June 16, 1964 H. WILCKEN 3,137,037

APPARATUS FOR FORMING A HELICAL SLIDE FASTENER

Original Filed March 12, 1959 2 Sheets-Sheet 1

FIG. 3

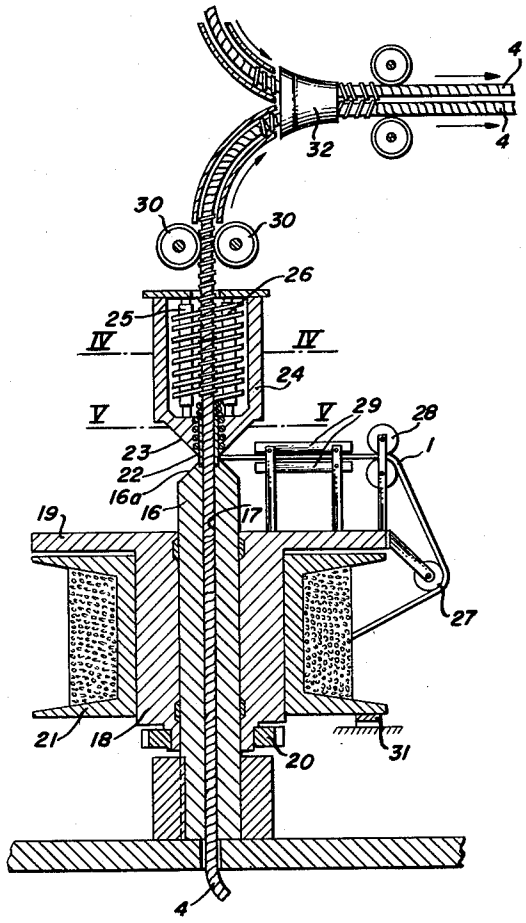


FIG. 2

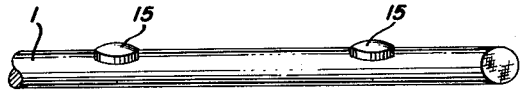
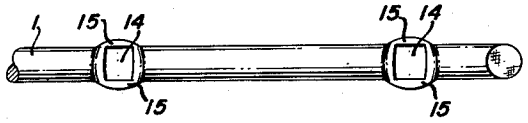


FIG. 1



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APPARATUS FOR FORMING A HELICAL SLIDE FASTENER

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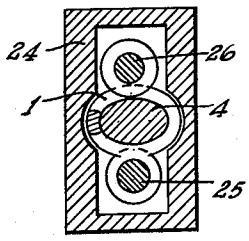


Fig. 4

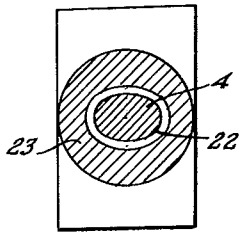


Fig. 5

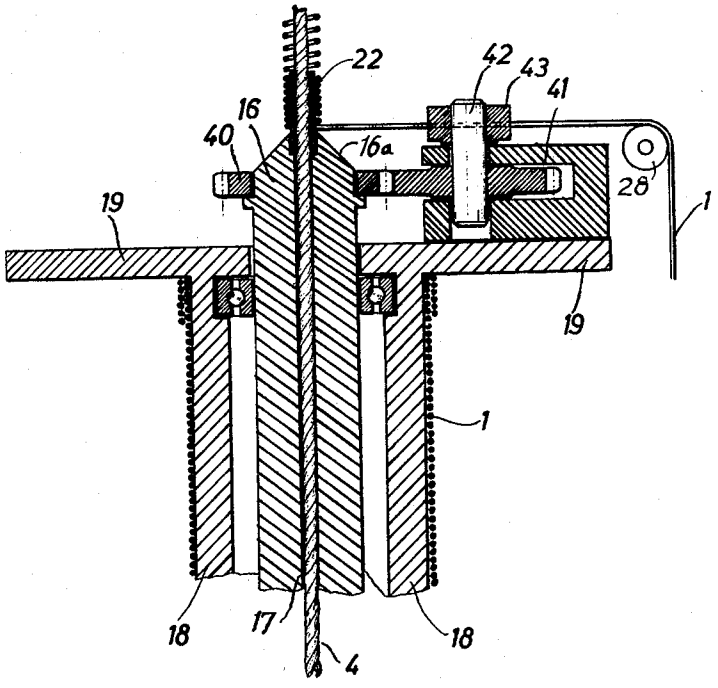


Fig. 6

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APPARATUS FOR FORMING A HELICAL SLIDE FASTENER

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Original application Mar. 12, 1959, Ser. No. 798,939, now Patent No. 3,047,923, dated Aug. 7, 1962. Divided and this application July 7, 1961, Ser. No. 133,538
Claims priority, application Germany Mar. 12, 1958
9 Claims. (Cl. 18—19)

The present invention relates to a machine for winding a plastic thread or filament around a filler cord to form a unit which is subsequently sewn to a stringer tape to provide one half of a sliding clasp fastener.

This application is a division of my copending prior application, Serial No. 798,939 filed on March 12, 1959, and now Patent No. 3,047,923 issued on August 7, 1962.

At the time when the filament is wound around the filler cord, it is provided with regularly longitudinally spaced deformations which are axially aligned during the course of winding operation to form a series of coupling elements properly located for engagement with a corresponding series of coupling elements of another similarly wound filler cord in the completed slide fastener.

In one embodiment of the invention, the deformations are pre-formed before the filament is supplied to the winding machine.

In another embodiment, the filament is smooth throughout its length and heated pressing rollers form the coupling element deformations in synchronism with the winding operation.

The machine comprises helical feed screws which operate to space the helical convolutions of the filament immediately after winding in order to provide precisely the correct pitch. Means such as an adhesive may be provided to maintain the correct pitch after the wound filler cord has left the winding machine.

Heating means may be operatively associated with the portion of the machine containing the feed screws to set the shape and pitch of the convolutions when using a filament of thermoplastic material.

The invention will be more fully understood from the following specification with reference to the accompanying drawing forming a part thereof.

Referring to the drawing:

FIGURE 1 is a fragmentary plan view of the filament or polyamidic thread which is wound by the machine, two of the series of coupling element deformations being illustrated.

FIGURE 2 is a fragmentary elevational view of the filament or thread shown in FIG. 1.

FIGURE 3 is a sectional view in elevation of a winding machine embodying the invention.

FIGURE 4 is a transverse sectional plan view taken along the line IV—IV of FIG. 3.

FIGURE 5 is a transverse sectional plan view taken along the line V—V of FIG. 3.

FIGURE 6 is a fragmentary view in sectional elevation illustrating a modified form of the invention wherein the coupling element deformations are formed by the winding machine which is supplied with smooth surfaced wire or thread.

As explained in my Patent No. 3,047,923 referred to above, the machine is supplied with a polyamidic thread

1 which is provided with a series of regularly longitudinally spaced deformations each of which consists on an indentation 14 providing laterally projecting edges 15 which form the coupling elements.

The machine winds the thread 1 around a filler cord 4 which passes upwardly through the machine. Referring to FIG. 3, the device consists of a fixed spindle 16 which is provided with a longitudinal bore 17, through which the filler cord 4 is passed. According to the profile of the convolutions of the helical thread to be manufactured, this bore and the cross-sectional configuration of the filler cord is circular, oval or the like. On this spindle 16 is rotatably mounted a collar 18 which is fixed at one end to a plate 19, or a frame or the like, whilst on the other end there is secured a gear 20, which may be driven by a motor (not shown) through suitable gearing. Between the plate 19 and the gear 20 a supply drum 21 is mounted to be freely rotatable on the collar 18. On the supply drum 21 is wound the thread 1 having transverse deformations 14, 15 serving as coupling elements, as previously explained.

The spindle 16 terminates at its free end, in a cone 16*a*. The axial bore 17 of the spindle is connected to a thin short tube 22, the cross-sectional shape of which corresponds to the cross-sectional shape of the helical thread turns or convolutions to be made. Instead of the small tube 22 a collar or equivalent means may be provided. An oppositely directed cone 23 of a housing 24 is disposed in axial alignment with cone 16*a* of the spindle. The inner wall of the housing may have at cone 23 a diameter or a cross-section which corresponds to the external diameter of the coil turns to be manufactured or to the cross-section of these turns, in such a manner that the radial distance between the exterior of small tube 22 and the inner wall of the housing 24 corresponds to the thickness of the polyamide thread 1. At the point where the end of the thin small tube or collar 22 is disposed, there are connected, in the housing 24, two feed screws 25 and 26, the spiral turns of which have pitch spacing equal to the spacing of the turns of the helical thread to be manufactured. The spiral threads of the screws engage between the turns of the helical thread so as to produce a precise spacing of the helical thread turns on the filler cord 4. This spacing is fixed by a heating device in housing 24 operable by steam or electric current. The steam, having a suitable temperature, is supplied to the helical thread in such a manner that the thread brought into helical form is fixed with the desired turn spacing. The heating device itself is not illustrated in the drawing since it may be of any conventional construction and per se forms no part of the present invention.

The apparatus operates as follows. The plate 19 on which roller-shaped guides 27 and 28 or the like are mounted, is rotated by gear 20 and collar 18. The polyamide thread 1 runs off from the drum and is wound on the thin collar 22 by means of guide rollers 27, 28 and elongated guide members 29. These guide rollers and guide members rotate with the plate 19 between the cone 16*a* of the spindle and the cone 23 of the housing. The helical threads on the collar are automatically displaced in the direction of feed by the winding operation. The guide members 29 are constructed in such a manner that the coupling elements 14, 15 which are provided by the transverse deformation of the thread are disposed always on the same longitudinal line of the collar 22 and in such

a manner that the indentations 14 of the transverse deformation are directed against the lateral surface of the collar 22, that is to say, against the surface of the flexible filler cord 4. The filler cord 4 passes through the spindle 16 and the housing 24 with a speed such that it is moved forward, on each rotation of the thread guide 19, by a distance equal to the pitch of the helical thread to be manufactured. As soon as the closely adjacent turns of the polyamide thread 1 reach the end of the collar 22 they are taken up by the feed screws 25 and 26 and thereby are brought to the correct spacing relatively to one another, this spacing being fixed on the filler cord 4 by means of the heating device above mentioned. It is possible to supply to the filler cord 4, through a further longitudinal bore and a radial bore of the fixed spindle 16 connected thereto, a textile glue or other adhesive. This is effected most advantageously at the point which is opposite to the position of the coupling elements on the filler cord in such a manner that the helical turns of the thread are additionally secured by the adhesive after they are properly spaced by the feed screws 25 and 26.

The axial feed of the filler cord 4 is effected by providing in the direction of feed beyond housing 24 two cooperating rollers 30. The rollers are driven and have peripheral teeth corresponding to the pitch and height of the helical thread. The teeth engage between the turns of the thread with corresponding points in the filler cord 4 and pull the latter through the spindle 16 and the housing 24. The tooth pitch of the roller 30 and its speed is synchronized with the speed of the thread guide 19 and of the screws 25, 26.

Since in certain circumstances it may occur that the polyamide threads fed over the guide rollers 27, 28 may experience backlash through which the coupling parts of the screw thread may be put in a wrong position, gripping means such as rollers may be provided near guide 29. These rollers would have suitable peripheral recesses, the recesses on the periphery of these rollers would be adjusted to the turn spacing and the form of the transverse deformations of the thread. The transverse deformations of the thread would be inserted in the corresponding recesses of the gripper rollers and would be positively taken along in such a manner that the transverse deformations on the thin collar 22 would always take up the same position.

It is also possible to coil on the supply drum 21 a polyamide thread having a continuously circular, elliptical or like cross-section and then to effect the transverse deformation for making the coupling parts beyond the guide rollers 28 and ahead of the thin collar 22. In this case there are mounted on the plate 19 heated cooperating pressing rollers 43 shaped as male and female parts, which effect the deformation. The drive for these rollers may be effected as shown in FIGURE 6 by means of a gear 41 carried by spindle 42 on the plate 19. The gear 41 meshes with and is driven by gear 40 secured to the fixed spindle 16. Gear 41 and one roller 43 are mounted on the same spindle 42.

The supply drum 21 is mounted on the collar 18 in a freely rotatable manner so that the polyamide thread is drawn in the direction of winding by means of the thread guide plate 19. The direction of rotation of the supply drum 21 is the same as that of the thread guide. It is possible to apply a tensioning drag to the thread 1 as it is payed out from the supply drum by providing a fixed brake lining against which a side of the drum will slide. This brake lining may be a piece of felt or the like. By means of this braking the supply drum 21 is prevented from rotating with the same speed as the thread guide on the collar 18.

It is possible to provide an opposed but similar arrangement as that of FIG. 3 in which the individual parts have opposite directions of rotation. The two opposite helical threads with their filler cords will then be mutually engaged by means of a slider 32 and subsequently will be

sewn to respective slide fastener stringer tapes. Since both filler cords will be very closely adjacent in this arrangement, it may be advantageous to open the two strips for the purpose of sewing and then to sew the two strips individually each to one fastener stringer tape, whereupon the two strips will then again be drawn together.

When the transverse deformations of the thread are made before the thread is supplied to the cone 16*a* of the spindle 16, the thread may be coiled directly on the filler cord without the coiling tube 22. It is also possible to work without the coiling collar 22 when the filler cord 4 possesses a sufficient stiffness so that deformations of the filler cord may be avoided on coiling. This could be done by passing the filler cord, before entering the coiling spindle 16, through a starch or sizing bath so as to impart a sufficient stiffness thereto. This starch or size may be removed after effecting the correct turn spacings by means of the screws 25 and 26, by washing or the like so that the fastener thereby again possesses the required flexibility.

While I have shown and described what I believe to be the best embodiments of my invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. Apparatus for use in making helical coil sliding clasp fasteners formed of helical filaments of plastic material, the turns of which filaments are provided with coupling elements formed by transverse deformations of the filament, comprising a spindle having a coil former at one end, a supply spool for said filament freely rotatable about the axis of said spindle, a support rotatable about said spindle, guide means carried by said support for guiding the filament drawn off from the supply spool to the coil former, whereby the filament is wound around the coil former as the support is rotated relative to the spindle, coupling element locating members carried by said support, and drive means for driving said members by relative rotation between said support and said spindle so that during each revolution of the support about the spindle one of the coupling elements is located in a predetermined circumferential position to insure that the coupling elements of successive turns will all be aligned with each other axially of the coil former.

2. Apparatus according to claim 1, wherein said coupling element locating members include cooperating forming dies which produce transverse deformations at uniformly spaced intervals along the filament.

3. Apparatus according to claim 2, wherein said dies are rotatable on said support, said drive means including a first gear fixed on said spindle and another gear meshed with the first gear and operatively engaged with at least one of said dies to rotate the same as said support rotates about the spindle.

4. Apparatus according to claim, 1, further comprising spacing means for receiving said coil from the coil former and for adjusting the spacing between adjacent turns of the coil.

5. Apparatus according to claim 1, further comprising two conveyor screws arranged axially parallel to each other near said coil former for receiving the coil therefrom, said screws having threads engaging between adjacent turns of the coil for fixing the spacing therebetween.

6. Apparatus according to claim 5, further comprising a housing having an opening therein, said screws being rotatably disposed in said housing, said opening having a wall serving as a guide for passing the coil to said screws.

7. Apparatus according to claim 1, wherein said spindle and said coil former having an axial passage therethrough for receiving and passing a flexible filler core axially or

the coil as the coil leaves the coil former, with the turns of the coil wound around the filler core.

8. Apparatus according to claim 7, further comprising opposed, driven toothed rollers engaging the filler core between turns of the helical coil for advancing the filler core through the spindle.

9. Apparatus according to claim 8, further comprising a housing having an opening therein, a pair of conveyor screws arranged axially parallel to each other in the housing, said housing having an opening therein with a wall serving to guide the coil and filler between the screws,

said screws having threads engaging between adjacent turns of the coil for determining the spacing therebetween, and heating means associated with said housing for fixing the spacing of the turns of the coil while they are engaged by the threads of the screws.

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