or a plurality of endless filaments, passes a stationary thread guide **3**, a cutting and holding device **4**, a thread brake **5**. Then thread **2** passes onto a thread feed or delivery mechanism consisting of a single pressure roll **6** and a delivery roll **7** extending along the length of the machine. Pressure roll **6** is equipped with detachable loading means, here shown designed as a pivotable loading arm **8**. The thread **2** passes through the nip formed by these two rolls **6** and **7** at a low feed velocity or speed $V_1$ and by means of drawing roll **9** and separator or deflector roll **10** this thread **2** is taken off at a speed $V_2$ which is three to four times higher than $V_1$, drawing of the thread thus being effected. In many cases, this process is carried out while using an intermediately disposed drawing pin **11**.

Subsequently, the thread **2** passes through a traveller **12** slidably arranged upon a ring **13** traversing up and down and is transferred onto a tube or sleeve **14** where it is wound into a thread package **15**. Below tube **14** a waste cone **17** is arranged on spindle **16** down to which section of the spindle **16** the traveller ring **13** is temporarily lowered for the formation of a waste bunch **18**. The twist imparting winding mechanism consisting of spindle **16**, ring **13** and traveller **12**, described here with reference to the example of a drawtwisting machine, of course, can be replaced by a winding mechanism not imparting twist, such as conventionally used on draw-winding machines.

As best seen by referring to FIG. 2, the thread cutting and holding device **4** consists of a stationary rail **19** extending along, and fixed to, the machine frame, and a rail or rod **20** arranged slidably along rail **19**. Each rail **19** and **20** is provided with a blade **21** and **22**, respectively, the latter further being equipped with a thread clamping device **23**, as shown, which contacts the edge **24** of the other blade **21** and clamps the thread end extending or running towards the thread brake **5**.

On a machine such as that described and incorporating a large number of such processing stations or positions, the following technique is utilized: If a predetermined thread length is wound onto the thread package **15** the machine is stopped and the thread is held in known manner on the spindle **16** while the full thread packages **15** are exchanged against empty tubes **14**. If the creeled packages **1** are emptied so far that not enough material is left for filling a whole thread package **15**, then the thread **2** at each processing position is severed by means of the cutting and holding device **4** between the creeled package **1** and the feed mechanism **7** and the thread end connected to each such feed mechanism (FIG. 2) is held ready by the associated thread clamping device **23** for knotting. Subsequently, the not quite depleted creel packages **1** are replaced by new full creel packages. The respective thread ends of the new creel packages **1** are threaded through the thread guide **3** arranged in front of the cutting point and are connected to the thread end held ready by the cutting and holding device **4** by means of, for instance, a knot, a welding or an adhesive bond. During the subsequent start-up of the machine the drawing ratio is reduced by suitable means, described in greater detail later on, at least while the connection or attachment location of the two thread ends passes through the drawing zone, so that no thread break occurs. This connection location or point subsequently is wound onto waste cone **17** into waste bunch **18**, rather than onto the thread package **15**. Additionally, the entire passage of the thread connection point may take place while the machine is running slowly at crawl speed.

The previously mentioned reduction of the drawing ratio, while the thread connection point passes through the drawing zone, can be effected by means of the following exemplary devices: In the embodiment according to FIG. 3, a drive cabinet of a drawtwisting machine with the feed mechanism drive and with the draw roll drive is illustrated. The main drive motor **25** drives the spindle drive shaft **26** and, via two gears **27** and **28**, the drive shaft **29** of the draw rolls **30**. On shaft **29** there are also arranged two more gears **31** and **32** which mesh with gears **34** and **35**, respectively, arranged to be freely rotatable upon feed roll shaft **33**. A disc **36** is fixed on shaft **33**. Adjacent to each of the gears **34** and **35** there is an electrically operated disc-clutch **37** and **38**, respectively, for either coupling the gear **34** arranged on the left-side or the gear **35** arranged on the right-side with the disc **36**, depending upon the position of a switch **39** controlling the current supply. If the gear **34** arranged on the left-side is coupled (switch position indicated with dashed lines), owing to the gear tooth ratio of gears **31** and **34** transmitting the rotational momentum, the feed roll shaft **33** turns faster and the drawing ratio between feed mechanism **33'** and draw rolls **30** thus is reduced. Once the thread connection point has passed, then the switch **39** is brought into normal operating position (solid lines) in which feed roll shaft **33** is driven via the gears **32** and **35**, the drawing ratio being normal again. Directly after the drive motor **25** a selectively operable reduction gear box **40** can be inserted into the drive train, if needed, permitting a slow or crawl motion of the machine. This design proposal also may be selected for draw-winding machines as the winding speed is not affected by the reduction of the drawing ratio.

Another embodiment of the invention, as shown in FIG. 4, permits the change in drawing ratio by means of lifting the pressure roll of the feed mechanism. Pressure rolls **41**, which in the arrangement of FIG. 4 rest upon feed roll **42** under their own weight, are arranged to be freely pivotable on shaft **44**. A carrier lever **45** fixed on this shaft **44** reaches under the associated support arm **43**, and by turning shafts **44** by means of a crank **48** via two mutually meshing gears **46** and **47** these pressure rolls **41** are thus lifted off the associated feed or delivery roll **42**. A ratchet **49**, or equivalent structure secures arms **43** in the lifted position. In order to reduce the drawing ratio it is only necessary to turn crank **48** clockwise until carrier lever **45** lifts associated arm **43** somewhat, so that the corresponding pressure roll **41** is lifted from the feed or delivery roll **42** and thread **51** at the speed $V_2$ is withdrawn from the package creeled above (not shown). The drawing ratio, in a very simple manner, is thus reduced to zero without any change of the winding speed. Once the thread connecting point has passed out of the drawing zone, the ratchet **49** is manually lifted so that pressure rolls **41** under the influence of their own weight again contact the associated delivery roll **42** and since pressure is re-established in the nip, the drawing ratio goes back to normal.

Still a further embodiment suitable for drawtwisting machines is shown in FIG. 5. On the outer part of draw rolls **52** there is provided a zone of low friction **53**, for instance a sand blasted zone. If the thread **54** is placed there (yarn path indicated in dashed lines) the circumferential speed of the draw rolls **52** is not transferred to the thread **54** owing to slippage at zone **53**, that is, the thread moves at the feed speed $V_1$ towards the winding position (not shown). No drawing action thus takes place. Shifting of the thread **54** along the associated draw roll **52** is effected quite simply by moving a rail **55** or equivalent structure, on which a plurality of thread guide elements, e.g. drawing pins **56**, are mounted, so far to the outside that thread **54** is guided onto zone **53**. This movement is effected by a suitable motor **57** provided with a reduction gear arrangement **58** and driving a shaft **59** on which there are provided control cam disc **60** and suitably shaped control cams **61**. Cam disc **60** activates a switch **62** controlling drive motor **57** which after the connection of the thread ends is established is started by hand, and after half a revolution of shaft **59** is stopped again by the next cam passing and activating the switch button **63**.

Rods **66** rigidly connected to rail **55** are arranged horizontally slidable in a housing **65** of the frame and are pressed against cam disc **61** by springs **64**. Motor **57** turns shaft **59** half a revolution or turn so that rail **55** moves outwardly into the position indicated by dash-dotted lines and remains there until the thread connection point has left the drawing zone. Shortly before shaft **59** has completed its half revolution the original condition is again established, that is to say, the thread is again guided onto the zone of high friction of the associated draw roll **52** (thread path indicated with solid lines) from the feed roll. The drawing ratio thus again corresponds to the original value. This design would not be feasible for draw-winding machines as the winding speed cannot be reduced to the feed speed $V_1$ without difficulties.

Another example of the invention provides reduction of the drawing action without mechanical means, but provides a thread connection of such extensibility that a normal drawing action can not take place. This is achieved, for example, by incorporating a thread reserve into the thread connection, as best seen by referring to FIG. 6. The thread end **67** running out is knotted in such manner that the end **68** of the new thread can slide in it, but catching on of the connection or attachment location at the thread guide elements, however, is not possible. The end **68** of the new thread forms a loop **69** as a thread reserve through knot **70** in the thread end **67** running out and is tied on itself in a slidable knot **71**, a thread length L being provided which can be used up while knot **71** moves toward knot **70** during the passing of the thread connection location through the drawing zone. Friction conditions in knots **70** and **71** are chosen such that loop **69** is not pulled out while it passes through the thread guide elements in front of the feed mechanism, but that after passing the feed mechanism, however, and before reaching the drawing pin, sliding occurs already such that the knot moves around the drawing pin without being tensioned by the full drawing tension. The same procedure also is applicable in a drawing zone without a drawing pin.

An alternative design, comparable to the arrangement according to FIG. 3, is shown in FIG. 7. Here, gear **72** can be coupled to shaft **73** by means of a clutch **79** which is activated and released by switch **74**. If the feed mechanism is uncoupled by switch **74** and pressure rolls **75** remain weighted, the threads **76** drag the feed mechanism, the threads being subject to an elastic deformation only as e.g. in processing of heavy denier threads, or the braking momentum acting on the feed mechanism due to friction in the bearings generates tensions in the thread sufficient for partial drawing. This might be the case if finer denier threads are processed. Somewhat higher thread tensions are generated if the inertia of the feed rolls is an influencing factor. This is the case if the machine is speeded up to normal operating speed while the thread connection passes through the drawing zone, in which case the feed mechanism must be accelerated by the tension on the threads exclusively.

A further embodiment is shown in FIG. 8. Here a first drawing phase e.g. with a thread drawing ratio ranging from 1.004 to 1.5 is effected in a drawing zone I between feed mechanism **172** and a first draw roll **173** rotating at high speed, whereupon a second, major drawing phase follows, for instance, with a thread drawing ratio ranging from 4 to 2.8, in a drawing zone II ending at draw roll **174**. Other than in the embodiment according to FIG. 3 an analogous arrangement comprising a clutch **177** coupling alternatively gears **175** or **176** here is used to reduce the drawing ratio in the drawing zone II to e.g. a ratio of 2, if gear **175** is coupled to disc **178** which is fixed on shaft **179**. The drawing ratio in the zone I being smaller anyhow, can remain unchanged as the danger of thread breakage due to excessive tension in the knot passing through the drawing zone is relatively small at low drawing ratios. This design also is suitable for draw-winding machines, as the speed of the thread leaving draw roll **174** is not influenced.



A further advantageous application of the principle shown in FIG. 5 can be used on a draw twisting machine equipped with a drawing and a relaxing zone, as schematically shown in FIG. 9. Between feed mechanism **80** and draw roll **81** the thread is drawn in drawing zone I and subsequently is relaxed by roll **82** rotating at lower speed in relaxing zone II. If the thread is guided onto the region or zone **83** of lower friction of roll **81** (thread path indicated by dash-dotted lines) slippage of the thread on this roll occurs and drawing no longer takes place. In zone II also no more relaxation can thus take place since an undrawn thread can not relax. As the thread is guided onto the zone **83**, the thread on roll **82** also moves onto the zone **84** of the lower friction provided here also, so that the thread also leaves this roll **82** at the feed speed and thread accumulations in the relaxing zone are avoided.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset to the specification have been successfully achieved.

What is claimed is:

**1.** A method of threading in threads on drawtwisting, draw-winding or similar machines comprising the steps of:

(a) severing the thread between an undrawn creel package which is becoming exhausted and a thread feed mechanism;

(b) holding the thread end extending towards the thread feed mechanism in a preparatory position;

(c) replacing the creel package which is becoming exhausted by a full creel package;

(d) establishing a connection between the thread end of the full creel package and said thread end extending towards the thread feed mechanism; and

(e) reducing the drawing ratio imparted to the thread while the previously established thread connection passes through a drawing zone.

**2.** The method of claim **1**, wherein the step of reducing the drawing ratio imparted to the thread is effected by reducing the difference in the circumferential speeds of the rolls defining the drawing zone.

**3.** The method of claim **1**, wherein the step of reducing the drawing ratio imparted to the thread is effected by increasing the speed of the feed mechanism.

**4.** The method of claim **1**, wherein the step of reducing the drawing ratio imparted to the thread is effected by increasing the speed of the feed mechanism by means of the tension in the thread.

**5.** The method of claim **4**, wherein the tension in the thread is additionally increased by acceleration of the drawing mechanism.

**6.** The method of claim **1**, wherein the step of reducing the drawing ratio imparted to the thread is undertaken by inducing slippage on the feed roll of the feed mechanism.

**7.** The method of claim **1**, wherein the step of reducing the drawing ratio imparted to the thread incorporates the step of tying a thread reserve into the connection of the thread ends.

**8.** The method of claim **7**, wherein the thread reserve is formed by tying a knot on the thread end held in preparatory position and a loop of the new thread end is pulled through said knot which allows thread slippage, then tying the new thread on itself at half the reserve length by a knot which also allows thread slippage.

**9.** The method of claim **6**, further including the step of additionally inducing thread slippage on a subsequent roll forming a relaxing zone.

**10.** The method of claim **1**, including the step of subjecting the thread to a drawing action imparted to such thread in two phases, wherein during the first phase a smaller part and in the second phase a large part of the drawing ratio is applied, and reducing the drawing ratio during the second phase while the thread connection passes through the drawing zone.

11. The method of claim 10, including the step of maintaining substantially constant the smaller part of the drawing ratio applied during said first phase.

12. The method of claim 1, including the step of winding the portion of the thread containing the thread connection separately from the thread package.

13. An apparatus for threading in threads on drawtwisting, draw-winding and similar machines, comprising a driven feed mechanism and a draw mechanism defining at least one drawing zone, and means for reducing the drawing ratio imparted to a thread during such time as a thread connection location thereof passes through said drawing zone.

14. An apparatus as defined in claim 13, wherein said means incorporates clutch means for interrupting the driving action imparted to said feed mechanism.

15. An apparatus as defined in claim 13, wherein said means includes a gear drive which alternatively can be coupled for driving said feed mechanism at increased speed.

16. An apparatus as defined in claim 13, wherein said feed mechanism includes feed roll means, said reducing means incorporating pressure roll liftably arranged on said feed roll means of said feed mechanism.

17. An apparatus as defined in claim 13, wherein said draw mechanism includes a draw roll processing zone of reduced friction, said reducing means embodying mechanism for changing the thread path temporarily and guiding the thread onto said draw roll zone of reduced friction.

18. An apparatus as defined in claim 17, wherein said mechanism for changing the thread path incorporates a drawing pin.

19. An apparatus as defined in claim 13, wherein means are provided such that said means for reducing the drawing ratio are centrally activated for all threads on a machine.

20. An apparatus as defined in claim 13, further including a thread severing device adapted to be arranged between a creeled package and said feed mechanism.



21. An apparatus as defined in claim 20, wherein said thread severing device serves for simultaneously severing a plurality of threads.

22. An apparatus as defined in claim 20, wherein said severing device embodies a clamping device for a thread end extending towards said feed mechanism.

23. An apparatus as defined in claim 13, wherein said draw mechanism incorporates a first draw roll and a second draw roll, said feed mechanism and said first draw roll defining a first drawing zone and said first and second draw rolls defining said second drawing zone, said means for reducing the drawing ratio incorporating mechanism which alternately can be coupled for driving said first draw roll of said second drawing zone and said feed mechanism of said first drawing zone at increased speed.

24. The method of claim 1, wherein the step of reducing the drawing ratio imparted to the thread is undertaken by inducing slippage on a draw-roll of a drawing mechanism.

25. The method of claim 24, further including the step of additionally inducing thread slippage on a subsequent roll forming a relaxing zone.


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U.S. Cl. X.R.

57—156, 22, 159