May 31, 1966 E. H. SHATTUCK 3,253,314

CRIMPING APPARATUS

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Fig. 1.

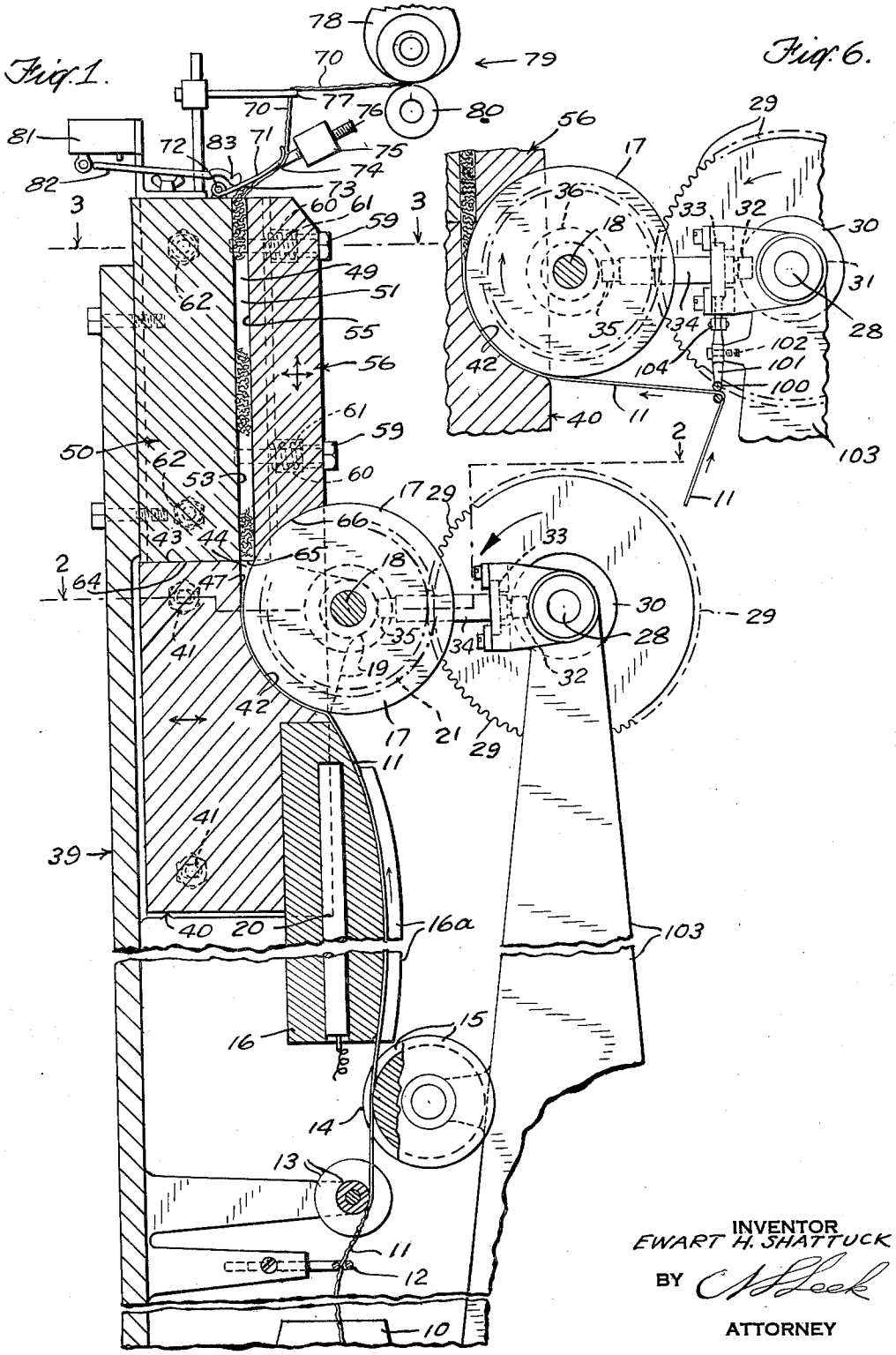


Fig. 6.

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Fig. 2.

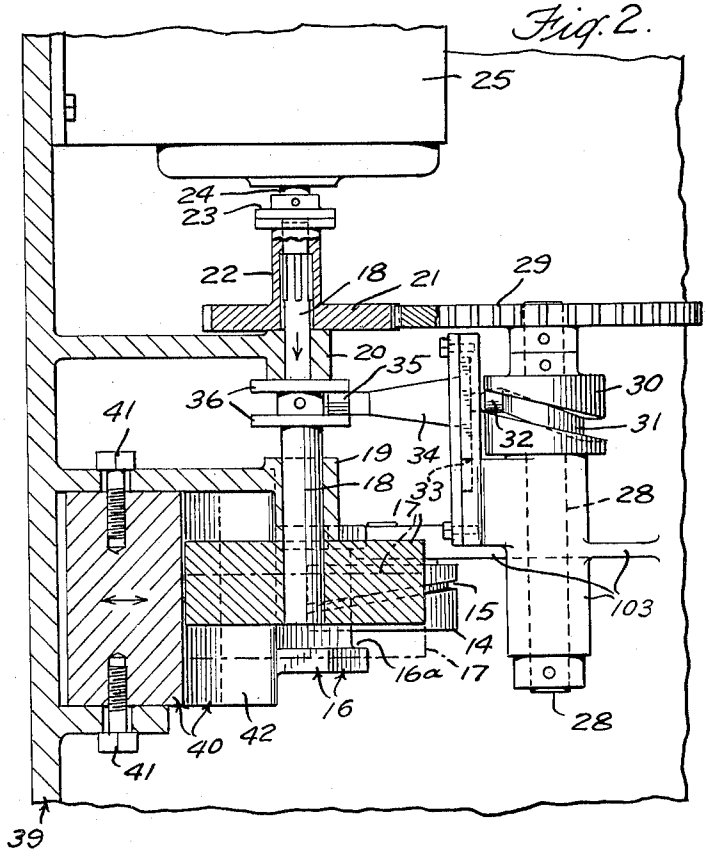
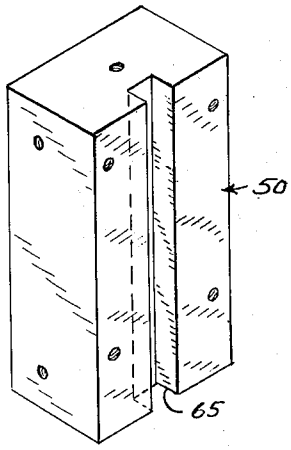


Fig. 4.



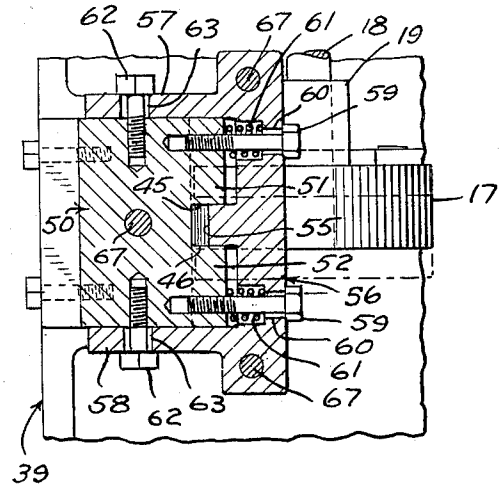


Fig. 3.

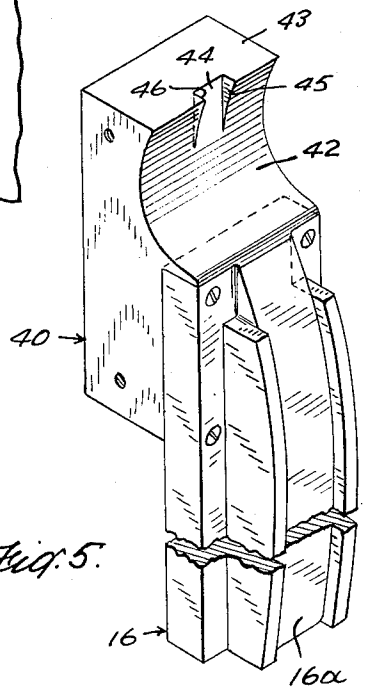


Fig. 5.

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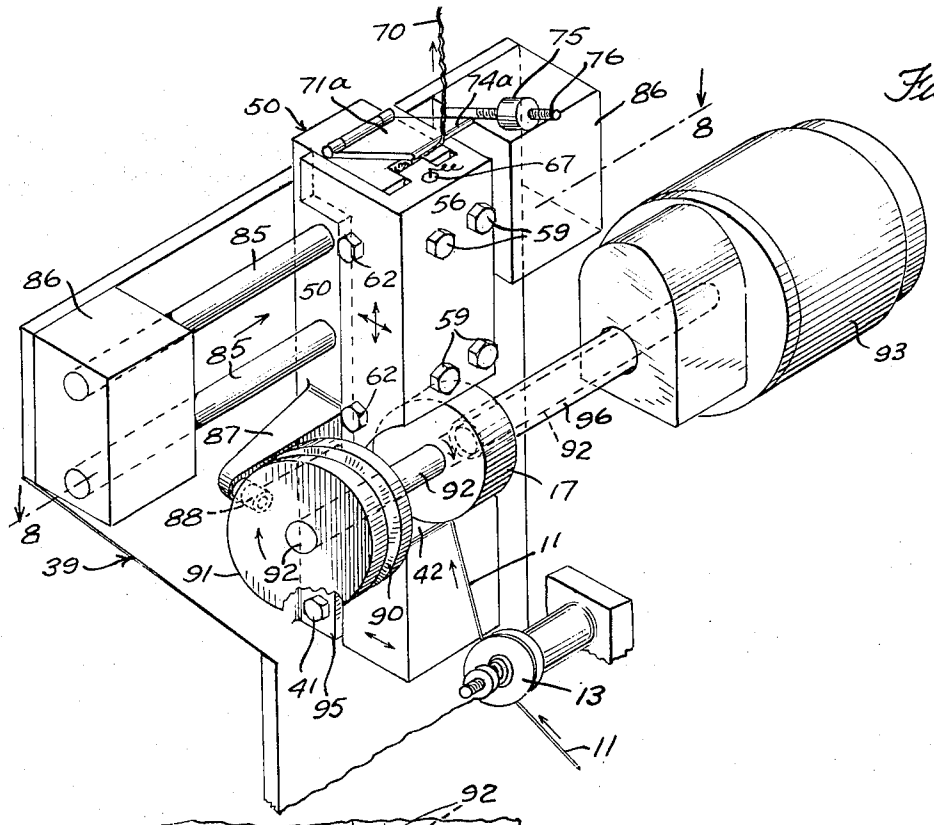


Fig. 7.

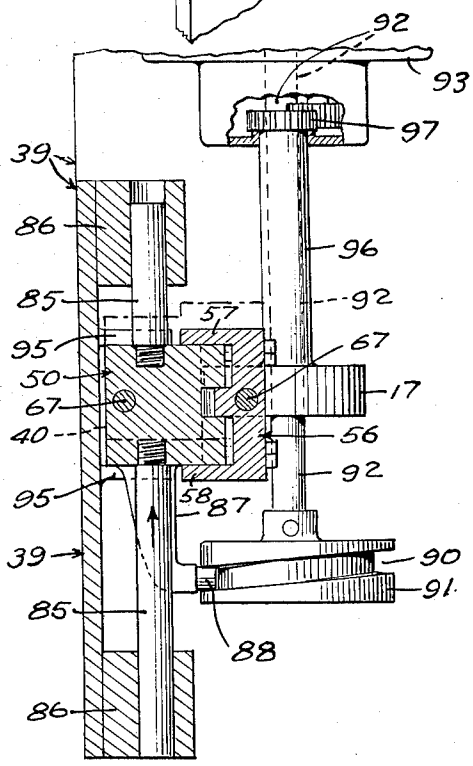


Fig. 8.

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United States Patent Office 3,253,314 Patented May 31, 1966

3,253,314

CRIMPING APPARATUS

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Filed Oct. 17, 1963, Ser. No. 316,878
9 Claims. (Cl. 28—1)

This invention relates to apparatus for crimping yarn and more particularly to apparatus of the stuffer crimper type wherein the filaments or yarn are fed by a feed roll into a confined chamber to be folded over and crimped against the back pressure of a mass of previously crimped filaments in the chamber.

An object of the invention is to provide apparatus of the above type having novel and improved characteristics.

Another object is to provide apparatus of the above type having improved means for controlling the various stages of the crimping cycle.

Another object is to provide an apparatus of the above type having new and improved details of construction and features of operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In accordance with the present invention, the stuffer crimper is provided with a single feed roll for introducing the yarn into the crimping chamber. This feed roll cooperates with a member having an arcuate surface conforming to the surface of the feed roll for holding the filaments in frictional and feeding contact with the feed roll so that the filaments are fed between the cooperating surfaces into the input end of the crimping chamber. Mechanism is also provided for preheating the filaments before they are led to the feed roll; for varying the gripping pressure of the feed roll on the filaments; for adjusting the point of introduction of the filaments into the crimping chamber; for varying the cross-sectional area of the crimping chamber; and for reciprocating the filaments with respect to the contacting surfaces so as to prevent grooving of the surfaces and to provide a uniform distribution of the filaments in the chamber.

The features of the invention will be better understood from the following description, taken in connection with the accompanying drawings in which certain specific embodiments have been set forth for purposes of illustration.

In the drawings:

FIG. 1 is a sectional view of a crimping apparatus embodying the invention with parts in elevation for clarity;

FIG. 2 is a transverse section taken on the line 2—2 of FIG. 1;

FIG. 3 is a similar section taken on the line 3—3 of FIG. 1;

FIG. 4 is a detail view of the fixed upper block forming a part of the crimping chamber;

FIG. 5 is a similar detail view of the adjustable feed member which cooperates with the feed roll for feeding the yarn into the crimping chamber.

FIG. 6 is a fragmentary detail view of a portion of the apparatus of FIG. 1 illustrating a traversing guide associated with the feed roll;

FIG. 7 is a perspective view of an apparatus illustrating a further embodiment of the invention wherein the crimping chamber and the adjustable feed member are reciprocated with respect to the feed roll; and

FIG. 8 is a partial horizontal section taken on the line 8—8 of FIG. 7.

Referring to the embodiment of FIGS. 1 to 5 the apparatus is shown as embodying a cop 10 supported by suitable means not shown and carrying a winding of a yarn 11 which is fed upwardly through a guide 12 and a tension gate 13 over an idler roll 14 having a traversing yarn

groove 15 and along a channel 16*a* in an arcuate heater plate 16 to feed roll 17 mounted on a shaft 18 which is journalled to rotate and to reciprocate axially in a bearing 19. The heater plate 16 is shown as heated by a heater element 20. The arcuate heater plate 16 is positioned to support the yarn to the point of contact of the yarn with feed roll 17 so as to prevent heat loss between the preheater and the feed roll. The shaft 18 is driven by a gear 21 having hub 22 which is splined to the shaft to permit the shaft to reciprocate axially therein. The hub 22 is connected by a coupling flange 23 to the shaft 24 of a motor 25.

The gear 21 drives a countershaft 28 through a gear 29. The counter shaft 28 carries a box cam 30 having a groove 31 which, through a cam follower 32, actuates a slide 33 having an arm 34 the free end of which carries a roller 35 embraced by a double flanged collar 36 pinned to the shaft 18 and adated to reciprocate the same as the cam rotates.

A feed member 40 in the form of a block is adjustably secured to a bracket 39 by bolts 41. The member 40 is formed with an arcuate surface 42 registering with the periphery of the feed roll 17 and having a clearance such that the yarn is held in frictional driving engagement with the periphery of the feed roll as the latter rotates. The clearance of the surface 42 can be adjusted by the bolts 41. The block 40 has a horizontal top surface 43 and a chamber 44 formed by front and back walls 45 and 46 and by a transverse vertical wall 47 which forms an upward extension of the arcuate wall 42. The fourth side of the chamber 44 is closed by the feed roll 17.

The chamber 44 thus extends upwardly from the bite of the feed roll 17 to form the entrance end of the crimping chamber to be described.

The upper portion of the crimping chamber is formed by a fixed block 50 which is carried by the bracket 39 and has a vertical channel 49 along one edge formed by front and back flanges 51 and 52 registering with flanges 45 and 46 of the block 40 and a vertical transverse wall 53 registering with the wall 47 of the block 40.

The vertical channel 49 is closed by tongue 55 carried by a block 56. The tongue is slidably disposed within the channel 49 to form a closed crimping chamber. The block 56 is formed with side flanges 57 and 58 which embrace the block 50 and are adjustably secured thereto by bolts 59 passing through enlarged holes 60 in the block 56.

The bolts 59 carry compression springs 61 interposed between the block 56 and the block 50 to hold the block 56 in retracted position. The block 56 is clamped in adjusted position by bolts 62 extending through enlarged holes 63 in the flanges 57 and 58 into the block 50. The block 50 has a horizontal bottom surface 64 resting on the top surface 43 of the block 40 and the block 56 has a lower horizontal surface 65 resting on the top surface 43 of the block 40 and has an arcuate surface 66 having a running clearance with the surface of the feed roll 17. The arrangement is such that the width of the crimping chamber and the clearance between the arcuate surface 66 and feed roll can be adjusted as required. Heating elements 67 are disposed in the blocks 50 and 56 for heating the crimping chamber.

The crimped yarn 70 is withdrawn from the top of the crimping chamber under a tension gate in the form of a plate 71 which is hinged to the block 50 by a hinge 72 and is formed with a flat surface 73 closing the top of the crimping chamber and with a curved end surface 74 over which the yarn 70 is pulled. A counterweight 75 is threaded on a rod 76 for adjustment along the plate 71 for controlling the pressure exerted by the plate 71 on the yarn.

The yarn 70 from the crimper chamber, is fed over a

guide **77** to a constant speed winder **79** comprising a package **78** resting upon and driven by a roll **80** driven by suitable means not shown.

A microswitch **81** is actuated by a pivoted rod **82** having its free end **83** resting on the hinged plate **71** and adapted to open the microswitch **81** when the hinged plate is raised beyond a predetermined point. The microswitch may be connected to stop the feed on the feed roll **17** until the level of the core returns to its operating position as the yarn is withdrawn therefrom by the winder.

In the operation of this apparatus the yarn **11** is fed from a cop **10** over the traversing roll **14** and the preheater plate **16** to the feed roll **17**. The traversing roll **14** causes the yarn **11** to reciprocate transversely across the channel **16***a*, across the face of the feed roll **17**, and across arcuate surface **42** so as to prevent grooving of these elements. The heater plate **16** heats the yarn to a suitable temperature below the softening temperature, but sufficiently elevated to facilitate the subsequent flexing and crimping of the yarn in the crimping chamber. The yarn is then fed around a portion of the periphery of the feed roll **17** by which it is fed to the bite between the surface of the feed roll and the vertical surface **47** of the feed block **40**. At this point the yarn encounters the mass of crimped yarn in the chamber **44** and is folded over and crimped due to the back pressure of the mass of crimped yarn.

The mass of yarn is fed upwardly along the crimping chamber **49** formed by the blocks **50** and **56** to fill the chamber until it is withdrawn through the friction gate **71** onto the winder **79**.

The yarn is subjected to heat in the crimping chamber by the heaters **67** for a time adapted to set the crimp in the yarn before it is released from the chamber. It is then wound onto the package **78** under a tension such that a portion of the crimp is pulled out but due to the permanent set of the crimp in the chamber the crimp will be restored when the temporary straight set is removed.

During the feed of the yarn around the feed roll **17** by the yarn it is pressed against the surface of the feed roll by the cooperating surface **42** of the block **40**.

To increase the life of the feed roll **17** it may be reciprocated axially by the box cam **30** and arm **34**, to prevent grooving of its periphery. Obviously the free end of arm **34** may be disconnected from the double flanged collar **36** of roller **35** so that the apparatus may be operated without reciprocation of feed roll **17** or in the alternative transversing roll **14** may be replaced by a fixed guide and the traversing effect obtained solely by reciprocation of the roll **17**. The reciprocation of both elements in unison increases the effect for a given throw. The preheater plate **16** may be omitted if sufficient heat is supplied to the crimping chamber or from other sources, by the heaters **67***a*. In any event the crimped yarn is maintained under setting conditions for the time required to produce a permanent set to the crimp.

FIG. 6 illustrates a modified type of feed wherein both the yarn guide and the feed roll are reciprocated, but in opposite directions. In this form the feed roll **17** is driven and reciprocated in the manner shown in FIGS. 1 to 3 and the corresponding parts have been given the same reference numbers. The yarn **11** is passed through a guide **100** carried on an arm **101** which is pivoted at **102** to a fixed bracked **103**. The arm **101** is connected to a link **104** which is pivotally connected to the slide **33**.

In this embodiment the yarn guide **100** is reciprocated oppositely to the feed roll **17** in a manner to avoid grooving of the feed roll as well as of the cooperating surface **42** of the block **40**. This construction may be used with or without the preheater **16** and the reciprocating roll **14**. Obviously the reciprocating guide **100** can be replaced by a grooved roll similar to the roll **14**, or the roll **14** of FIGS. 1 to 3 may be replaced if desired by a reciprocating guide similar to the guide **100**.

The embodiment of FIGS. 7 and 8 is similar to that above described except that the crimping chamber and the feed block **40** are mounted for reciprocation and the feed roll **17** rotates about a fixed axis. In this form the parts which are identical with those of FIGS. 1 to 5 have been given identical reference numbers and will not be redescribed. The essential difference is that the block **50** is carried by rods **85** which are slidably mounted in supports **86** attached to the bracket **39**. The block **50** carries an arm **87** having a cam follower **88** engaging the groove **90** of a cam **91**. The cam **91** is mounted on a shaft **92** driven by a motor **93**. The shaft **92** carries a sleeve **96** on which the feed roll **17** is mounted. The sleeve **96** is driven through reduction gears **97** by the shaft **92** so that the rate of the feed roll can be controlled independently of the rate of reciprocation of the blocks **40** and **50**. Arms **95** projecting from the block **50** adjustably secure the block **40**.

In this form the tension gate **71***a* is shown as a flat plate having a rounded edge **74***a* over which the yarn **70** slides.

As the shaft **92** rotates the cam **91** causes the arm **87** and the block **50**, together with the blocks **56** and **40**, which are carried thereby, to reciprocate with respect to the feed roll **17**.

What is claimed is:

1. Apparatus for crimping yarn comprising means forming an elongated crimping chamber, and feed means disposed to feed said yarn into one end of said chamber for crimping against a mass of previously crimped yarn held compacted in said chamber, said feed means comprising a driven roll having a peripheral surface and means including a fixed member having an arcuate surface disposed to hold said yarn in feeding relationship to said peripheral surface, said crimping chamber having a wall forming a continuation of said arcuate surface and spaced from the periphery of said roll to form a bite therebetween from which the yarn is fed into said crimping chamber and having side walls forming with said last wall and with the periphery of said roll a confined chamber for said yarn, and means discharging the crimped yarn from the other end of said crimping chamber, said crimping chamber being formed by a fixed member having a channel-shaped groove at one edge adpated to form three side walls of said chamber, and a second member adapted to slidably fit within said groove and adjustable transversely thereof to form the fourth wall of said chamber.

2. Apparatus for crimping yarn as set forth in claim **1** in which said second member has an arcuate surface conforming to the periphery of said roll and means is provided for adjusting said second member relative to said first member and to said roll.

3. Apparatus for crimping yarn as set forth in claim **2** in which said arcuate surface is carried by a third member and means is provided for adjusting said third member relative to said roll.

4. Apparatus for crimping yarn comprising a member having a vertical passage adapted to form a crimping chamber, feed means disposed to feed said yarn for crimping into one end of said chamber, said feed means comprising a driven feed roll and a member having a fixed arcuate surface cooperating with said roll for holding the yarn in feeding engagement therewith, said surface forming a continuation of said crimping chamber and terminating in a bite from which the yarn is fed into said chamber, means mounting said members for sliding in a direction parallel to the axis of said roll and means connected to cause said members to reciprocate with respect to said feed roll to prevent grooving of said arcuate surface and to distribute said yarn uniformly across said chamber.

5. Apparatus for crimping yarn as set forth in claim **4** in which said last means comprises a cam driven to rotate with said feed roll and a cam follower connected to reciprocate said members.

6. Apparatus for crimping yarn comprising a crimping chamber, means including a feed roll disposed to feed said

yarn into one end of said chamber to be folded over and crimped against the back pressure of a mass of previously crimped yarn in said chamber, preheating means disposed in advance of said feed roll said preheating means having a surface engaging and supporting said yarn and substantially the point of contact of the yarn with said feed roll whereby the yarn is maintained under heating conditions continuously from said preheater and until it reaches said crimping chamber.

7. Apparatus for crimping yarn comprising a member having a vertical passage adapted to form a crimping chamber, feed means disposed to feed said yarn for crimping into one end of said chamber, said feed means comprising a driven feed roll and a member cooperating therewith to form a bite from which the yarn is fed into said chamber and means causing relative reciprocation of said feed roll with respect to said chamber for distributing the yarn across said chamber and for preventing wear of the feed surfaces.

8. Apparatus for crimping yarn as set forth in claim 7 in which said feed roll is mounted for axial reciprocation and means is provided to reciprocate said feed roll as it rotates for thereby varying the zone of contact between the yarn and the fixed surfaces.

9. Apparatus for crimping yarn comprising a member having a vertical passage adapted to form a crimping chamber, feed means disposed to feed said yarn for crimping into one end of said chamber, said feed means comprising a driven feed roll and a member having a fixed arcuate surface cooperating with said roll for holding

the yarn in feeding engagement therewith, said surface forming a continuation of said crimping chamber and terminating in a bite from which the yarn is fed into said chamber, said feed roll and said arcuate surface being mounted for relative reciprocation as the yarn is fed therebetween for preventing grooving of the surfaces and for distribution of the yarn uniformly across the crimping chamber.

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