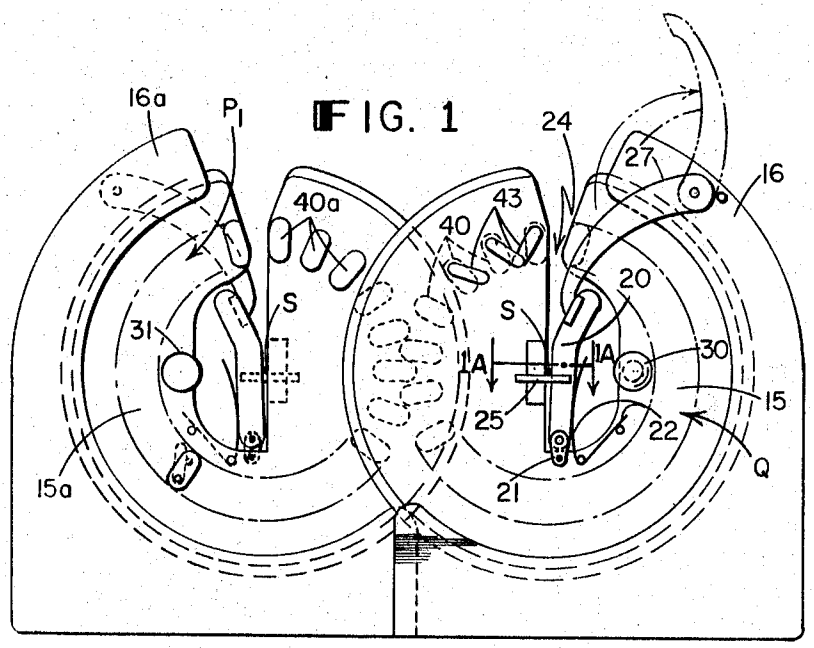
March 7, 1967 C. H. PORTER 3,307,339

APPARATUS FOR JOINING THREADS

Filed June 27, 1966 2 Sheets-Sheet 1

FIG. 1



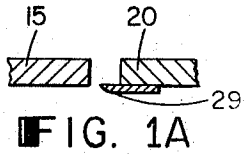


FIG. 1A

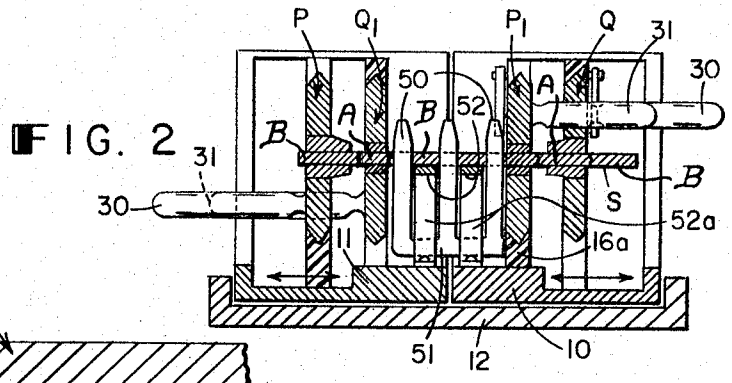


FIG. 2

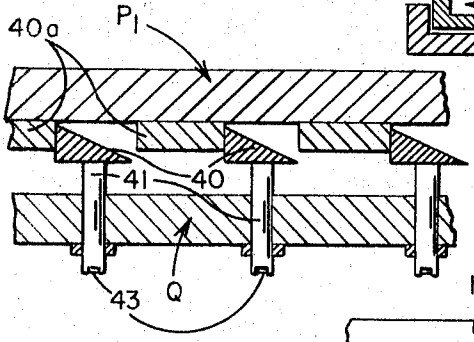


FIG. 4

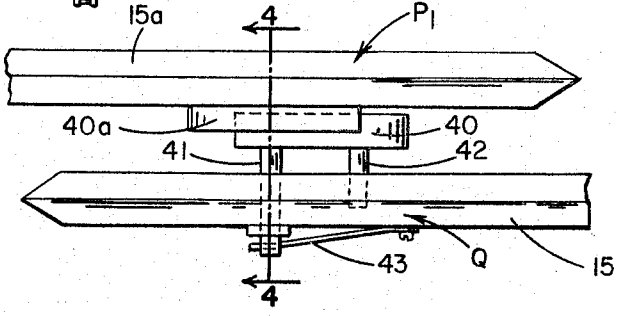


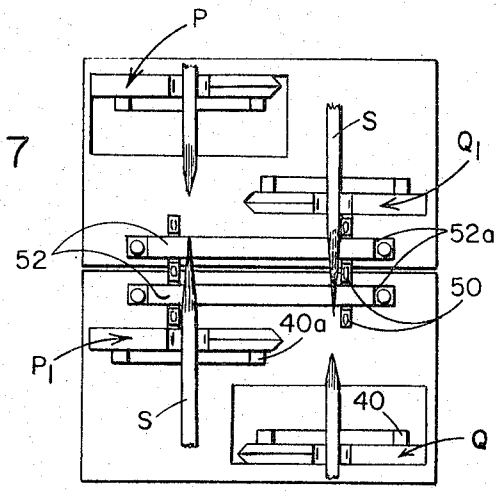
FIG. 3

March 7, 1967 C. H. PORTER 3,307,339

APPARATUS FOR JOINING THREADS

Filed June 27, 1966 2 Sheets-Sheet 2

FIG. 7



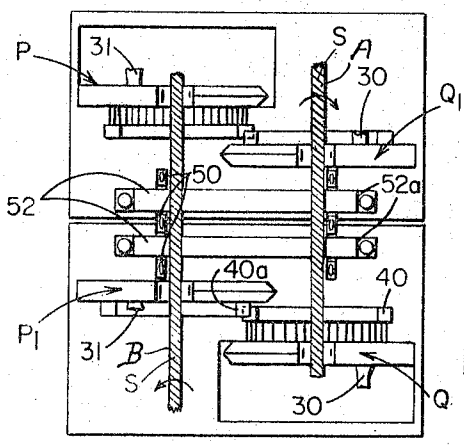


FIG. 5

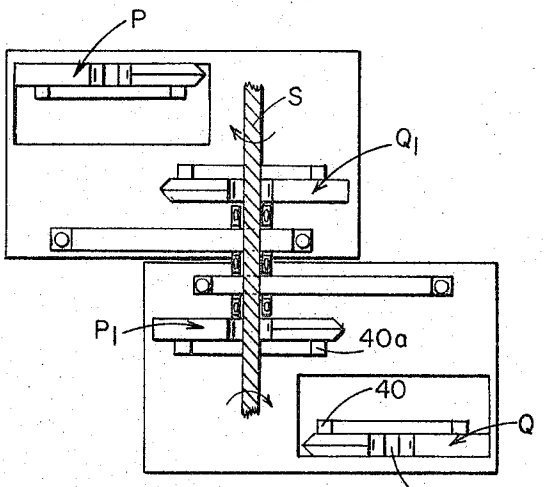


FIG. 8

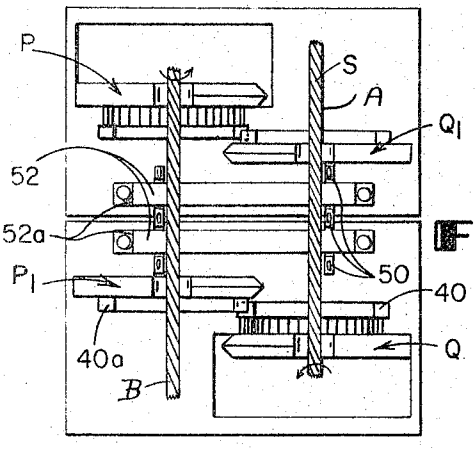


FIG. 6

United States Patent Office

3,307,339

Patented Mar. 7, 1967

3,307,339

APPARATUS FOR JOINING THREADS

Clarence H. Porter, 295 North St.,
Hingham, Mass. 02043

Filed June 27, 1966, Ser. No. 560,613
4 Claims. (Cl. 57—22)

This invention relates to apparatus for joining threads and is preferably employed in the method of joining two threads with a tailless overhand knot as disclosed in my United States patent application Ser. No. 354,698, filed March 25, 1964, now Patent No. 3,264,023. In the method of that application two threads are set up in a configuration having crossings corresponding to the crossings in an overhand knot, the ends of the two threads are then joined in a junction which includes fibers from both initially unjoined threads, and the configuration of crossings is then reduced to an overhand knot in the junction. This results in a tailless overhand knot which locks together fibers of the two initial threads.

The apparatus of the present invention is especially concerned with forming the initial junction.

Since two thread ends are involved the various operations can be most expeditiously performed by provision of two identical oppositely disposed main units. As will appear, each of these main units comprises as main elements two similar thread-gripping and twisting sub-units.

In the accompanying drawings:

FIG. 1 is an end view of the two main units with some parts omitted. The construction may be most readily visualized by regarding FIG. 1 as a right end view of the device of FIG. 2, but the shapes and relations of the parts are consistent with FIG. 1 being regarded as a left end view.

FIG. 1A is a fragmentary sectional view on the line 1A—1A of FIG. 1, showing gripping jaws and a thread severing blade.

FIG. 2 is a sectional view of the apparatus taken through the axes of the various rotatable gripper sub-units, showing fragments of threads therein.

FIG. 3 is a diagrammatic view of a ratchet connection between the rotatable elements of two sub-units of a given main unit.

FIG. 4 is a fragmentary sectional view on the line 4—4 of FIG. 3.

FIGS. 5 to 8 inclusive are diagrammatic views each largely in plan, of the apparatus showing various positions and operations of the units and sub-units.

In FIG. 5 the two units are each gripping both thread ends and their sub-units are rotating to increase the twist in the standing parts of the two threads A and B.

In FIG. 6 the two units are each gripping both thread ends and one sub-unit of each unit is rotating to untwist the thread which extends to a non-rotating sub-unit of the other unit and hence to the standing part of the thread.

FIG. 7 shows the two sub-units of the respective unit as having been moved apart, as a result of which the two untwisted thread ends have been ruptured, leaving frayed ends of diminishing fiber content extending from the gripped standing parts.

FIG. 8 shows the two units as having been shifted laterally, bringing the frayed ends together, and a sub-unit of each unit rotating to run twist from a standing part into the body of fibers composed of the two frayed ends.

The bases of the two identical units are designated as **10** and **11** and as indicated in FIG. 2 are supported in an overall guiding base **12**. In this overall base **12** the units are moved toward and away from the observer in FIG. 2, or towards the right and left as viewed in FIGS. 7 and 8 or in end view FIG. 1.

FIG. 1 will now be referred to for the construction of the sub-units of the unit. Each of these has as main parts an inner rotatable disk **15** or **15***a* mounted for rotation in a non-rotatable guide or housing **16** or **16***a*. The guides or housings **16** and **16***a* are preferably of nylon in order to form anti-friction bearings for the metallic disks **15** and **15***a* received thereby, and are grooved generally in the form of a re-entrant V to receive a generally corresponding projecting V-section of a chamfered periphery of the inner rotatable disk. The guides or housings **16** and **16***a* embrace a little more than 180° of the circumference of the inner disk. The flexibility of the nylon may be relied upon to permit the metal disks to be snapped into place, or the guides or housings may be made in two parts so that one part may be fastened to the other part after the disk has been set into the other part.

The guides or housings thus serve as bearings for the disks and also position them as to axial and lateral movement.

As seen in FIG. 1 the right hand disk **15**, that is the disk of one sub-unit designated Q, somewhat overlaps the left hand disk **15***a* of the other sub-unit designated P1. Disk **15** is hollowed to provide a working space for a gripper lever **20** pivoted thereto at **21** and urged against an opposed edge of the disk by a spring **22**. A throat **24** leads from the periphery of the disk to the hollow interior thereof and provides an entrance for the thread. A pin **25** stops the thread at the center of the disk. As seen in FIG. 1 the gripper lever is seen held in an open position, for thread reception, by a detent **27**. Moving the detent to the dotted line position of FIG. 1 releases the gripper and allows it to grip the thread.

The gripper **20** of disk **15**, but not the corresponding gripper of the disk **15***a*, is preferably provided with a severing blade **29**, FIG. 1A, which cooperates with the disk **15** to sever the thread as the latter is gripped. Omission of the blade from disk **15***a* is because the standing part S of the thread B runs from this disk, and this of course should not be cut off. It is contemplated that automatic mechanism for driving the disks will be provided. The invention can be understood by assuming that handles **30**, **31** are provided for the disks for manual rotation. However, it will be noted that it is not necessary to turn both handles **30** and **31** at one time because the disks **15** and **15***a* of the unit are ratcheted together.

Disk **15** on its side away from the observer in FIG. 1 and disk **15***a* on its side toward the observer are provided with intermeshing teeth, teeth **40***a* on disk **15***a* being fixed on the disk, and the teeth **40** being carried by pins **41** and **42** which are slidable in disk **15**. To avoid overcrowding the illustration in FIG. 1 only a few of these teeth are shown on each disk, but it will be understood that the teeth extend around the full 360° of each disk. The throat **24** passes between two adjacent teeth.

Pin **41** is urged by a spring **43** to project its tooth into operative engagement with a tooth **40***a* of disk **15***a*. Teeth **40** are beveled so that with counterclockwise rotation of disk **15** the teeth ratchet out of driving relation with the teeth on disk **15***a*. Thus clockwise rotation of disk **15** gives counterclockwise rotation of disk **15***a* and counterclockwise rotation of disk **15** leaves disk **15***a* stationary.

There is one phase in the operation when disk **15***a* is turned clockwise, namely the final phase of FIG. 8 wherein twist is being run into the junction from the standing part of original thread B. There is no need for disk **15** to rotate in this phase, and as will be apparent the ratchet relation between the disks is interrupted throughout that phase so that disk **15***a* does not drive disk **15**.

As indicated in FIG. 2 the sub-unit Q provided by disk **15** and its housing **16** is longitudinally shiftable in the

unit. FIG. 2 shows its position up to the time when disk **15** is retracted away from the other unit in FIG. 7 to rupture the untwisted thread. Disk **15***a* of the sub-unit P^1 does not partake of this retraction, its guide or housing **16***a* being fixed to the base of the unit, so that the ratchet between disks **15** and **15***a* is disconnected by the retraction.

A comb **50** comprising three generally vertical teeth and a bottom back **51** is attached to the housing **16***a*. Upon lateral shift of the base **10** of the unit this comb shifts one frayed thread end to engage the other frayed end which is similarly shifted by a corresponding comb.

Vertical support for the thread ends is afforded by horizontal runs of strips **52** which extend between teeth of the combs, one strip **52** being mounted on the base **10** of one unit and the other strip being mounted on the base **11** of the other unit by connecting leg portions **52***a*. The horizontal runs of strips **52** support the threads at the central axes of the disks.

The device has thus far been described mainly by reference to the unit which is mounted on base **10** and comprises sub-units Q and P_1. Corresponding structure operating in the same way is mounted on base **11** of the other unit and need not be separately described. Sub-unit P is like sub-unit Q and sub-unit Q, is like sub-unit P_1. It is only necessary to point out that when it is stated that a disk, say the disk **16***a*, is turning counterclockwise as viewed in FIG. 1, and more particularly in FIG. 5, disk **16***a* of the other unit has rotation having the same effect upon its gripped thread, only it would be necessary to move around and look at the device from the other end to see this as counterclockwise movement. From FIG. 1 it would appear clockwise. Looked at from the point of view of FIG. 1 the movements are as follows.

FIG. 5, running twist back.—Disk **15** carried by base **10** rotates clockwise; disk **15***a* carried by base **11** rotates clockwise; disk **15***a* carried by base **10** rotates counterclockwise; disk **15** carried by base **11** rotates counterclockwise.

FIG. 6, untwisting.—Disk **15** carried by base **10** rotates counterclockwise; disk **15***a* carried by base **11** is stationary; disk **15***a* carried by base **10** is stationary; disk **15** carried by base **11** rotates clockwise.

FIG. 8, twisting.—Disk **15** carried by base **10** is idle and retracted; disk **15***a* carried by base **11** rotates counterclockwise; disk **15***a* carried by base **10** rotates clockwise; disk **15** carried by base **11** is idle and retracted.

As indicated, the retracting movements of the sub-units comprising disks **15** of the two units which follow the untwisting operation of FIG. 6 result in the ruptures of FIG. 7. The lateral shifts of the bases **10** and **11** which align the two disks then intervene between FIG. 7 and FIG. 8. In this lateral shifting the combs comprised of the fingers **50** centralize the frayed thread ends, and in subsequent twisting of FIG. 8 these combs hold the fibers of the two ends together under light pressure. Upon

completion of the junction as described the junction may be removed and the previously set up configuration of thread crossings reduced to an overhand knot in the junction as described in my said application, Serial No. 354,698.

I claim:

1. In apparatus for use in joining textile threads, means for untwisting end parts of two threads, means for plucking fibers from the untwisted end parts so as to cause said end parts to diminish in fiber content toward the end thereof, means for bringing together the thus treated end parts where they respectively diminish in fiber content, and means for twisting said end parts together.

2. Apparatus as claimed in claim **1** including sets of rotatable longitudinally spaced grippers, the sets being adapted for side by side location, a gripper of each set being rotatable relative to another gripper of the same set to untwist a thread end part extending therebetween, a gripper of each set being retractable longitudinally of the end part relative to another gripper of the set, to pluck out fibers from the standing part of thread held by said other gripper, means for supporting the frayed ends resulting from such plucking, the means for bringing together the end parts including means for aligning the said other grippers associated with the standing parts.

3. Apparatus as claimed in claim **1** including an interconnection between a gripper of one set and a gripper of the other set such that rotation of the first-named gripper in one direction is accompanied by rotation of the second-named gripper in the opposite direction, for use in running twist into the standing part of a thread, and such that, prior to the plucking, rotation of one of the interconnected grippers in a direction opposite to its original direction leaves its interconnected gripper stationary, for use in untwisting.

4. Apparatus as claimed in claim **1** including two main units each including longitudinally offset and laterally offset but overlapping gripper carrying sub-units, the two main units being capable of a relative shift between positions (1) where both carriers of both units are aligned with respect to carriers, each of the other unit, for running back twist into the standing parts, for untwisting, and for plucking, and (2) where inner carriers of the two units are aligned, for retwisting.

References Cited by the Examiner

UNITED STATES PATENTS

1,345,375	7/1920	Lemay	57—22
1,532,572	4/1925	Brewster	57—22
1,986,974	1/1935	Kellogg	57—159 X
2,515,172	7/1950	Abbott	57—159
2,846,838	8/1958	Wolfe	57—22 X
2,943,434	7/1960	Joy et al.	57—159 X

FRANK J. COHEN, *Primary Examiner.*

D. E. WATKINS, *Assistant Examiner.*