April 26, 1960 H. H. WEINSTOCK, JR 2,933,771

CRIMPING APPARATUS

Filed Oct. 10, 1955

FIG.1.

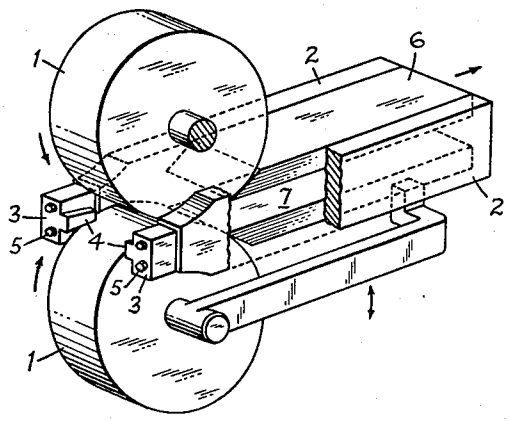


FIG.2.

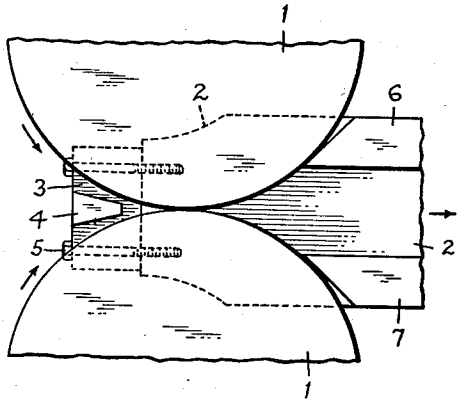


FIG.3.

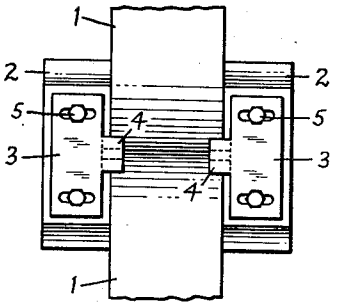
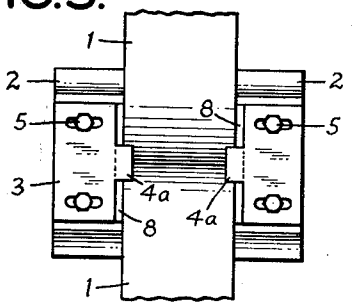


FIG.5.



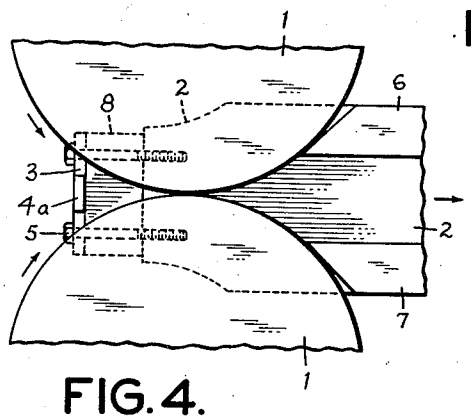


FIG.4.

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CRIMPING APPARATUS

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1 Claim. (Cl. 19—66)

This invention relates to improved crimping apparatus of the type wherein a pair of rolls forces filamentary material through the nip of the rolls into a crimping chamber. By filamentary material I mean a tow of continuous filaments or a sliver of staple filaments.

In apparatus of the above stated sype, especially when operated at speeds of at least about 150 feet per minute, and especially when operated using a fusible thermoplastic such as polycaprolactam, problems frequently arise due to lodging and entrapment of filaments being crimped, in crevices where the walls of the crimping chamber closely approach the circular side surfaces of the feed rolls, e.g. with clearance of about 0.01 inch or less. Problems also arise due to uneven pressures developing in the crimping chamber. The present invention represents a simple and effective means of mitigating these problems.

In accordance with my invention, I provide a restricted passage formed suitably by a pair of projecting guides, one at each side of the approach to the nip of the feed rolls in crimping apparatus as above described. This passage is between about ¼ inch and about ½ inch narrower than the width of the nip between the said feed rolls; and this passage terminates within the volume lying between the cylindrical feed surfaces of the rolls and the plane tangent to said surfaces at the feed end, generally terminating at a distance in the range between about ½ inch and about 3 inches from the nip of said feed rolls.

When the entering tow passes through this passage between the guides into the nip of the feed rolls, traveling from the entrance end thereof to the terminus, it is held away from the crevices yet substantially fills the crimping chamber including the entering end of the chamber near the rolls. Under these circumstances I have found that entrapment of filaments is reduced to a point where it does not seriously interfere with operations; and operating pressures remain substantially uniform as a result of the substantially complete filling of the crimping chamber, especially the filling of the entering end where most of the crimping action actually occurs.

Guides located as much as 6 inches from the nip of the rolls are insufficient to control filaments at the edges of the moving tow. Upon entering the nip formed by the two rolls of the crimping apparatus, these filaments become disengaged from the main bundle of tow and are caught in the crevice between the sideplates and the rolls. Tow crimped under such conditions is found to have fused and torn edges. Prolonged operation results in damage to the crimping apparatus.

The accompanying drawing illustrates a typical embodiment of my invention. In the drawing Fig. 1 is a general perspective view, partially cut away; Fig. 2 is a side view, and Fig. 3 is an end view of crimping apparatus fitted with a trapezoidal form of the guides. Fig. 4 is a side view and Fig. 5 is an end view of crimping

apparatus fitted with a bar form of the guides of my invention.

In all the figures, numeral 1 designates the feed rolls; numeral 2 designates the side plates forming the side walls of the crimping chamber; numeral 3 designates generally the guide of my invention; and numeral 4 designates a project forming the active guiding surface. Said projection may suitably be of generally trapezoidal shape, fitting within the curvature of the feed rolls (Fig. 2), or it may be rectangular, as in the modification represented in Fig. 4. Numeral 5 designates a bolt in a hole for holding the guide on the end of the side plate 2 or onto spacing shim 8. The holes can be round or, as shown, they can be slotted for easy adjustment of the position of the guide. The guide may also be adjusted by a suitable mechanical device of conventional design, such as a screw. Numerals 6 and 7 designate blades meeting the rolls in a knife edge. The two side plates and two blades form the walls of the crimping chamber. In the drawings a horizontal chamber is shown, but a vertical chamber of similar general construction can advantageously be provided likewise with the guide passage of my invention. The termination of the passage is preferably as close to the nip as is permitted by the height of the projection 4 (i.e. the dimension perpendicular to the axes of th rolls), the radius and resulting periphery of the rolls, and the working clearance between guide and the nearest surface of the rolls. This working clearance is suitably about 1/16 inch. The necessary height of the projection is determined by the maximum movement of the tow on the guide surface during operation. For example, if the projection is ½ inch high at the end nearest the nip, and a crimping apparatus with rolls of 2 inch, 6 inch, or 12 inch diameter is used, the passage will terminate, respectively, about ⅞ inch, about 1½ inches, or about 1⅞ inches from the nip.

Shorter guides and closer working clearances can be used, but the tow may ride over the guide and the roll surface may be scored by the guides. The practical effect of the guides is lost when the passage terminates at a distance of more than about 3 inches from the nip of the said feed rolls.

Two auxiliary width-constricting guides which are positioned about 6 inches from the nip of the rolls and which constrict the tow to a width about ⅛ inch to ¼ inch narrower than the width of the nip between the said feed rolls, improve the operation of the guides of my invention although they are practically ineffective in themselves.

The following is an example of operation of crimping apparatus as illustrated in the drawings, employing the guides of my invention.

In repeated tests, a tow or bundle of polycaprolactam nylon filaments of 6 denier per filament and total denier of 200,000 was fed from a roll at 400 feet per minute through a distance of 10 feet to a crimping apparatus. Said crimping apparatus was of the horizontal chamber type shown in the drawings herein, with movable lower blade loaded to oppose passage of the tow through the chamber. It was equipped with nip rolls 2 inches wide and 6 inches in diameter. The tow passed through a pair of tow restricting guides 6 inches from the nip, set each about ⅛ inch to ¼ inch narrower than the width of the feed rolls. The filaments on the edges of the tow did not remain with the bundle when entering the nip, but lodged in the crevices between the rolls and sideplates. This caused the crimped tow product to have fused and torn edges. After continued operation under these conditions for about an hour the crimping appa-

ratus jammed due to fibers lodged in the crevices between the rolls and sideplates.

In repeated tests, a tow of the same type was crimped in the same apparatus and under the same conditions except that guides of the type illustrated in Fig. 4 were used in addition to those already on the apparatus. The acting guiding surfaces were 0.5 inch high by 0.125 inch long and were set about 0.35 inch narrower than the width of the passage between the rolls, leaving a passage of about 1.65 inches. The passage terminated 1.5 inches from the nip of the rolls. The guides kept the fibers on the edge of the tow away from the crevices between the rolls and sideplates. After passing the nip, the tow substantially completely filled the crimping chamber. The product was a crimped tow of good quality, with soft and well crimped edges. The operation was maintained continuously for several hours in each test, and at the end of each test there were insignificant quantities of fibers lodged in the crevices between the rolls and the sideplates.

In tests like those above but using apparatus of the vertical chamber type along the lines of that shown in Hitt U.S. Patent 2,311,174 of Feb. 16, 1943, results without and with guides in accordance with my invention were similar, respectively, to the above outlined results without and with my guides.

I claim:

In crimping apparatus wherein a pair of feed rolls forces filamentary material through the nip of the rolls into a crimping chamber, said chamber comprising side plates which overlap the circular ends of the rolls with clearance of not more than about 0.01 inch, and knife blades which meet the rolls in knife edges parallel to the nip of the rolls with clearance of not more than about 0.01 inch; the improvement which comprises: a restricted passage to the nip of said rolls, said passage being formed by a pair of projecting guides, one at each side of the approach to the nip of the feed rolls; and being between about ¼ inch and about ½ inch narrower than the width of the nip between said feed rolls, and said passage terminating within the volume lying between the cylindrical feed surfaces of said rolls and the plane tangent to said surfaces at the feed end and terminating not more than about 3 inches from the nip of said feed rolls, whereby the entering tow is held away from the crevices between the feed rolls and the side plates of the crimping chamber while substantially filling the crimping chamber.

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