# United States Patent

**Stalder et al.**

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## [54] SLIDING RADIALLY-CLAMPING GRIPPER


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[73] Assignee: **Electrospin Corporation,** Columbus, Ohio



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[30] **Foreign Application Priority Data**

Apr. 3, 1970 Switzerland ..... 4945/70

[52] **U.S. Cl.** ..... **57/77.3,** 57/58.95, 57/77.4

[51] **Int. Cl.** ..... **D01h 1/12,** D01h 7/92

[58] **Field of Search** ..... 57/77.3–77.45, 57/58.89–58.95, 59, 60, 1 R, 34 R, 51, 51.6



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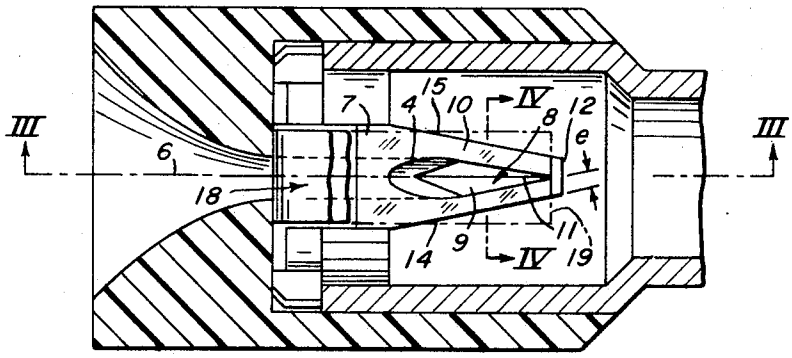
[57] **ABSTRACT**

A gripper for use in open-end spinning of textile fiber in which axial movement of fiber is permitted through a bevelled tubular element while the fiber moves through a generally V-shaped groove and has an axial pressure exerted against it by suitable resilient means. The gripper is rotated while the fiber is moved axially under the radial pressure so that a textile yarn is formed.


**11 Claims, 9 Drawing Figures**



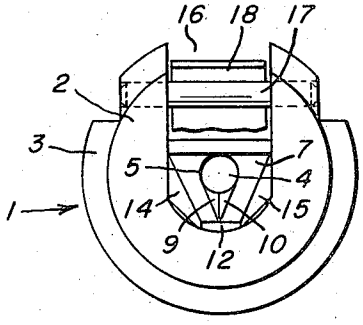



FIG. 1.

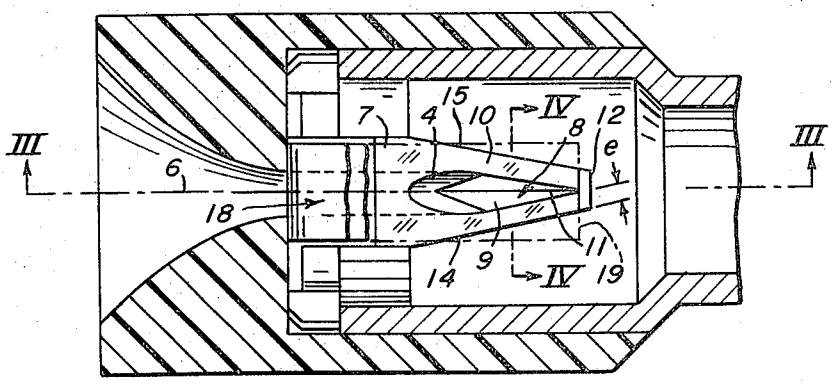



FIG. 2.

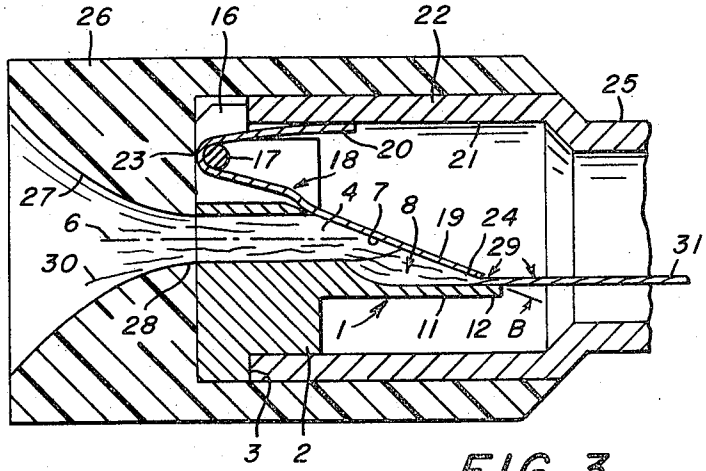



FIG. 3.

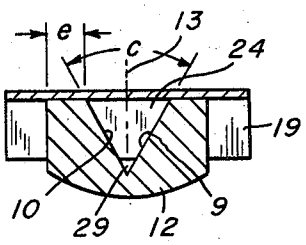



FIG. 4.

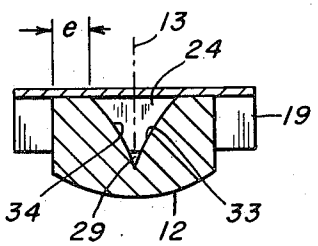



FIG. 5.

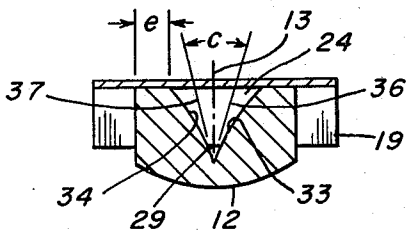



FIG. 6.

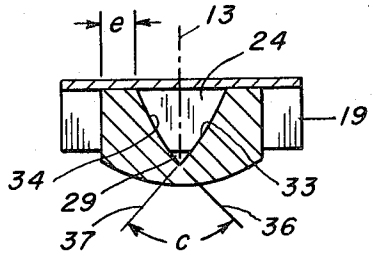



FIG. 7.

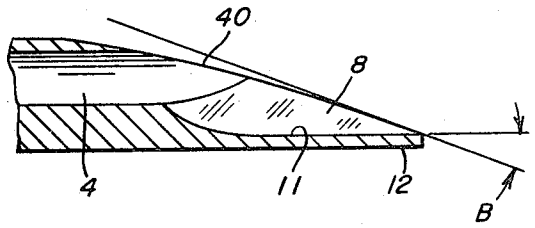



FIG. 8.

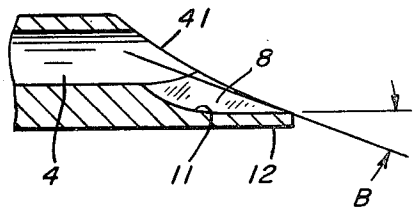



FIG. 9.

# SLIDING RADIALLY-CLAMPING GRIPPER

The present invention concerns a radially clamping gripper for angularly locking therewith a filiform object, notably a textile thread, while still enabling this filiform object to slide axially.

There are several known types of grippers of this kind, which are used notably as false twist members in some spinning machines, and more particularly in machines for manufacturing a textile thread by the so-called open-end spinning methods. It has however been found that when they were applied to spinning, the known sliding radially clamping grippers all suffer from one or other, or even several, of the following drawbacks:

the clamping force is very much dependent on the diameter of the thread (i.e., on its number); as a result, the tension exerted on the thread fluctuates constantly because of the inevitable presence of lumps in the thread;

the clamping force is dependent on the rotational speed of the gripper and on the output rate;

the passage point of the thread in the clamping member is not invariable, thus leading to constant fluctuation in the thread tension;

the impurities that inevitably accompany the thread are held back when passing through the gripper and progressively clog it up, thus causing in the long run a drift in the value of the thread tension;

in the event of thread breakage, it is relatively awkward to reinsert the latter for piecing purposes, even when such reinsertion is performed with suitable tooling.

The present invention provides a gripper which does away with the major part of these drawbacks and which is characterized in that it comprises a bevelled tubular terminal element which is formed, at least at its end, with an internal V-shaped groove delimited by two sides and which is bevel cut along a ruled surface perpendicular to the bisecting plane of these two sides, and a blade which is disposed in this ruled surface and which is applied against the bevel by resilient means, so that the groove and the blade together define a pyramidal channel for receiving the filiform object and having two fixed walls constituted by said sides and a movable wall constituted by the blade, the cross-section of this channel having the shape of an isosceles triangle with a rectilinear base of which the area progressively decreases towards the end of the bevel until it reaches, at that end, a minimum value constituting the outlet of this channel.

The following description relates to a particular form of embodiment of the invention, given by way of example. It is illustrated by the accompanying drawing, in which:

FIG. **1** is a front view of the essential part of the gripper.

FIG. **2** is a plan view of the whole gripper, part of which has been cut off.

FIG. **3** is a longitudinal view along line III—III of FIG. **2**.

FIG. **4** is a section along line IV—IV of FIG. **2**.

FIGS. **5**, **6** and **7** illustrate, in section, variants of the part of the gripper shown in FIG. **4**.

FIGS. **8** and **9** illustrate, in longitudinal section, variants of another part of the gripper, visible in FIG. **3**.

As is apparent from FIGS. **1** to **3**, the gripper comprises a tubular terminal element **1** having a base **2** which is provided with a shoulder **3**. This tubular terminal element is pierced with a channel **4**, whose internal cross-section is circular, as shown by the contour **5** visible in FIG. **1**, and it is bevelled (i.e., cut obliquely in relation to its axis **6**) along a plane **7**. The channel **4** is formed with a V-shaped groove **8** delimited by two planar sides **9** and **10**, the bottom **11** of which (see FIG. **3**) is, at least at the end **12** of the bevel, parallel to the axis **6** of channel **4**. The plane **13** bisecting the sides of this groove passes through the axis **6** of channel **4** and is moreover perpendicular to the plane **7** of the bevel. By virtue of the presence of the bevelling along plane **7**, the height of the sides **9** and **10** of groove **8** progressively decreases as one approaches the end **12**, but their summital thickness *e*, measured in plane **7**, is kept constant by the fact that the terminal element is externally



delimited by two planes **14** and **15** that are oblique in relation to the axis **6** and whose line of intersection is located in this bisecting plane; in other words, the terminal element is not only bevelled (by virtue of plane **7**), but it is also tapered (by virtue of planes **14** and **15**). The base **2** is formed with a meridian slot **16** across which extends a pin **17**. Around this pin **17** is passed a strip **18**, of resilient material, which has previously been folded into the V-shape visible in FIG. **3** so that this strip comprises a first limb **19**, which lies in the plane **7** of the bevel, and a second limb **20**, which cooperates with the internal surface **21** of a rotary casing **22** in which is inserted the terminal element **1**. The angle formed by the V-shaped fold at its apex **23** is so chosen that the internal surface **21** of the sleeve **22** exerts a resilient prestress over the entire strip **18**, the effect of this prestress being that the limb **19** of strip **18** is applied with an elastic force against the bevelled part **7** of the terminal element **1**. In this way, the two sides **9**, **10** of the V-shaped groove **8** and the limb **19** of the resilient strip **18** together delimit a pyramidal channel **24** (FIG. **4**) having two planar fixed walls **9**, **10** and a movable wall **19**; the cross-section of this channel has the shape of an isosceles triangle whose area progressively decreases as one approaches the end **12** of the bevelled part. The length of the limb **19** of the resilient strip **18** is such that it leaves free the extreme tip of this pyramidal channel, this extreme tip constituting the outlet **29** of the latter.

The rotary casing **22** is itself mounted at the end of a spindle **25** that is rotatably driven about an axis coinciding with the axis **6** of the channel **4** of the tubular terminal element **1**. The whole set-up is capped by a member **26** which is so shaped internally as to form an inlet funnel **27**, the narrower portion **28** of which coincides with the inlet of the channel **4** of the terminal element **1**.

This gripper operates as follows. The filiform object which it is required to immobilize angularly in relation to itself, enters through the funnel **27**, passes through the channel **4**, and enters the pyramidal channel **24** at the bottom of which it is wedged under the action of the classical force with which the tongue formed by the limb **19** of the elastic strip **18**. Since the area of the triangular cross-section of this pyramidal channel decreases as the object moves forward towards the end **12** of the terminal element **1**, the nipping force increases so that in the vicinity of this end, and notably at the outlet **29** of the pyramidal channel, the filiform object is angularly immobilized in relation to the terminal element, but it can nonetheless be moved axially, from the inlet funnel **27** to the outlet **29**, under the action of a slight pull.

This gripper is more particularly intended to serve as a twisting member in a spinning machine carrying out an open-end spinning method on textile fibers. In this case, the filiform object consists, at the input, of a plurality of fibers **30** which are progressively packed in the pyramidal channel **24**, and angularly immobilized in relation to the end **12** of the terminal member **1**. Since the latter rotates about its axis **6**, under the rotational action of the spindle **25**, the plurality of fibers **30** that constitutes the gripped object leaves the terminal member **1** at the outlet **29** of the pyramidal channel **24**, in the form of a twisted thread **31**.

This gripper has various advantages, which are of particular interest in this special application constituted by the manufacture of a thread by open-end spinning:

the clamping force only varies slightly with the diameter of the thread, because the force exerted by the resilient tongue formed by the limb **19** of strip **18** depends only little on this diameter; as a result, the tension (pull) exerted on the thread is stable;

any lumps appearing in the bundle of fibers **30** can easily move past the end **12** of the terminal element, since the mass that these lumps are required to push aside in order to move past the outlet **29** is minimal such mass reducing itself to that of the end of the tongue **19**; the forces of inertia which come into play on that occasion are thus practically negligible. Moreover, the clamping elements constituted by the tongue

19 and the sides 9, 10 of groove 8 exert no frictional force on one another when this tongue moves away upon a lump travelling past;

there is no element likely to catch the impurities and to hold them back in the gripper thereby clogging up the latter and this practically eliminates any long term drift in the tension of the thread. The fact, as regards the two planes 14 and 15 that render the end 12 of the terminal element tapered, of giving the walls of the pyramidal channel 24 a summital thickness *e* which is constant, and as small as possible, also helps to reduce the risks of clogging;

the fact that the terminal element is bevelled has a self-centering effect on the thread; any fiber tending to escape between the tongue 19 and the tops of the sides of groove 8 is subjected, because of the inclination of the plane 7, to a force tending to return it towards the bisecting plane 13 of this groove, i.e., towards the interior of the pyramidal channel 14. The inclination of this plane 7 is however not immaterial and it should be determined empirically; thus, it has become apparent that with a groove 8 whose planar sides 9, 10 are inclined 60° in relation to one another (thus imparting to the pyramidal channel 24 a cross-section of equilateral triangular shape), an inclination of the order of 20° was favorable. If the inclination is too slight, the tension in the thread is insufficient; if it is too large, this tension is likely to fluctuate.

Various modifications may be made to the above described embodiment. Thus, the sides 9 and 10 of the groove 8 can have various inclinations, which provide the cross-section of the pyramidal channel 24 with the shape of a more or less acute isosceles triangle; however, an inclination of 60 percent is particularly advantageous since this cross-section can then have the shape of an equilateral triangle, which shape has an intrinsically useful symmetry.

The sides of the groove 8 can be formed not by planes, but by curved surfaces. Thus FIG. 5 shows a case where these sides are convex surfaces 33 and 34, which are mutually symmetrical in relation to the bisecting plane 13. In FIG. 6, these sides are also symmetrical convex surfaces, but instead of meeting along the bottom of the groove, with their bisecting plane 13 acting as a common tangent plane (angle of intersection equal to zero), they each have a different tangent plane, i.e., planes 36 and 37, which planes are mutually symmetrical in relation to the bisecting plane 13 (plane of intersection C other than zero). The sides of the groove 8 can also consist of concave curved surfaces 38, 39 (FIG. 7) which have a meeting angle C less than 180°. In all of these cases, the cross-section of the pyramidal channel 24 has the shape of an isosceles curvilinear triangle with a rectilinear base; this curvilinear triangle is concave when the sides consist of convex curved surfaces (FIGS. 5 and 6); it is convex when these sides consist of concave curved surfaces (FIG. 7).

Further, the bevel can be cut along a curved surface, which can either have its concavity situated to the side of the groove 8, like the curved surface 40 in FIG. 8, or have its concavity situated to the side remote from this groove 8, like the curved surface 41 in FIG. 9. In the first case, the terminal element is convexly bevelled, and in the second it is concavely bevelled. In general, the bevel is cut along a ruled surface whose generatrices are perpendicular to the bisecting plane 13 of the sides of groove 8. Of course, in all cases the tongue constituting the movable wall of the pyramidal channel must be so shaped as to conform to the surface along which the bevel is cut, the angle B of this surface in relation to the axis of the channel 4 being generally of the order of 20° at the end 12 of the bevel. Further the length of this tongue must be such that an outlet 29 remains free at the end of the pyramidal channel.

Instead of starting off with a tubular terminal element having a circular channel and of subsequently machining therein a groove 8, it is also possible to start off with a tubular terminal element whose channel 4 has a cross-section that already is of the required shape, e.g., a cross-section of equilateral triangular shape, and to machine at its inlet a connection, for instance of conical shape, that links this triangular section with the circular section of the end 28 of funnel 27.

We claim:

1. A sliding radially clamping gripper, for angularly locking therewith a filiform object, notably a textile thread, while still enabling this filiform object to slide axially, comprising a bevelled tubular terminal element including an internal V-shaped groove delimited by two sides and which is bevel cut along a ruled surface on said terminal element perpendicular to the bisecting plane of these two sides, and a blade which is disposed in this ruled surface and which is applied against the bevel by resilient means, the groove and the blade together defining a generally pyramidal channel for receiving the filiform object and having two fixed walls constituted by said sides and a movable wall constituted by the blade, the cross-section of this channel having the shape generally of an isosceles triangle with a rectilinear base of which the area progressively decreases towards the end of the bevel until it reaches, at that end, a minimum value constituting the outlet of this channel.

2. A gripper according to claim 1, wherein said blade consists of a tongue of resilient material of which the end remote from said bevel is secured to the terminal element by fixing means capable of imparting a prestress thereto that applies the blade against the bevel, so that said resilient means are constituted by the inherent resiliency of the tongue.

3. A gripper according to claim 1 wherein a casing is provided and inside which are mounted the terminal element and the blade, the blade consisting of a strip of resilient material which is folded into a V thereby defining first and second limbs and which is housed between the casing and the terminal element, retaining means to maintain the strip in a position such that the first limb rests on said bevel to constitute said tongue and the second limb bears against the internal wall of the casing.

4. A gripper according to claim 3 wherein said retaining means comprises a pin secured to said terminal element ahead of said bevel, said pin being parallel to the surface of the latter and at right angles to the axis of the terminal element, and said folded strip being slipped over this pin so that the apex of its V-shaped fold may straddle the pin.

5. A gripper according to claim 4 wherein said planar sides are inclined at 60° in relation to one another, so that said rectilinear isosceles triangle is equilateral.

6. A gripper according to claim 1, wherein the two sides of said groove are planar sides, so that the cross-section of said channel has the shape of a rectilinear isosceles triangle.

7. A gripper according to claim 1, wherein the two sides of said groove are mutually symmetrical convex sides, so that the cross-section of said passage has the shape of a concave curvilinear triangle with a rectilinear base.

8. A gripper according to claim 1, wherein the two sides of said groove are mutually symmetrical concave sides, so that the cross-section of said channel has the shape of a convex curvilinear triangle with a rectilinear base.

9. A gripper according to claim 1, wherein the ruled surface along which said bevel is cut is a plane.

10. A gripper according to claim 1, wherein the ruled surface along which said bevel is cut is a curved surface whose concavity is located to the side of said groove, so that said terminal element is convexly bevelled.

11. A gripper according to claim 1, wherein the ruled surface along which said bevel is cut is a curved surface whose concavity is located remote from said groove, so that said terminal element is concavely bevelled.

* * * * *

## Dedication

3,664,110.—*Herbert Stalder*, Geneva, and *Jean Pellaton*, Chatelaine/Geneva, Switzerland. SLIDING RADIALLY-CLAMPING GRIPPER. Patent dated May 23, 1972. Dedication filed Mar. 23, 1977, by the assignee, *Electrospin Corporation.*

Hereby dedicates to the Public the entire term of said patent.

[*Official Gazette May 10, 1977.*]