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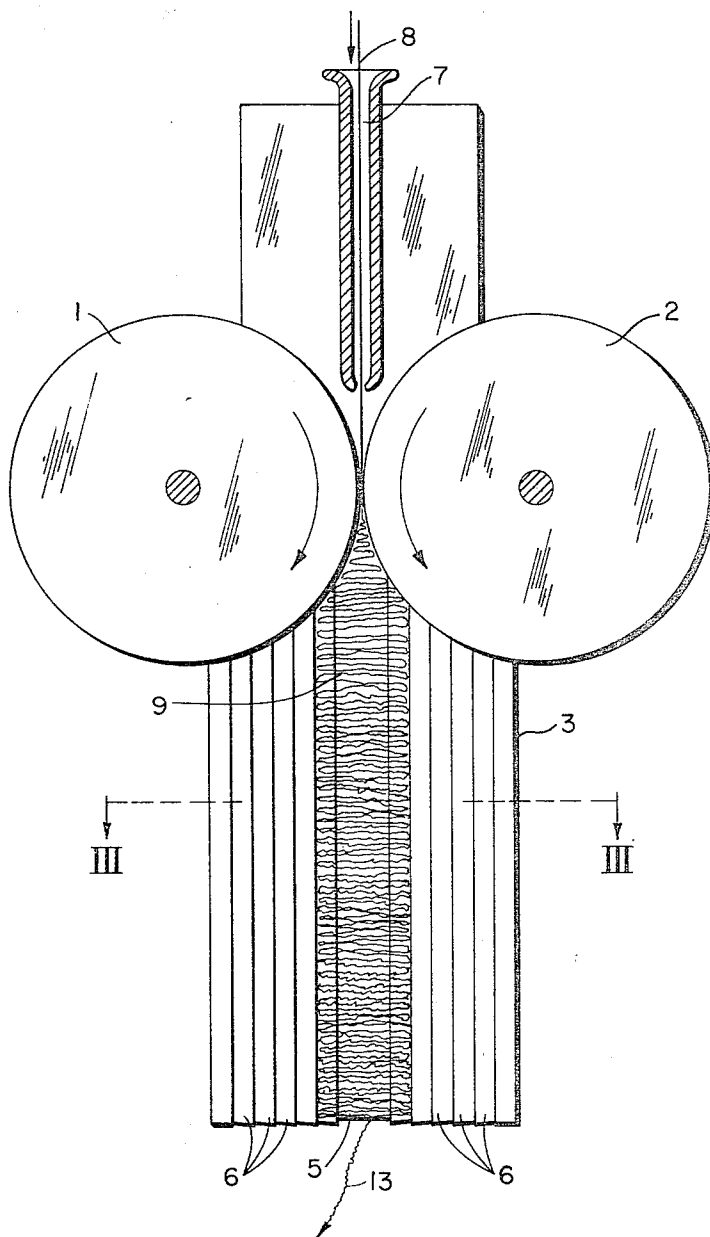
3,309,751

STUFFER BOX CRIMPING APPARATUS

Filed Jan. 15, 1965

2 Sheets-Sheet 1

FIG I



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FIG. 2

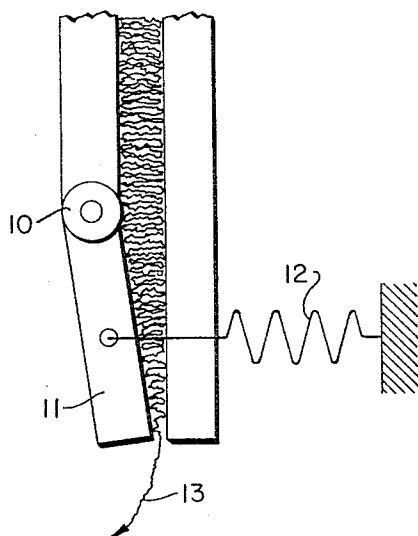


FIG. 3

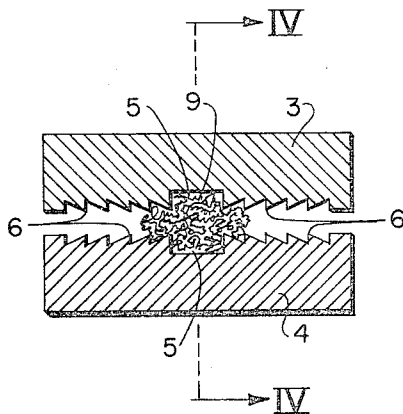
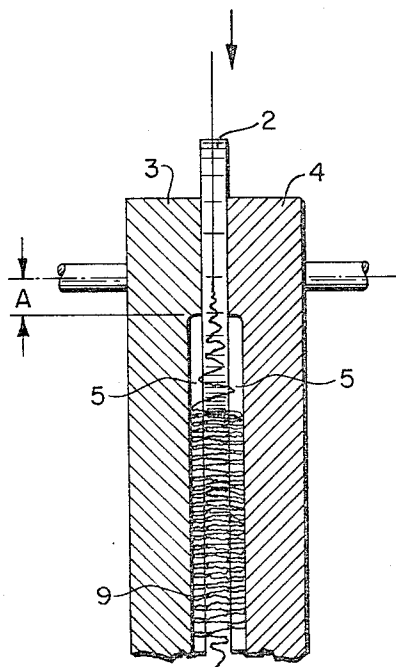


FIG. 4



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STUFFER BOX CRIMPING APPARATUS

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Claims priority, application Netherlands, Jan. 25, 1964, 64/00599

1 Claim. (Cl. 28—1)

The present invention relates generally to the preparation of textile filament and fiber for commercial use and more particularly to an improved apparatus for crimping thermoplastic thread involving the stufferbox principle.

Many methods of texturizing thermoplastic textile yarns are well known. One of such methods is concerned with imparting crimp to a continuous thermoplastic thread or to a tow of filaments by feeding the same into the chamber of a stufferbox against the action of a mechanical pressure or restriction. In usual practice, the thread is fed into a heated portion of the stufferbox by driven feed rollers, cooled in another portion of the box, and finally, withdrawn therefrom by thread discharge means. Stufferboxes of this general type have been known for many years, and an early patent showing such a stufferbox is U.S. Patent No. 2,311,174 dated Feb. 16, 1943.

In crimping thread by use of stufferbox apparatus, the thread forced into the chamber of the stufferbox between parallel, adjacent, rotatable discs, loops back and forth upon itself until a wad forms at the entrance of the chamber. The wad moves in the direction of the discharge end of the chamber as more thread is fed into the chamber. This action produces crimps in the continuous thread. The crimped thread is withdrawn from the stufferbox at a proportionate rate to the in-feed of the thread. The thread is restrained in its path of travel through the stufferbox by friction of the stufferbox walls. A pivoted clapper plate, weighted disc or spring may be resiliently urged into the path of travel of the thread to produce a back pressure on the thread wad.

The known stufferboxes are enclosed, elongated chambers. The yarns, which may be presoftened by heat or fluid, are stuffed into these chambers against the action of mechanical pressure by oppositely rotating discs which clamp the yarn between their circumferential surfaces. To effectively grip the yarn, the discs are generally spring-biased in the direction of their circumferential yarn contacting surfaces. During passage through the enclosed box, the yarn is cooled, thereby setting the crimp produced therein. The yarn is continuously withdrawn from the stufferbox and wound into a package.

While the aforesaid apparatus operate to produce set crimps in continuous thread, there are certain disadvantages which are objectionable. The alignment of the rotating crimping discs with the entrance of the stuffer chamber is highly critical. During initial thread-up and subsequent operation of the stufferbox, there is a tendency for the thread to follow the surfaces of the rotating discs instead of the longitudinal axis of the enclosed stufferbox chamber. For this reason, minute clearances must be maintained between the side walls of the stufferbox and surfaces of the rotating discs. Because the discs are resiliently biased against each other and rotate at high speeds, excessive wear develops on the side walls of the stufferbox chamber.

Because of the wear produced and the increased expense involved in machining parts to such close tolerances, apparatus has been designed to avoid, as much as possible, the association of the rotating discs with the stufferbox walls. One particular apparatus which avoids the requirement of close tolerances, and thus lowers the manufacturing cost of the stufferbox, consists of oppo-

sitely rotating thin discs which, at their point of contact, are enclosed on both sides by two flat plates spaced from the discs by means located between the plates. The facing sides of the plates are each provided with a longitudinal recess extending from the point of contact of the discs to the discharge end of the stufferbox. These recesses together form a central yarn path on which the crimped product moves through the stufferbox. The sides of the stufferbox are open, thus reducing the wear and eliminating the difficulty in alignment of the crimping discs with the stufferbox. The open-sided stufferbox produces an effective yarn crimp, but the apparatus is not desirable due to the tendency of the wadded yarn to be forced out of the open sides of the stufferbox. This apparatus is disclosed in Belgian Patent No. 622,306 dated Sept. 28, 1962.

One of the objects of this invention is to provide an apparatus for crimping thread not having the inherent disadvantages of known crimping devices.

Another object of the present invention is to provide a novel apparatus for crimping thread which requires less precision in manufacture, alignment, and operation.

A further object of this invention is to provide a novel apparatus for crimping thread which is more economical to construct than those heretofore known.

Still another object of the present invention is to provide crimping apparatus in which the thread is prevented from wrapping around the crimping rollers during, and subsequent to, threading-in of the stufferbox.

Specifically, the apparatus of the present invention employs the flat plate, open-side stufferbox design disclosed in the aforesaid Belgian patent with modifications to effectively contain the yarn wad in the central recess of the stufferbox chamber. By use of the modified stufferbox of the present invention, the advantages of low cost of construction and decreased wear are obtained without sacrifice to product uniformity and apparatus shut-down caused by the yarn wad being forced out the sides of the stufferbox chamber.

The apparatus of the present invention comprises a stufferbox formed by two flat parallel, spaced plates having a central recess in their facing sides and provided with auxiliary recesses on each side of the central recess. The auxiliary recesses are parallel and coextensive with the central recess of each plate. The plates together form the front and back walls of the stufferbox. By the provision of the auxiliary recesses, the yarn wad is effectively contained in the central stufferbox chamber.

It has been found that the tendency of the yarn wad to leave the stufferbox sideways is also reduced if the central recess begins at a point a short distance downstream of the point of contact of the rotating discs.

The invention will be further elucidated by reference to the accompanying drawings in which:

FIG. 1 shows a stufferbox crimping device in front elevation, the front plate of the stufferbox having been removed.

FIG. 2 shows the lower or discharge portion of the stufferbox apparatus in side elevation.

FIG. 3 shows the stufferbox in cross section taken along lines III—III of FIG. 1.

FIG. 4 shows the apparatus in cross section taken along lines IV—IV in FIG. 3.

FIG. 1 shows crimping discs 1 and 2 in yarn-gripping relationship. The discs may be spring-biased in the direction of their contact by conventional means. The discs are relatively thin and are rotated in the direction indicated by the arrows by a conventional drive mechanism (not shown). At their point of yarn contact, the sides of the discs are enclosed by two flat plates 3 and 4. Flat plate 4 has been removed to show the interior arrangement of the stufferbox but is identical to plate 3.

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Incoming thread 8 is led by discs 1 and 2 through capillary tube 7 which precedes the nip portion of the discs. The capillary may be heated by conventional heating means to soften the thermoplastic thread. Plates 3 and 4 are provided with identical central recesses 5 which begin near the point of contact of discs 1 and 2 and together form the central crimping chamber. This chamber extends downward to a suitable discharge point for the crimped thread. The plates 3 and 4 may be heated or cooled by conventional means if desired. Although the stufferbox is shown with the thread running downward, the entire device may be inverted without affecting the operation of the apparatus or uniformity of the product.

FIG. 2 shows the discharge end of the stufferbox chamber. The yarn wad 9 (FIG. 1) is held in the stufferbox by the pressure of door 11, hingedly attached at 10 to one of the flat plates and counterbalanced against the force of the yarn wad by spring 12.

Provided on either side of the central recesses 5 are auxiliary recesses 6 which are shown to have a serrated or tooth-like shape. As best shown in FIG. 3, the central recesses 5 and auxiliary recesses 6 directly oppose each other. The yarn wad 9 is contained substantially within the central recesses and the first auxiliary recesses on either side thereof. The friction created on the wad by the auxiliary recesses 6 prevents the wad from becoming displaced in its longitudinal travel through the central chamber of the stufferbox. Although the auxiliary recesses are shown to have a serrated shape, they may be of any suitable configuration which produces a retention of the yarn wad.

FIG. 4 shows the relationship of the crimping disc 2 with respect to the central recesses 5. The beginning of each recess is displaced from the point of contact of the crimping discs 1 and 2 for a short distance, shown by letter A.

The operation of the device is as follows. The initial uncrimped yarn 8 is guided through heating capillary 7 and subsequently gripped by rotating discs 1 and 2. In its passage through the capillary, the yarn is slightly softened. As the yarn is gripped by discs 1 and 2, it is forced into the central chamber of the stufferbox, formed by recesses 5. The action of the discs against the pressure of door 11 creates a folding back of the yarn upon itself to form a wad 9 in the yarn. The yarn wad is forced along the passage or central chamber of the stufferbox to its discharge point 19 by the action of the crimping discs. During its passage to the discharge point, the crimped yarn is cooled and set. The wad 9 is held in the stufferbox by the pressure asserted on the wad, both by the surface friction of the flat plates forming the stufferbox and by the counter pressure of discharge door 11. The wad 9 in the central recesses 5 is prevented

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from leaving the stufferbox sideways by the auxiliary recesses 6. To improve passage of the yarn from the surface of the crimping discs, recesses 5 which form the central chamber of the box may begin a short distance downstream of the point of contact of the discs with the yarn. This distance may vary; however, 2-3 mm. has been found to be satisfactory.

The yarn discharged from the stufferbox may be wound into a package by conventional winding apparatus. The withdrawal of yarn from the stufferbox is proportional to the input of the crimping discs.

By use of the unique apparatus of the present invention, thermoplastic textile filament yarns may be effectively texturized by the stufferbox method. The apparatus does not require the high degree of precision and adjustment heretofore necessary with conventional stufferbox apparatus, due to the fact that the sides of the stufferbox remain open and the yarn-gripping surfaces of the crimping discs are free to move during rotation. The opensided stufferbox may be effectively used and the crimped yarn maintained in the central chamber during passage therethrough by provision of the auxiliary recesses of the present invention.

The present invention is intended to be limited only to the extent of the following claim.

What we claim is:

A stufferbox crimping apparatus comprising a pair of spaced, parallel flat plates forming a crimping chamber having a longitudinal axis and open sides, a pair of rotatable yarn gripping discs partially enclosed within said plates at one end thereof for supplying yarn to said crimping chamber, pressure exerting means at the other end of said plates whereby the yarn is folded in said chamber and adapted to release said yarn whenever the pressure exerted by said pressure means is overcome by the pressure of the yarn in said chamber, each of said plates having a central recess extending coextensively along said longitudinal axis from adjacent the yarn gripping nip point of the discs, said recesses forming a yarn path extending to a yarn discharge point; and serrations on each side of each recess for maintaining yarn in said yarn path during passage from the yarn gripping point of the discs to the yarn discharge point of the apparatus.

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