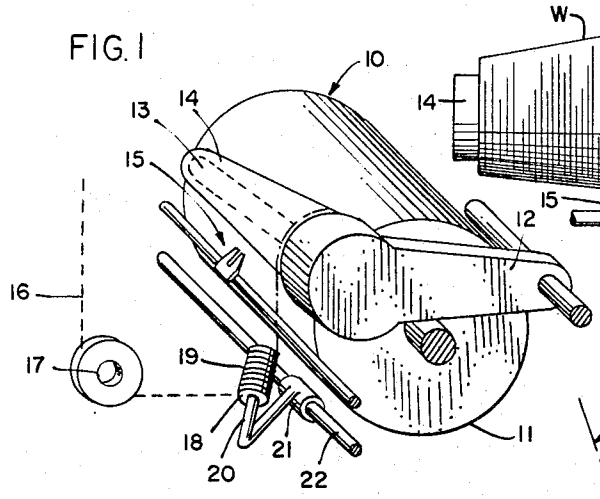
Oct. 29, 1968 W. LENK ET AL 3,408,011

THREAD RESERVE FORMING DEVICES FOR THREAD WINDING MECHANISMS

Filed Jan. 24, 1966

FIG. 1



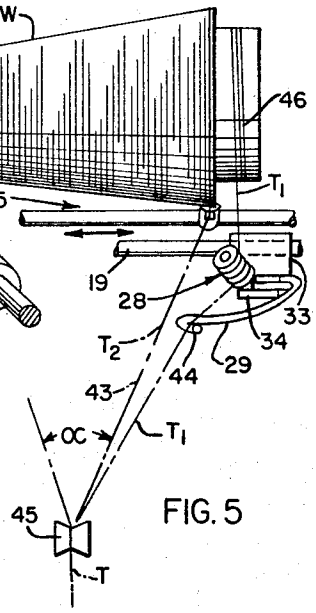


FIG. 5

FIG. 2

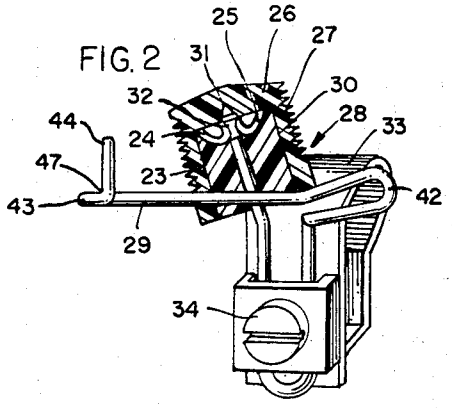


FIG. 3

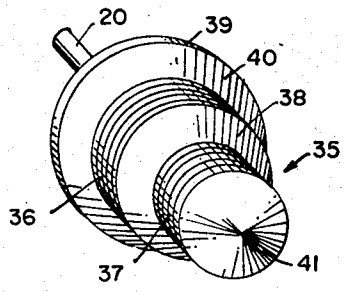
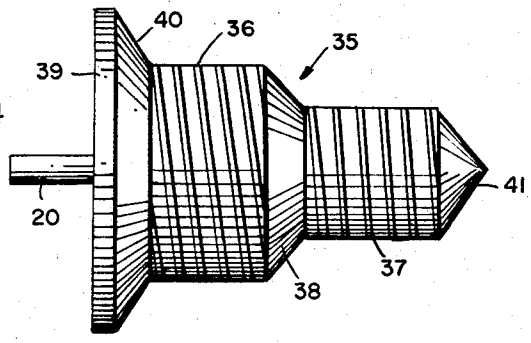


FIG. 4



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United States Patent Office 3,408,011
Patented Oct. 29, 1968

3,408,011

THREAD RESERVE FORMING DEVICES FOR THREAD WINDING MECHANISMS

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Filed Jan. 24, 1966, Ser. No. 522,573
Claims priority, application Germany, Jan. 29, 1965, B 80,316
7 Claims. (Cl. 242—18)

ABSTRACT OF THE DISCLOSURE

Devices for forming thread reserve windings on winding tubes embodying screw threaded roller with axis of rotation extending obliquely toward winding tube; roller may have axially spaced thread sections of different diameters with threads of different screw pitch.

This invention pertains to improvements in thread reserve forming devices for winding a thread reserve winding on a spool, a pirn tube, or like thread winding tube. More particularly, the thread reserve forming devices of the invention comprise a thread guide roller rotatable about an axis which preferably is oblique to the axis of winding tube, which roller has at least one cylindrical or frusto-conical surface with spiral grooves which receive a thread or other yarn or filament, hereinafter designated generically as "thread," as it is initially wound on the winding tube.

In general, threads are wound on a rotatably driven winding tube such as a winding spool, winding pirn, winding bobbin, etc., while causing the thread to reciprocate back and forth as it is wound. The reciprocation is called the traverse guide stroke. The winding devices of this invention are located just outside the traverse guide stroke and guide the thread as it is wound initially on the winding tube. The initial winding, thus, is outside the traverse guide stroke for the winding body proper and forms, usually at the base of the winding tube, a separate winding or windings known as a waste thread winding and/or a thread reserve winding. The latter is used to tie the initial, underlying part of the winding body proper to another thread winding on another winding tube prior to exhaustion of said winding body proper to allow continuous, sequential run-off of the thread windings. Waste thread windings, on the other hand, are windings of thread to be cut away from the threads of the winding body proper and/or thread reserve windings and to be discarded.

Devices are already known for the formation of a thread reserve in spooling mechanisms, which consist essentially of a constantly rotating thread catcher arranged outside the thread guide path. The catcher grips the thread placed next to it in the initial spooling and blocks it against any lateral movement until, in consequence of its rotation, it releases the running thread, so that this latter, after the spooling of the thread reserve, can move laterally toward a self-threading thread guide of the traverse guide stroke mechanism. These systems have, however, the drawback that they require a special drive, by which the thread catcher is continuously driven during the entire spooling process or at least during the initial part of the winding. Since the thread delivery speed differs considerably from the turning speed of the thread catcher, the quality of the advanced thread end is generally inadmissibly impaired by abrasion and increases of the tension of the thread sliding in a sharp bend over the thread catcher.

Moreover, it is frequently desired, before the commencement of the formation of the thread reserve winding or the thread winding proper, to deposit separately unstretched or untwisted thread lengths on the winding tube or on the winding spindle itself. By means of the known devices on winding mechanisms this is not possible.

This invention, therefore, provides an advance in the art by providing a device for the formation of a thread reserve on winding mechanisms, which device operates without a special drive means, assures a gentle treatment of the leading or initial thread ends which are handled thereby and the consistent feed during such handling of approximately equal lengths and, finally, makes possible by certain embodiments the separate deposition of a preceding thread waste winding ahead of the thread reserve winding.

In order to achieve these objectives and advantages, the invention provides for the formation of the thread reserve winding a cylindrical and/or frusto-conical thread guide roller borne to turn freely on an axis set obliquely to the axis of rotation of winding spindle and the winding tube thereon. The roller is provided on its circumference with a screw thread by which the running thread is guided to the free end of the roller. This thread guide roller can be provided with two or more screw thread sections axially spaced on the roller circumference, which sections may have different screw thread pitches. Moreover, the bearing pin on which the thread guide roller is freely rotatably borne may be fastened by means of a clamping device to a stationary machine part and may be equipped, if desired, with a thread guide bow.

The thread guide rollers of the invention are of surprising reliability in operation. They require no separate drive and no maintenance and can be mounted with the simple means on the machine frame and adjusted to the particular thread course. The thread at the start of its winding is merely laid over the roller near its base. It slips into the rearmost threads and then begins, by friction of the deflected, running thread, to turn the roller. With the aid of the screw thread or spiral groove, the rotating roller shifts the running thread toward its free end, where the thread is thrown off and is caught by the reciprocating thread guide of the transverse guide mechanism and is then wound to form the winding body proper. In the process, the first thread windings, because the thread running at a constant speed requires a certain amount of time for the acceleration of the roller to a peripheral speed near the linear speed of the thread, will lie closer together in the thread reserve winding or the waste winding than is later the case when the roller has gone into full speed rotation.

If a waste end winding and the thread reserve winding are built up separately from the winding proper, two, separate, screw axially spaced thread sections, which are connected with one another by a thread transfer means, are arranged on the thread guide roller in such a way that the thread in the initially wound thread end is distributed with the desired winding number and pitch and with clear marking with respect to the waste end. Here, it may be expedient to make the screw thread pitch of the thread section situated on the free end of the thread guide roller smaller than that of the other thread section, in order to reduce the axial thread advance of the roller. The thread reaches the first-mentioned section with the roller turning at full speed.

Further, it may be advantageous in certain cases to arrange the individual screw thread sections on roller zones of different diameter, in which case the roller can be frusto-conical or in cylindrical or frusto-conical step form.

It is an object of the invention to provide, in the combination of a thread winding machine having a winding station comprising a spindle rotatably supporting a winding tube, means to rotate said winding tube, and a traverse guide device for reciprocating the running thread as it is wound on said tube, a device for forming a thread reserve winding prior to forming the thread winding body proper comprising a thread guide roller having a screw thread on the roller surface, roller supporting means rotatably supporting said roller contiguous to an end of said winding tube, the axis of rotation of said roller extending obliquely toward said winding tube, and a free end of said guide roller providing an end unobstructed to passage of thread thereover and facing toward said winding tube, whereby the initial portion of running thread being wound may be deflected over the screw threaded surface of said roller to frictionally rotate said roller and thereby convey said thread in said screw thread to the free end of said rotating roller, during which said thread reserve winding is formed.

Another object is to provide, for use in a thread winding machine having a winding station comprising a spindle rotatably supporting a winding tube, means to rotate said winding tube, and a traverse guide device for reciprocating the running thread as it is wound on said tube, a thread guide roller having a screw thread on the roller surface, stub axle means extending into an axial end of said roller and rotatably supporting said roller, the other axial end of said roller being an end free of obstructions to thread passing thereover, and means for supporting said stub axle means and said roller at a winding station of a thread winding machine contiguous to an end of the winding tube of said station with the axis of said roller extending obliquely toward said winding tube.

A more specific object is to provide in the aforesaid combination and thread guide roller subcombination a roller composed of two axially spaced screw thread sections of the same hand.

Another more specific object is to provide two screw sections as aforesaid with respective threads of different pitch.

A further more specific object is to provide in the aforesaid combination and thread guide roller subcombination a roller support comprising a rod having one end extending axially into said end of said roller and also shaped in the form of a thread guide bow.

Still another more specific object is to provide a roller support member comprising a rod extending axially into an end of said roller and clamping means on said rod for mounting said rod and roller to a stationary member of said winding station.

The features, objectives and advantages of the invention are illustrated in the preferred embodiments illustrated in the drawing, wherein:

FIGURE 1 is a perspective view of a winding station of a thread winding machine and shows an embodiment of a thread guide roller of the invention and its relationship to the winding mechanism of the winding station;

FIG. 2 is a perspective view of another thread guide roller embodiment with the roller shown in diametric cross-section;

FIG. 3 is a perspective view of another thread guide roller embodiment;

FIG. 4 is a side elevation of the embodiment of FIG. 3 with respective threads of different pitch in the two thread sections; and

FIG. 5 is a top plan view of a winding station similar to FIG. 1 with the thread guide roller, thread guide bow and associated mounting structure illustrated in FIG. 2.

Referring to FIG. 1, the winding machine station **10** is of usual construction and comprises a drive roller **11**, a winding tube spindle **13** rotatably journalled on the swinging arm **12**, on which spindle there is placed the winding tube **14**, and a reciprocating thread guide **15**. Roller **11** is mounted on a gang drive shaft which commonly drives rollers **11** and each winding station. The thread **16**, delivered by or drawn off from the stretching or twisting device, for example, is conducted over or through a thread guide means **17** constructed as a roller, eye or the like. The latter is arranged approximately centrally opposite the winding tube **14**. The advance end of the thread **16** is secured on the base end of the winding tube **14** and the initial part of the winding is first deflected laterally over the lower end of the thread guide roller **18** in the screw thread **19** near the base of the guide roller **18**. After descent of the swinging arm until the winding tube comes to lie on the drive roller, the running thread by friction sets the easily turnable roller in increasing rotary movement and is conveyed in the spiral screw thread groove to the free end of the roller **18**. In the process, the thread is wound on the tube **14**, depending on the oblique position of the roller **18** with respect to the tube **14** in a more or less broad or narrow thread reserve winding. At the upper end of the thread groove the thread then jumps over the slightly rounded or conical face surface of the roller **18** into the traverse stroke range of the self-threading, reciprocating thread guide **15**, is carried along by this and in a known manner, and forms the winding body proper, distributed beside the thread reserve winding on the winding tube. The thread guide roller is rotatably journalled on the stub axle end of support rod **20**, the other end of which is releasably coupled by clamp sleeve **21** on the fixed rod **22** of the winding machine in the proper, spaced relation to winding tube **14**. Thus, the support rod **20** provides an axis of rotation for roller **18** extending obliquely toward the winding tube **14**. The free end of the roller **18** is contiguous to and substantially faces the winding tube **14** and provides an end unobstructed to passage of thread thereover. This provides a combination whereby the initial portion of running thread being wound may be deflected over the screw threaded surface of said roller to frictionally rotate said roller and thereby convey said thread in said screw thread to the free end of said rotating roller, during which said thread reserve winding is formed.

Referring to FIG. 2, the cylindrical or frusto-conical form thread guide roller **28** consists essentially of a cylindrical, rotatably journalled core **23**, on the upper face of which there is made a concentric recess **24** for the reception of a snap ring **25**, as well as of the cup-shaped shell **26**, the outer circumference of which is provided with a screw thread **27**. The core **23** and/or the shell **26** can be made of light metal or plastic, especially polyamide, or of sinter material and are joined securely together, for example, by cementing. The support rod for the thread guide roller **28** is a thread guide bow **29**, one end of which is the stub axle pin **30** with conical point **31** and a locking groove **32** for the snapping in of the snap ring **25** and the other, U-bent end of which is fastened by means of clamp **33** and screw **34** to the stationary rod **19**. The right-hand U-loop **42** provides resilient support for the thread guide bow **29** to give the thread guide bow resilient flexibility if it is contacted by the running thread. The left-hand U-loop **43** has an upstanding tip or rod **44**. Normally the thread T does not contact the thread guide bow **29**, its tip or rod **44** or guide roller **28** as the thread traverses winding tube **14** over traverse angle α in forming winding W. Its closest path is path T_2. However, when the thread path from guide roller **45** is deflected laterally by hand or otherwise over roller **28** into thread path T_1 for the purpose of forming a thread reserve winding **46** prior to forming winding W, the thread lies against angular corner **47** at the base of the pin or tip **44** to provide an angular deflection between deflection roller **45** and guide roller **28** and thereby hold the thread T in the screw threads **27** of the latter roller until it is released over the free end of roller **28**.

FIG. 3 shows a two-stage, thread-guide roller **35** rotatably mounted on the rod **20** with two, different diameter, screw thread sections **36** and **37** lying axially one behind the other with a frusto-conical wall **38** therebe-

tween. The respective screw threads of sections **36** and **37** may be of the same or of different thread pitch and are of the same hand. By means of this roller it is possible, first of all, to wind possible waste on the winding tube or on the spindle itself or a separate, juxtapositioned waste tube (not shown) and then to wind in the second stage the thread reserve winding and then the winding body proper. The base of the roller **35** may have a flange **39** with a frusto-conical wall **40** for guiding the thread into the rear portion of screw thread section **36**. The tip **41** of roller **35** is conical.

The embodiment of FIG. 4 is like in most respects to the embodiment of FIG. 3. It illustrates, however, screw thread sections **36** and **37** of the same hand wherein the threads of rear section **36** have a greater pitch than the pitch of the threads of front section **37** at the free end of roller **35**. The thread sections of different thread pitch and the axial space therebetween, which is provided by frusto-conical wall **38**, provides sharp delineation between the thread waste winding resulting from rear thread section **36** and the thread reserve resulting from front thread section **37**. The advantages of the thread guide rollers herein lie above all in completely sure operation and in the elimination of special drive means whereby they are surprisingly simple and inexpensive devices and can be mounted readily on the winding mechanisms of stretching or twisting machines on hand.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. In the combination of a thread winding machine having a winding station comprising a spindle rotatably supporting a winding tube, means to rotate said winding tube, and a traverse guide device for reciprocating the running thread as it is wound on said tube, a device for forming a thread reserve winding prior to forming the thread winding body proper comprising a thread guide roller having a screw thread on the roller surface, roller supporting means rotatably supporting said roller contiguous to an end of said winding tube, said roller supporting means embodying a rod extending axially into one end of said roller, a thread guide bow having an arm extending across said roller with said roller between said arm and said winding tube, an upstanding rod on an end of said arm, said rod forming a thread path deflection member when the thread path is deflected into said screw thread of said thread guide roller, and the opposite, free end of said guide roller providing an end unobstructed to passage of thread thereover and facing toward said winding tube, whereby the initial portion of running thread being wound may be deflected over the screw threaded surface of said roller to frictionally rotate said roller and thereby convey said thread in said screw thread to the free end of said rotating roller, during which said thread reserve winding is formed.

2. In a combination as claimed in claim **1**, wherein said thread guide bow comprises a rod bent into U-loops at opposite ends of said arm with said upstanding rod projecting upwardly from an end of one U-loop.

3. In a combination as claimed in claim **2**, and clamping means on said rod for mounting said rod and roller to a stationary member of said winding station.

4. In a combination as claimed in claim **1**, said screw thread being composed of two axially spaced screw thread sections of the same hand and of different diameters with a frusto-conical wall therebetween, the section of smaller diameter being adjacent said free end.

5. In a combination as claimed in claim **4**, said screw thread sections respectively having threads of different screw pitch.

6. A thread guide roller useful for forming a thread reserve winding contiguous to the winding body proper on a winding tube of a winding machine comprising a roller having a screw thread on the roller surface, stub axle means extending into an axial end of said roller and rotatably supporting said roller, the other axial end of said roller being an end free of obstructions to thread passing thereover, means adapted for mounting said stub axle means and said roller thereon on a thread winding machine contiguous to an end of the winding tube, and a thread guide bow mounted on said last-mentioned means and having an arm extending across said roller with said roller between said arm and said winding tube, an upstanding rod on an end of said arm, said rod forming a thread path deflection member when the thread path is deflected into said screw thread of said thread guide roller.

7. A thread guide roller as claimed in claim **6**, said screw thread being composed of two axially spaced screw thread sections of the same hand and of different diameters with a frusto-conical wall therebetween, the section of smaller diameter being adjacent said free end.

References Cited

UNITED STATES PATENTS

2,715,308	8/1955	Soussloff et al.	242—18 X
3,147,579	9/1964	Michalek	242—18 X
3,237,876	3/1966	Franzen	242—18

FOREIGN PATENTS

914,082	12/1962	Great Britain.
978,187	12/1964	Great Britain.
1,128,873	8/1956	France.

STANLEY N. GILREATH, *Primary Examiner.*