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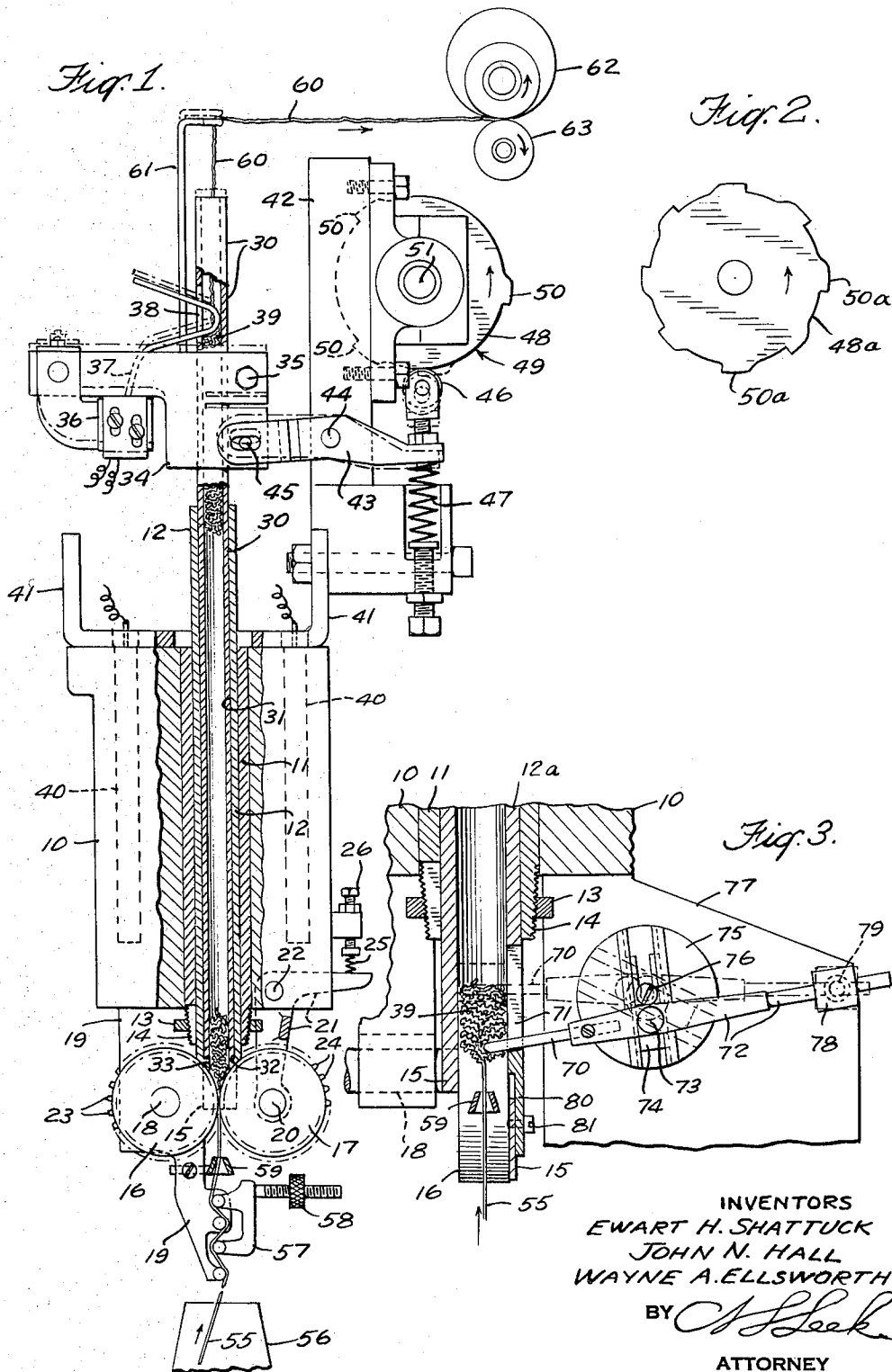
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3,248,770

CRIMPING APPARATUS

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2 Sheets-Sheet 1



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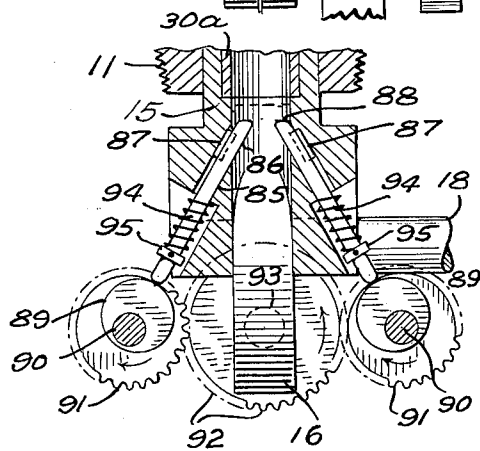
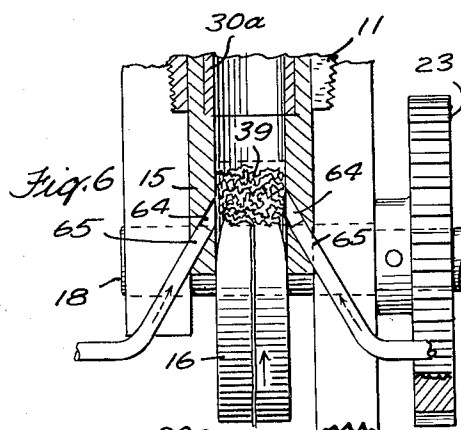
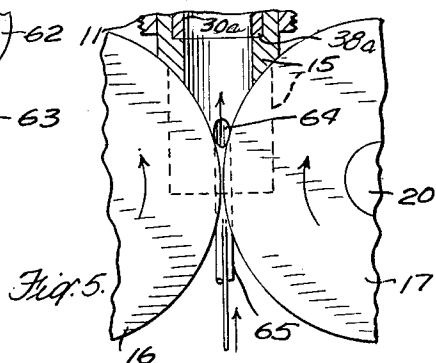
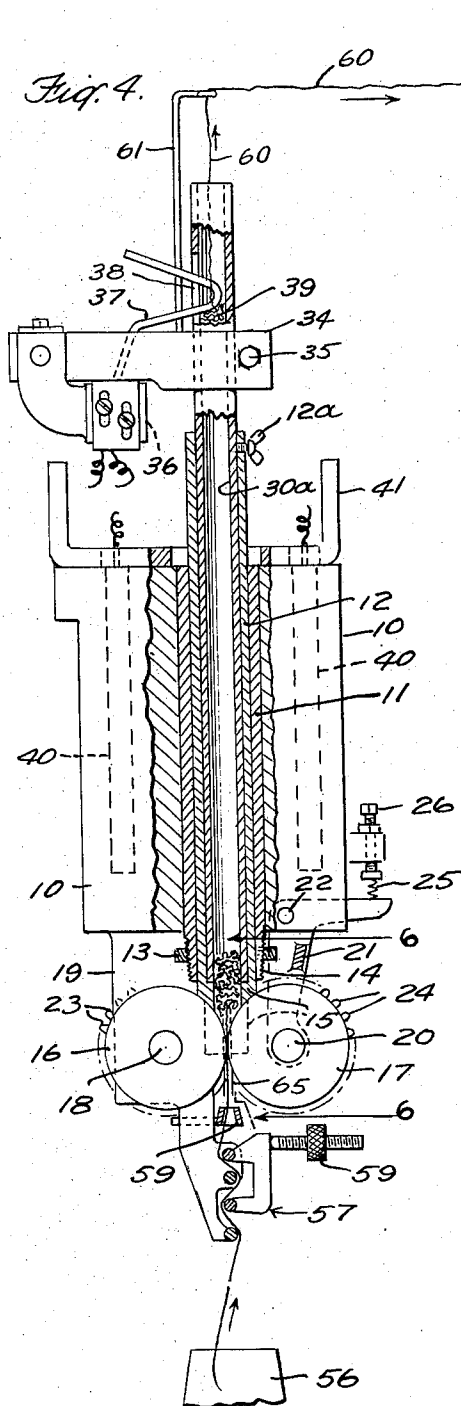
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2 Sheets-Sheet 2



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CRIMPING APPARATUS

Ewart H. Shattuck, Wycliff, Wilmington, and John N. Hall, Newark, Del., and Wayne A. Ellsworth, Endwell, N.Y., assignors to Joseph Bancroft & Sons Co., Wilmington, Del., a corporation of Delaware
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This invention relates to apparatus for crimping yarns and more particularly to crimping apparatus of the stuffer crimper type wherein filaments of yarns are folded over and crimped against the back pressure of a mass of previously crimped yarns as they advance along a crimping and setting chamber.

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

Another object is to provide apparatus of the above type wherein the back pressure of the yarn at the crimping zone is varied in a predetermined pattern.

Another object is to provide, in an apparatus of the above type, novel means for controlling the back pressure of the crimped mass of filaments or yarn in the crimping zone.

Another object is to provide a stuffer crimper having means to vary the amplitude of the crimp in successive portions of the yarn.

Another object is to provide a stuffer crimper which is adapted to produce a yarn having alternate zones of high crimp level and low crimp level.

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

In accordance with one embodiment of the invention the stuffer crimper is provided with a crimping chamber in the form of an elongated tube or sleeve which is adapted to be reciprocated axially as the crimping operation proceeds. When the sleeve is in its lower position the usual back pressure is applied for effecting the crimp at the crimping zone. When the sleeve is raised the back pressure of the crimped core is reduced so that the incoming yarn remains uncrimped or is less highly crimped. The crimp level thus varies as the sleeve is reciprocated.

In another embodiment the core of crimped yarn in the crimping tube is alternatively raised and lowered with respect to the bite of the feed rolls for varying the back pressure. In either case a yarn is produced which is variably bulked in successive areas.

In the drawing:

FIG. 1 is a front elevation of a crimper embodying the invention with parts in section for clarity;

FIG. 2 is a detail of a modified cam for use in the apparatus of FIG. 1;

FIG. 3 is a partial vertical section on a larger scale of the lower part of the crimper illustrating a further embodiment of the invention;

FIG. 4 is a front elevation of a crimping apparatus, similar to FIG. 1, illustrating a further embodiment of the invention;

FIG. 5 is partial vertical section through the lower portion of the crimping tube of FIG. 4 but on a larger scale;

FIG. 6 is a partial vertical section taken on the line 6—6 of FIG. 4; and

FIG. 7 is a sectional view, similar to FIG. 6 illustrating a further embodiment wherein the core is lifted by reciprocating pins.

Referring to FIG. 1 the invention is shown as embodied in a crimping apparatus comprising a block 10 having a vertical bore in which a fixed sleeve 11 is secured as by a press fit. A crimping tube 12 is adjustably secured within the sleeve 11 by a clamping nut

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13 threaded on the split, tapered end 14 of the fixed sleeve 11. The lower end of the tube 12 is formed with a saddle 15 registering with the bite of a pair of feed rolls 16 and 17. The feed roll 16 is mounted on a shaft 18, journaled in a bracket 19 depending from the block 10. The feed roll 17 is mounted on a shaft 20 journaled in a bracket 21, pivoted at 22 to the block 10. The feed rolls 16 and 17 are coupled by gears 23 and 24 for operation in unison. The feed rolls are driven at suitable speed by suitable means, not shown. The feed roll 17 is spring-pressed by a spring 25 the tension of which can be adjusted by adjusting screw 26.

A reciprocating sleeve 30 slides in an enlarged bore 31 in the tube 12 and has a bottom end 32 resting upon a shoulder 33 of the tube 12.

The sleeve 30 extends upwardly above the top of the tube 12 and supports a bracket 34 which is clamped to the sleeve 30 by a bolt 35. The bracket 34 carries an electric switch 36 having an actuating arm 37 extending through a slot 38 into the sleeve 30 and adapted to rest upon the core of crimped material 39 within the sleeve. The switch 36 is connected to control the drive of the feed rolls 16 and 17 by suitable means not shown so as to maintain the core at a constant level in the sleeve.

The block 10 carries heater elements 40 and is supported by fixed member 41. The supporting member 41 carries a bracket 42 on which a lever 43 is pivoted by a pin 44. One end of the lever 43 is slotted to receive a pin 45 carried by the bracket 34. The other end of the lever 43 carries a cam follower roller 46 which is spring-pressed by a spring 47 against the face 48 of a cam 49 having spaced lobes 50. The cam 49 is mounted on a shaft 51 which is journaled in the bracket 42 and is rotated by suitable means not shown. The arrangement is such that the rotation of the cam 49 causes the sleeve 30 to reciprocate rapidly in a vertical direction.

The yarn 55 is shown as withdrawn from a cop 56 through a grid type tension device 57 carrying an adjusting weight 58; thence through a trumpet 59 mounted on the bracket 19 and having a tapered end adjacent the bite of the feed rolls 16 and 17. The crimped yarn 60 is withdrawn from the core 39 through a guide 61 onto a constant speed winder 62 resting on a driven roll 63.

In the operation of this device the yarn is fed by the feed rolls 16 and 17 into the crimping tube 12 wherein it is folded over and crimped against the back pressure of the core or mass of previously crimped yarn in the tube. The crimped yarn is fed upwardly in the tube 12 and in the sleeve 30 wherein it is head-set while in compacted form. The head-set yarn is then withdrawn and wound onto the yarn package 62. On the winding 62 the crimp is pulled out into substantially straight form but will be restored when the tension of the yarn is released and the yarn relaxed as by heat.

During this operation the sleeve 30 is reciprocated, in a vertical direction by the movement of the cam 49. When the sleeve is raised the back pressure on the incoming yarn at the bite of the feed rolls is reduced, thereby reducing or eliminating the tendency of the incoming yarn to crimp. This portion of the yarn accordingly remains straight or only slightly crimped whereas the portion of the yarn which encounters the back pressure of the core when the sleeve is in its lower position is highly crimped and retains such crimp after being heat set in the heated portion of the sleeve. The resultant yarn contains alternate portions which are highly crimped and other alternate portions which are less highly crimped or are straight or substantially straight in form. The relative lengths of the alternate portions depend upon the relationship between the rate of feed into the crimping chamber and the rate of reciproca-

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tion of the sleeve 30. These portions may vary from inches to yards according to the ratios which are selected.

In FIG. 1 the cam 48 is shown as having three lobes 50. A modified form of cam is shown in FIG. 2 having a face 48a with eight lobes 50a. Obviously the number and size of lobes can be varied as desired according to the rate at which the sleeve 30 is to be reciprocated.

In the embodiment of FIG. 3 the crimping apparatus is similar to that of FIG. 1 except that the crimping tube 12a is formed with a uniform bore and the reciprocating sleeve is omitted. In place of the reciprocating sleeve a pin 70 is disposed to extend through a slot 71 in the saddle 15 at a point adjacent the bite of the feed rolls and in a direction parallel to the axes of the feed rolls. The pin 70 projects from an arm 72 which is pivoted by a pin 73 to a slide 74 which is mounted for radial adjustment on a disk 75 and may be secured in adjusted position by a set screw 76. The disk 75 is mounted for rotation on a bracket 77 supported by the block 10. The arm 72 slides in a block 78 which is pivoted at 79 on the bracket 77. The disk 75 is rotated at a constant speed by suitable means not shown.

An adjusting slide 80 extends into the slot 71 and may be adjusted vertically by a set screw 81 threaded into the saddle 15.

In the operation of this embodiment the pin 70 advances into the mass of yarn in the saddle, moves upwardly to elevate the core then is retracted and returns to its lower position shown as the disk 75 rotates. The throw of the pin 70 may be adjusted by the set screw 76 for varying the thrust of the pin into the core and the amount of elevation of the core. The slide 80 may be adjusted according to the stroke of the pin so as to avoid an opening at the lower end of the slot 71.

In this embodiment when the pin 70 is retracted the core rests upon the bite of the feed rolls and the incoming yarn is crimped in the usual manner. When the pin extends into the core and elevates the core from the bite of the feed rolls the back pressure on the yarn is reduced or removed entirely and the incoming yarn remains uncrimped or is less highly crimped, thus forming alternate crimped and uncrimped areas along the yarn as in the embodiment of FIG. 1. The relative lengths of the crimped and uncrimped portions depend upon the relative rates of drive of the disk 75 with respect to the feed rolls 16 and 17. The variation of back pressure depends upon the elevating stroke of the pin 70. Hence the variation between the amount of crimp in the various portions as well as the relative lengths of the various portions can be controlled as desired by suitable adjustment of the parts.

In the embodiment of FIGS. 4 to 6 a block 10 having a vertical bore in which a sleeve 11 is secured as by a press fit. A crimping tube 12 is adjustably secured within the sleeve 11 by a clamping nut 13 threaded on the split tapered end 14 of the fixed sleeve 11. The lower end of the tube 12 is formed with a saddle 15 registering with the bite of a pair of feed rolls 16 and 17. The feed roll 16 is mounted on a shaft 18, journaled in a bracket 19 depending from the block 10. The feed roll 17 is mounted on a shaft 20 journaled in a bracket 21, pivoted at 22 to the block 10. The feed rolls 16 and 17 are coupled by gears 23 and 24 for operation in unison. The feed rolls are driven at suitable speed by suitable means, not shown. The feed roll 17 is spring-pressed by a spring 25 the tension of which can be adjusted by adjusting screw 26.

A liner 30a seats within an enlarged bore in the tube 12 and has a bottom end resting on a shoulder 33a of the sleeve 12.

The liner 30a is secured in the tube 12 by a wing nut 12a and extends upwardly beyond the tube 12 and supports a bracket 34 which is clamped to the liner 30a by a bolt 35.

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The bracket 34 carries an electric switch 36 having an actuating arm 37 extending through a slot 38 into the liner 30a and adapted to rest upon the core of crimped material 39 within the liner. The switch 37 is connected to control the drive of the feed rolls 16 and 17 by suitable means not shown so as to maintain the core at a constant level in the liner.

The block 10 carries heater elements 40 and is supported by a fixed member 41. The yarn 55 is shown as withdrawn from a cop 56 through a grid type tension device 57 carrying an adjusting weight 58, thence through a trumpet 59 mounted on a bracket 19 and having a tapered end adjacent the bite of the feed rolls 16 and 17. The crimped yarn 60 is withdrawn from the core 39 through a guide 61 onto a constant speed winder 62 resting on a drive roll 63.

In this embodiment the saddle 15 is formed with upwardly inclined passages 64 (FIGURES 5 and 6) terminating within the saddle above and adjacent the bite of the feed rolls and connected externally to tubes 65 which are connected to a source of air under pressure not shown.

The operation of this embodiment is generally similar to that of FIGS. 1 and 2. Air under pressure is supplied intermittently to the tubes 65 so as to form intermittent jets against the core 39 within the bite of the feed rolls. The jets are adapted to raise said core or at least to reduce the back pressure on the incoming yarn at the bite so as to intermittently lower the crimp level as in the previous embodiments. They also assist in feeding the core upwardly within the liner. One or more jets can be used according to the particular construction of the apparatus.

In the embodiment of FIG. 7 the construction is similar to that above described except that the saddle 15 is provided with bores 85 in which pins 86 are keyed by keys 87 to slide axially. The pins 86 are inclined to project into the crimping zone within the saddle adjacent and above the bite of the feed rolls so as to engage and lift the core as they reciprocate. The upper ends of the pins are formed with horizontal surfaces 88. The pins 86 rest upon and are reciprocated by eccentric cam surfaces 89 on shafts 90 having gears 91 driven by a common drive gear 92 mounted on a shaft 93 which may be driven by any suitable means not shown. The pins 86 are held against the surfaces 89 by springs 94 engaging collars 95 on the pins.

In this embodiment the operation is similar to that of FIGS. 5 and 6 except that the core is periodically raised from the bite by the reciprocating pins 86 which may be driven at a controlled and selected rate to provide spaced thick and thin portions, or bulked and non-bulked portions in the resulting yarn.

What is claimed is:

1. Apparatus for crimping filaments and yarn comprising means forming an elongated chamber having crimping and setting zones, feed means including a feed roll and a cooperating element having a bite disposed to feed said yarn into said crimping zone to be folded over and crimped against the back pressure of a mass of previously crimped yarn in said chamber and to cause the mass of crimped yarn to advance along said setting zone to a discharge point and means periodically raising said mass of crimped yarn from said bite for thereby reducing the back pressure on the incoming yarn for varying the crimp level thereof.

2. Apparatus for crimping filaments and yarn comprising means forming an elongated chamber having crimping and setting zones, feed means positioned to feed said yarn into said crimping zone to be folded over and crimped against the back pressure of a mass of previously crimped yarn in said chamber and to cause the mass of crimped yarn to advance along said setting zone to a discharge point, a reciprocating member adapted to be periodically advanced into said mass of crimped yarn and retracted therefrom, and means shifting said last member axially of said chamber while in advanced posi-

tion for thereby raising said mass of crimped yarn from said crimping zone so as to reduce the back pressure on the incoming yarn.

3. Apparatus for crimping filaments or yarn comprising a tubular member adapted to form a crimping and setting chamber means including a feed roll disposed to feed said yarn into one end of said member to be folded over and crimped against the back pressure of a mass of previously crimped yarn in said tubular member, a sleeve disposed within said tubular member and extending from said crimping zone to a discharge point, and means connected to reciprocate said sleeve axially of said tubular member for thereby raising and lowering the mass of crimped yarn therein for varying the back pressure at the bite of said feed rolls.

4. Apparatus as set forth in claim 3 in which said last means comprises an arm connected to said sleeve and cam means to actuate said arm for reciprocating said sleeve.

5. Apparatus for crimping yarn comprising a tubular member adapted to form crimping and setting chambers, feed means having a bite adapted to feed yarn for crimping into one end of said member to be folded over and crimped against a mass of previously crimped yarn in said crimping chamber, said tubular member including a saddle disposed to confine the yarn at the bite of said feed means, and having an enlarged bore extending from its discharge end to a shoulder within said saddle, an inner sleeve disposed in said enlarged bore to rest upon said shoulder and adapted to receive the mass of crimped yarn from said saddle and terminating in a discharge end from which the crimped yarn is withdrawn, and means including a continuously rotating cam connected to cause limited axial reciprocation of said sleeve for thereby raising and lowering said mass of crimped yarn with respect to the bite of said feed means so as to vary the back pressure of said mass on the incoming yarn.

6. Apparatus for crimping yarn comprising a tubular member adapted to form a crimping and setting chamber, feed means having a bite to feed the yarn into said tubular member to be folded over and crimped against the back pressure of a mass of previously crimped yarn in said crimping chamber, and means for repeatedly lifting the mass of crimped yarn from the bite of said feed means for thereby varying the back pressure on the incoming yarn, said last means comprising at least one arm disposed to extend into said tubular member at a point adjacent the bite of said feed means and means including at least one rotating actuating member connected to cause said arm to be successively advanced into and retracted from said crimping chamber and to be shifted axially of said chamber while in advanced position for thereby advancing the mass of crimped yarn along said setting chamber and to be returned while retracted from said member.

7. Apparatus as set forth in claim 6 in which said arm is actuated by a rotating crank to which it is pivoted and

has a free end slidably held in a pivoted block so that the other end of said arm executes a circular motion as it is advanced and retracted in two directions.

8. Apparatus for crimping yarn comprising a member having a passage forming an elongated crimping and setting chamber, feed means including a feed roll and a cooperating element having a bite disposed to feed said yarn into one end of said chamber to be folded over and crimped against a mass of previously crimped yarn disposed as a core in said chamber, said member having a saddle disposed over the bite of said feed means and forming therewith a confined crimping zone, said saddle having a passage communicating with said crimping zone above and adjacent said bite and means supplying air under pressure periodically to said passage under conditions to lift said core and reduce the back pressure thereof on the incoming yarn in said bite whereby the crimp amplitude of the resulting yarn is varied periodically.

9. Apparatus for crimping yarn comprising a member having a passage forming an elongated crimping and setting chamber, feed means including a feed roll and a cooperating element having a bite disposed to feed said yarn into one end of said chamber to be folded over and crimped against a mass of previously crimped yarn disposed as a core in said chamber, said member having a saddle disposed over the bite of said feed means and forming therewith a confined crimping zone, at least one pin slidably disposed in said saddle for axial reciprocation and having an end positioned to engage the core above and adjacent said bite for periodically lifting the core as the pin is reciprocated, and means periodically reciprocating said pin.

10. Apparatus for crimping yarn comprising a member having a passage forming an elongated crimping and setting chamber, feed means including a feed roll and a cooperating element having a bite disposed to feed said yarn into one end of said chamber to be folded over and crimped against a mass of previously crimped yarn disposed as a core in said chamber, said member having a saddle disposed over the bite of said feed means and forming therewith a confined crimping zone, a pair of pins slidably disposed in said saddle for axial reciprocation and positioned to engage said core above and adjacent said bite for lifting said core as the pins are reciprocated and means periodically reciprocating said pins.

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