Nov. 21, 1967 A. G. COFFIN, JR., ET AL 3,353,223

METHOD AND APPARATUS FOR CRIMPING

Original Filed Aug. 19, 1963 2 Sheets-Sheet 1

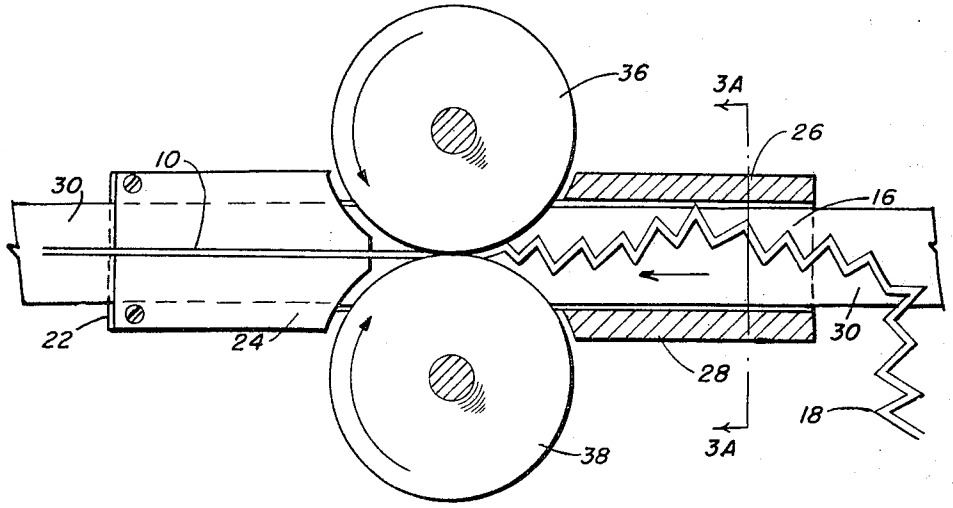


FIG. 1.

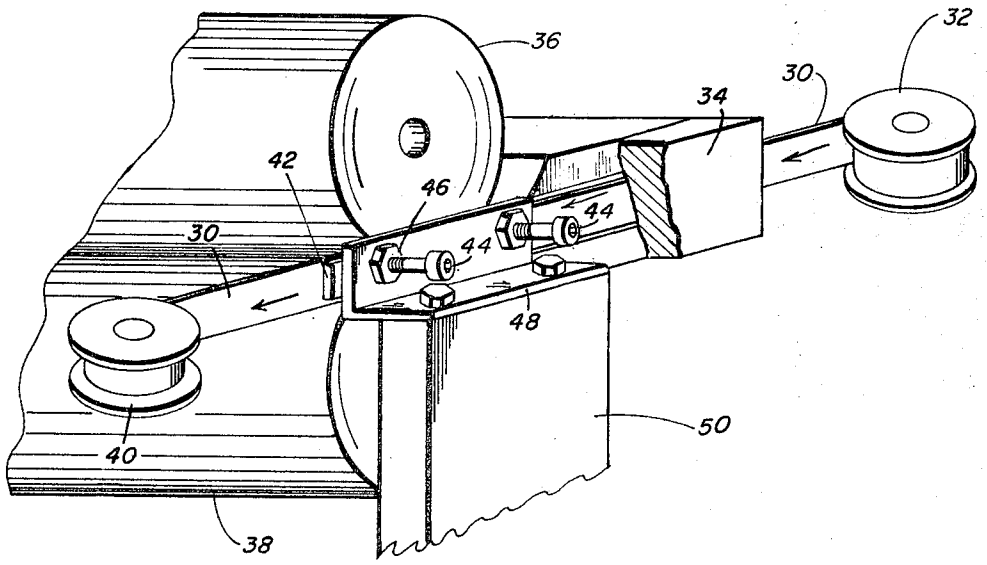


FIG. 2.

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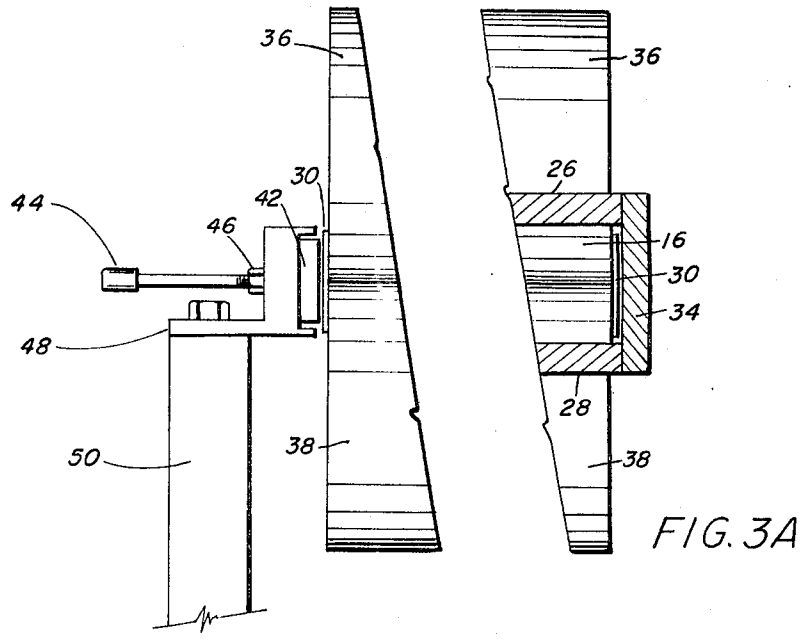


FIG. 3

FIG. 3A

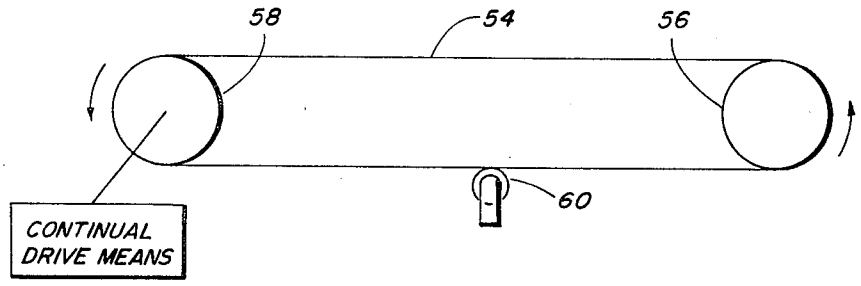


FIG. 4.

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METHOD AND APPARATUS FOR CRIMPING

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Continuation of application Ser. No. 302,945, Aug. 19, 1963. This application May 31, 1966, Ser. No. 554,217

6 Claims. (Cl. 19—66)

ABSTRACT OF THE DISCLOSURE

An improved method and apparatus for crimping filaments whereby the effect of crimper wear is minimized and filament breakage is reduced.

The method of crimping includes the steps of feeding filaments through a crimper chamber by feed rolls, confining the filaments within the width of the crimper chamber and feed rolls by movable side plates, and moving the side plates countercurrent to the direction of feeding the material.

The crimping apparatus has rolls for feeding filaments through a crimper chamber, movable side plates supported within the crimper chamber and by the ends of the rolls, and means for moving the side plates countercurrent to the direction of feed imparted to the material.

Cross-reference to related application

This application is a continuation of our copending application, Ser. No. 302,945, filed Aug. 19, 1963, and now abandoned.

Stuffer box crimping involves passing continuous filaments between rolls into a crimping chamber normally operating under pressure. The filaments pile up inside the chamber until sufficient crimped material is collected to pass out the opposite end of the chamber and on toward a dyer or other appropriate treating apparatus. In the construction of such a stuffer box crimper side plates are customarily provided which bear against the edges of the rolls at the nip, thus controlling the width of the bundle or band of filaments introduced to the crimper and forming the initial point of contact of the bundle with the crimper chamber. Although such an arrangement has proved generally satisfactory in the man-made filament industry, there still remains room for improvement. For example, after a period of use on a stuffer box crimper, replacement of side plates may become necessary because of excessive wear causing a distortion in the crimper chamber. Poorly formed edges in the crimped material may result. Also, sometimes filaments may be broken, and in other instances the sides of the rolls may become galled or roughened. It may then require a rather painstaking effort to make the adjustments necessary to insure the desired uniformity of width of the band of filaments introduced to the crimper. Therefore it is apparent that development of a crimping apparatus and process which eliminates the necessity of frequent replacement of side plates and permits more prolonged periods of operation without shutdown represents a highly desirable result.

After extended investigation and experimentation, we have found a method and apparatus for providing a substantially uniform renewable surface against which material to be crimped may bear while passing through a stuffer box crimper without requiring excessive adjustment or replacement of side or friction plates.

This invention has for one object to provide an improved process and apparatus for crimping man-made continuous filaments. Another object is to provide a method and apparatus for crimping synthetic filaments which substantially eliminates the problems of wear to

rolls, side plates and substances to be crimped. Still another object is to provide a method and apparatus arrangement whereby continuous filament material may be continuously and uniformly crimped without the necessity of frequent replacement of side plates. A further object is to furnish a method and apparatus for controlling crimping action in such a way as to create well formed edges on the band of filaments introduced to a stuffer box crimper and thereby substantially eliminate filament breakage which may result from worn side plates. Other objects will appear hereinafter.

One aspect of our invention involves providing as side plates in a stuffer box crimper ribbons of material moving in an opposite direction to that of movement of the substance being crimped. A moving ribbon of material is provided to form each side plate of the crimper, thereby eliminating any difference in width of space between side plates and space between chamber walls. The ribbon moves countercurrent to the direction of movement of the band of filaments through the crimper. The ribbons act as side boundaries or guide lines for confining the mass of moving filaments as they move from the exit along the inside of the chamber walls and along the sides of the rolls to beyond the point at which the filaments pass through the nip of the rolls. Thus, the web or band of continuous filaments undergoing crimping moves so that its edges are in contact with a surface which is being continually renewed by relatively unworn portions without the necessity of the band of filaments moving over any obstruction such as might be caused by any prior art arrangement of a possible minor difference in width between stationary side plates and chamber walls.

The continuous ribbon side plates may be introduced from supply reel or wound tape sources located downstream from the crimper and taken up by like reels or tapes located upstream from the rolls in an intermittent manner similar to that in which a typewriter ribbon is continually moved from one side to the other in the course of typing. Another manner of providing the side wall surface according to our invention is by means of an endless belt of material moving countercurrently to the direction movement of the band of filaments being crimped.

The material forming the moving side plate may be plastic natural or synthetic fiber, metal or alloy, for example, brass. It may be suitably coated, for instance with polytetrafluoroethylene, to modify the friction with elements of the crimping apparatus and the material being crimped.

Although the crimping apparatus and method according to our invention are appropriate for yarn of a wide range of denier per filament and total denier, we have found them most effective when used to crimp material having a denier per filament of about 1.5 to about 25, preferably 1.5 to 6 and a total denier of from about 36,000 to 600,000, preferably 300,000 to 500,000.

For a more complete understanding of our invention reference is made to the attached drawing forming a part of the present application.

In the drawing:

FIG. 1 is a side elevation, partially in section, of a stuffer box crimper having the moving side walls of this invention, but which is shown without detailed structural parts such as exit gate and the like, which comprise no part of the present invention.

FIG. 2 is a perspective view showing one side of a stuffer box crimper having the moving side wall construction of the present invention.

FIG. 3 is a broken end view depicting the details of the pressure adjusting device for the stuffer box crimper with moving side wall of FIG. 2.

FIG. 3A, is a broken end view taken along line 3A—3A in FIG. 1 showing the movable side wall of the invention in relation to the crimper box.

FIG. 4 is a top elevation showing an alternate embodiment of the moving side plate of the present invention in endless belt form.

In FIG. 1, the band of filaments **10** passes just inside shield **24** through the nip formed by rolls **36** and **38** which rotate countercurrently and leaves the crimping chamber **16** in crimped form **18**. Side plate **22** is suitably located so that an adjustable shield **24** may be positioned as desired in relationship to the edge of the band of filaments. The crimper chamber **16** includes wall portions **26** and **28** which form top and bottom scraper blades. Ribbon material **30** is shown passing through the inside of the crimping chamber **16** and extending in a direction both upstream and downstream of the feed rolls **36** and **38**. Further details as to stuffer box crimper structure may be found in Ser. No. 36,881 of our coworkers Crawford and Stevens, now U.S. Patent No. 3,120,692.

Referring now to FIGS. 2, 3 and 3A ribbon material **30** moves from supply reel **32** along the inside of the wall **34** of the crimping chamber and then along the edges of rolls **36** and **38** before being wound up on takeup reel **40**. The ribbon material **30** is advanced through the crimper countercurrent to the direction of movement of the band of filaments being crimped, thus presenting a continually new surface of ribbon material or side plate for each section of filaments moving forward through the crimper. The ribbon material **30** is made to bear closely on the sides of rolls **36** and **38** by a back up pressure plate **42** which is adjustably positioned against the ribbon **30** by adjusting screws **44** and lock nuts **46** mounted in a pressure plate holder **48**. The pressure plate holder **48** is fixxedly mounted to a frame **50**. As shown in FIG. 3A, the ribbon material **30** is brought through the chamber in such manner that it forms the sides of the chamber and presents an uninterrupted surface to the sides or edges of the band of filaments as they pass through the crimper. Supply reel **32** may be provided with a brake (not shown) which maintains tension on the ribbon as it passes countercurrently through the crimper chamber. Takeup reel **40** may be provided with a ratchet and pawl device (not shown) to prevent reverse movement of the ribbon. Takeup may be in increments of about one and one-half inch or at the rate of about an inch per hour of operation. The word "continually" is used herein in its dictionary sense and includes both of these forms of takeup.

Referring next to FIG. 4, an alternate embodiment of the moving side plate is shown wherein it exists as an endless belt **54** which moves continuously around rolls **56** and **58** and may be polished by surface **60** each time around before being reintroduced to the crimper. Drive means **61** serve to impart continual movement to the sideplate **54**. Takeup reel **40** in FIGURE 2 is driven by similar continual drive means.

A further understanding of our invention will be had from a consideration of the following example which is set forth to illustrate a preferred embodiment.

Several separate portions of continuous filament polyester (polycyclohexylenedimethylene terephthalate and polyethylene terephthalate) yarn of 1.5 denier per filament and 450,000 total denier were crimped (1) in a stuffing box crimper having moving ribbon side plates such as illustrated by FIGS. 2 and 3 and (2) in a crimper having fixed side plates such as disclosed in Ser. No. 36,881, now U.S. Patent No. 3,120,692. The following table reports the results of this comparison and illustrates the elimination of plate changes during comparable periods of crimper operation resulting from use of the ribbon side plates of this invention instead of fixed side plates.

TABLE

Days operated:	Plate changes
With fixed side plates	
11	59
6	21
3	13
With ribbon side plates	
6	0
7	0
21	0

It is thought apparent from the foregoing description and illustrations that we have provided an improved apparatus and method of crimping whereby frequent replacement of side plates is avoided by the use of a moving ribbon introduced to a stuffer box crimper, the moving ribbon acting as a side plate against which the edge of the band of filaments moves, preferably countercurrently. The advantages of such a moving ribbon include a wear surface of low friction on both rolls and band of filaments and a surface which not only substantially eliminates sources of damage to the material being crimped but is also easy and relatively inexpensive to maintain.

Although the invention has been described in considerable detail with particular reference to certain preferred embodiments thereof, variations and modifications can be effected within the spirit and scope of the invention as described hereinabove, and as defined in the appended claims.

We claim:

1. A crimping apparatus comprising a pair of coacting feed rolls adapted to turn in opposite directions, a stuffing box located downstream from said feed rolls, said stuffing box including a chamber having fixed sides, against which sides are positioned ribbon side plates which extend through the chamber past the nip of the aforesaid feed rolls to the upstream side of the feed rolls, means for positioning said ribbon side plates against the sides of said feed rolls, and means for advancing said ribbon side plates in a direction from said downstream to said upstream side of said rolls.

2. Yarn treating apparatus comprising a pair of coacting feed rolls adapted to turn in opposite directions, a stuffer box crimper located downstream from said feed rolls and including side walls adjacent said feed rolls, adjustable ribbon side plates positioned along the inside of said side walls, said adjustable ribbon side plates adapted to be moved in increments in a direction countercurrent to the direction of movement of yarn through the nip of said rolls and through said stuffer box crimper, means for adjusting said ribbon side plates to provide a new smooth surface in contact with the yarn moving through said stuffer box crimper, and means for holding said ribbon side plates against the sides of the rolls and the yarn moving through the nip thereof.

3. An apparatus for crimping comprising: wall means having opposed side portions defining a crimper chamber; a pair of contra rotating rolls for feeding material to be crimped through a nip therebetween; a pair of side plates supported within said chamber by said opposed side portions and in surface engagement with the respective ends of said rolls adjacent said nip for guiding the material fed by said rolls; and means for moving said side plates in a direction countercurrent to the direction of the feeding movement imparted to such material.

4. The invention of claim **3** wherein said side plates are in the form of ribbons and said ribbons are supported in surface engagement with said side portions.

5. In a method wherein a band of material is crimped as a result of being fed through a crimper chamber by a pair of contra rotating feed rolls, the improvement comprising the steps of confining said band of material within the width of said feed rolls and within said chamber

by side plates positioned against the ends of the feed rolls adjacent the nip formed thereby and extending through said chamber; and moving said side plates countercurrent to the band of material being fed so that portions of said side plates, which are subject to wear as a result of contact with said rolls and said band of material, are replaced by relatively unworn portions.

6. The invention of claim 5 wherein the moving side plates are moved continually.

References Cited

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3,090,096	5/1963	Schwartz	19—66 X

DORSEY NEWTON, *Primary Examiner.*