United States Patent [19]

Trifunovic

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[54] **APPARATUS FOR STUFFER-CRIMPING YARN**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 40,486, May 26, 1970, abandoned.

[52] **U.S. Cl.** **28/1.6,** 28/72.14

[51] **Int. Cl.** **D02g 1/12**

[58] **Field of Search** ..... 28/1.6, 1.7, 72.14; 19/106 R, 150

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Primary Examiner—Robert R. Mackey

[57] **ABSTRACT**

Apparatus for crimping yarn in which a pair of feed rolls feeds the yarn against a conveyor belt which passes between the rolls adjacent the bite and advances parallel to the axes of the rolls. The belt carries the crimped yarn from the crimping zone at the bite over a heated surface where the crimp is set. Alternative embodiments add a second conveyor belt or a pair of helical screw members in opposed cooperating relationship with the first conveyor belt to carry the crimped yarn from the crimping zone.

12 Claims, 22 Drawing Figures

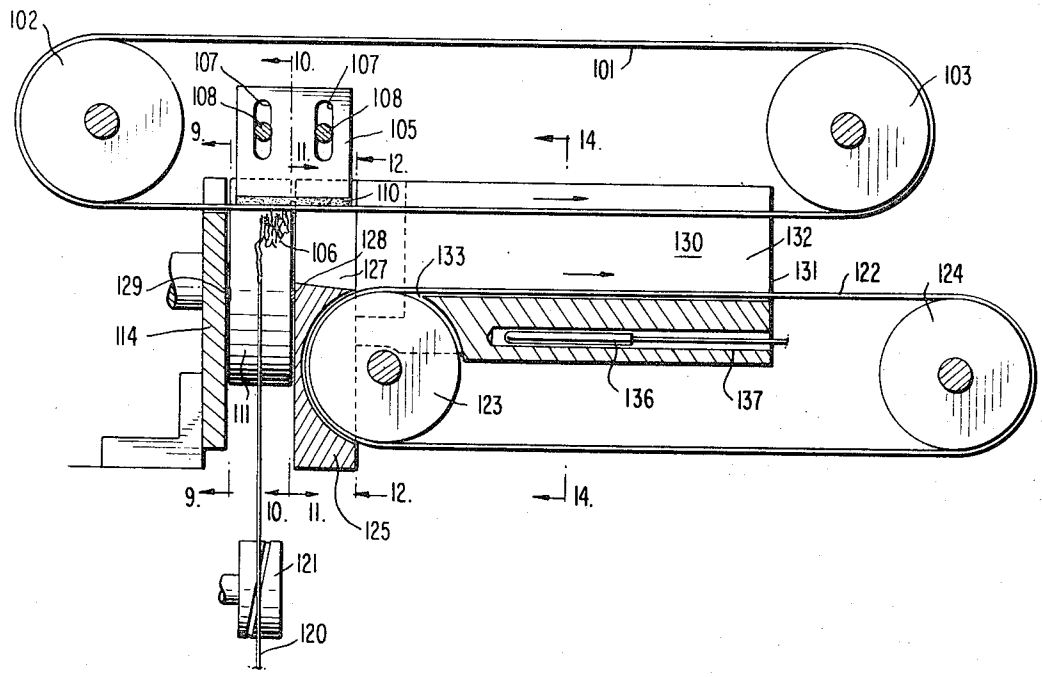
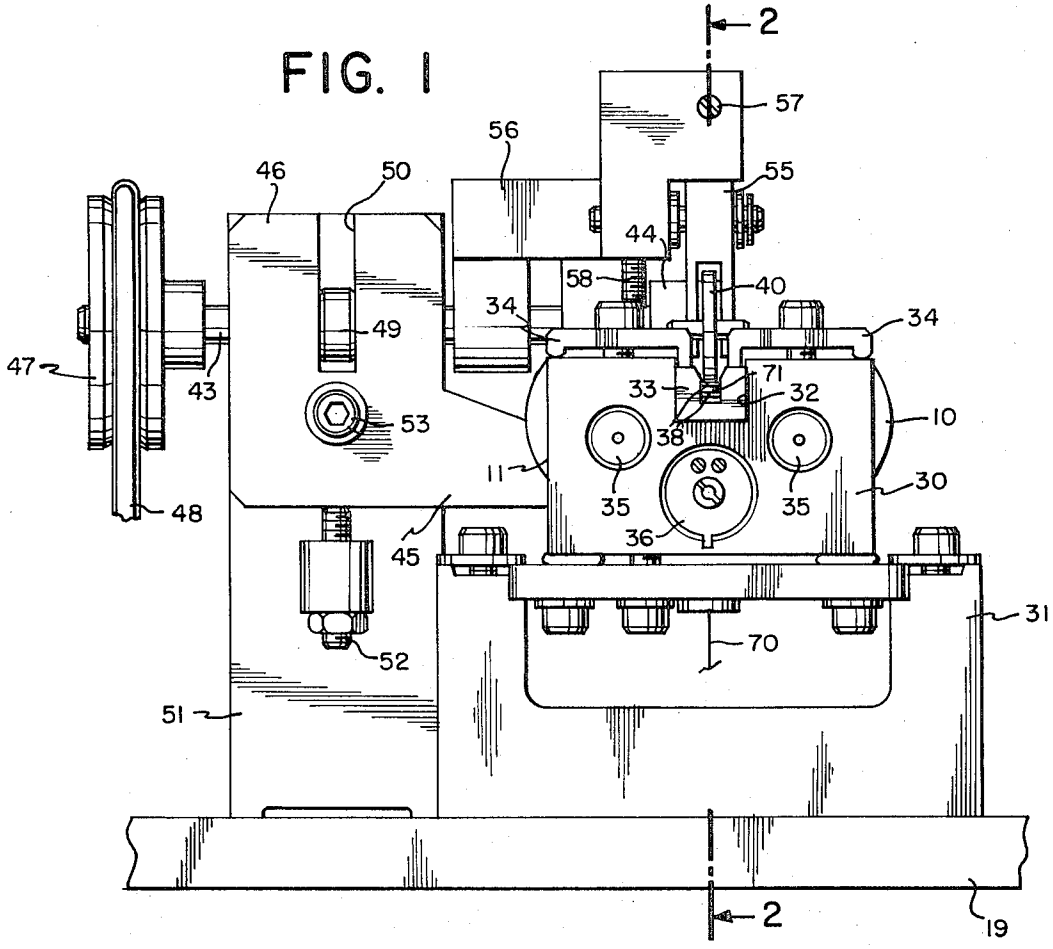


FIG. 1



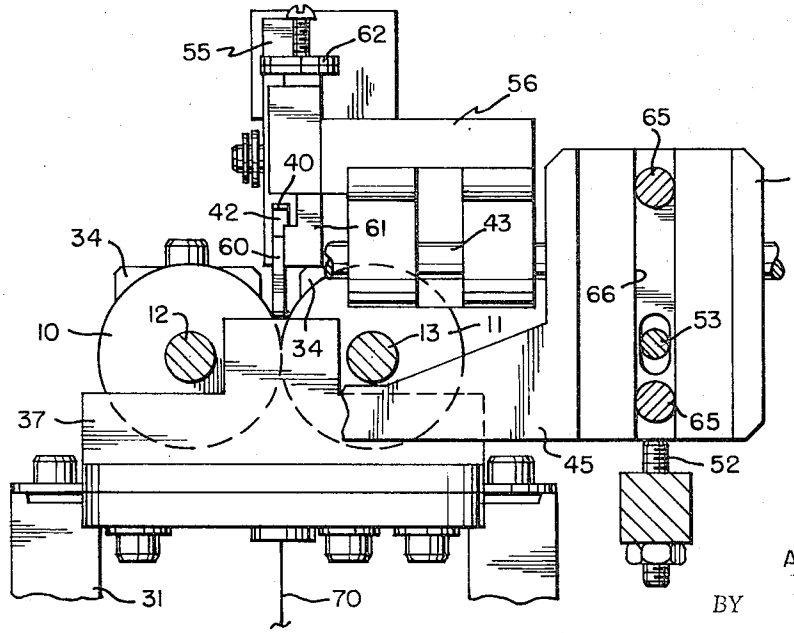


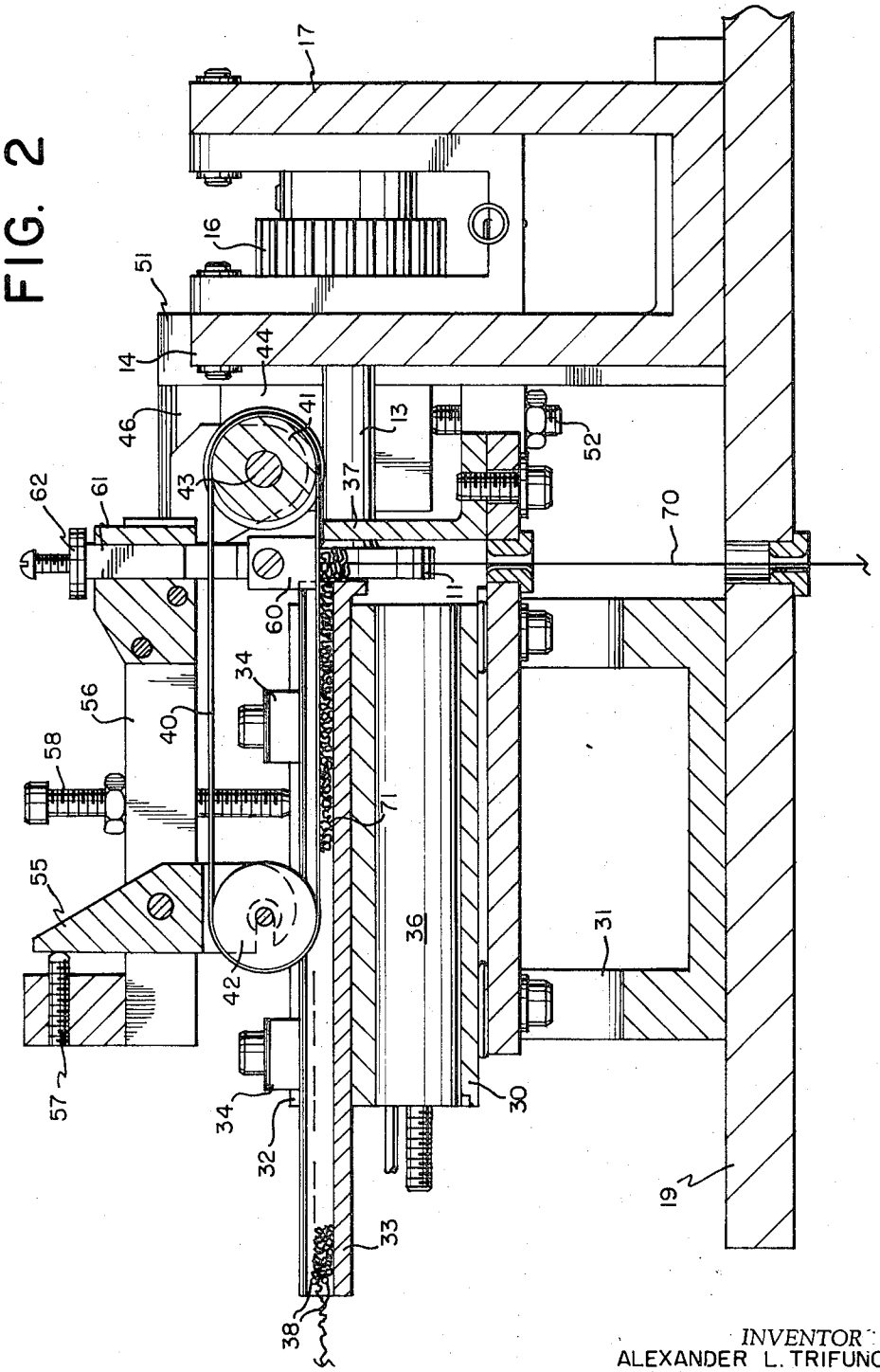
FIG. 4

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FIG. 2



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FIG. 3

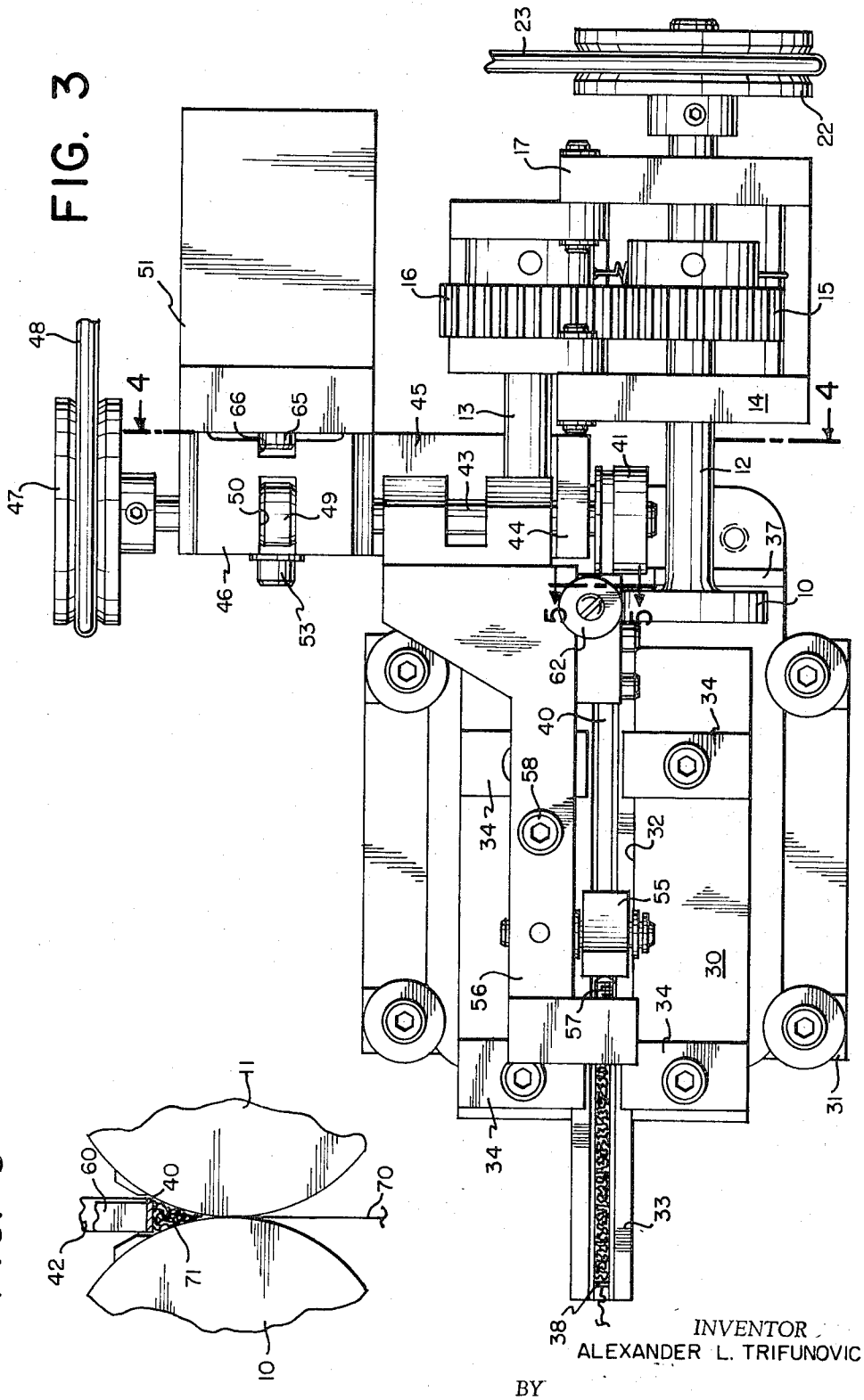


FIG. 5

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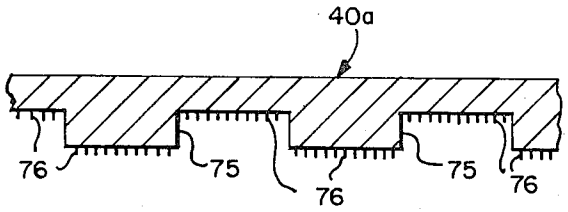
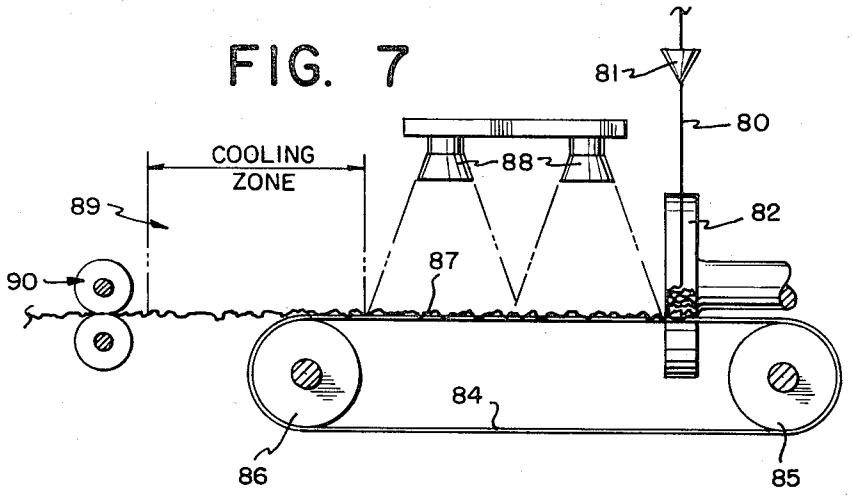


FIG. 6

FIG. 7



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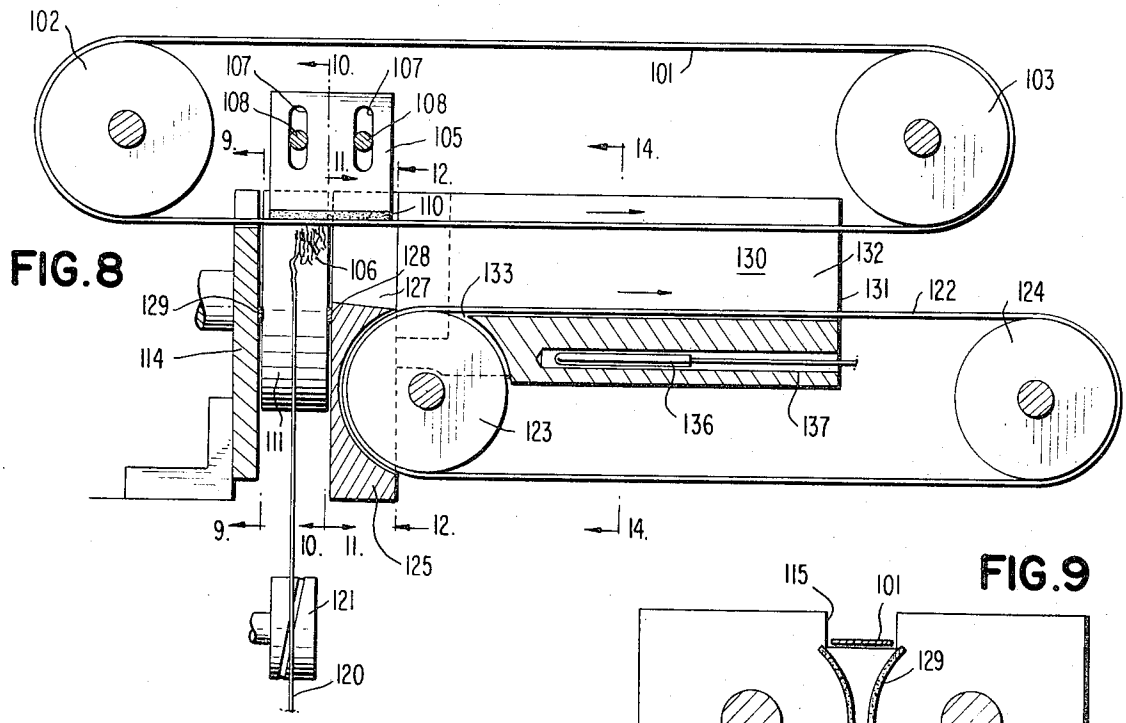


FIG.8

FIG.9

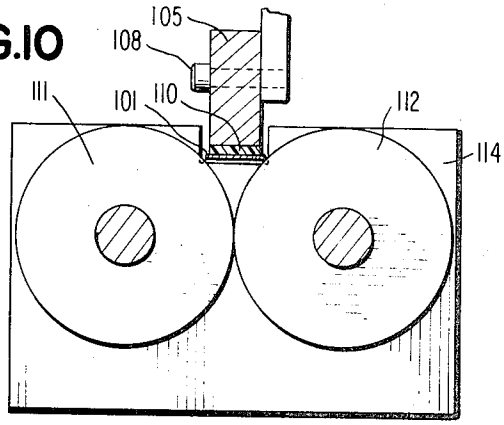


FIG.10

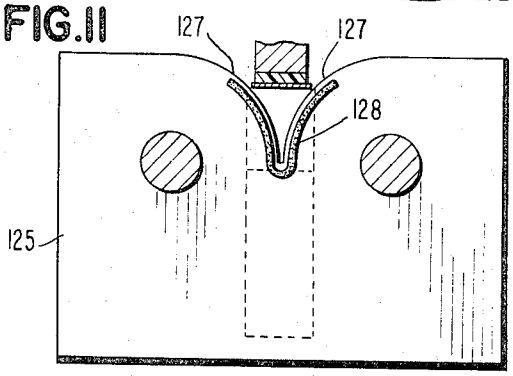


FIG.11

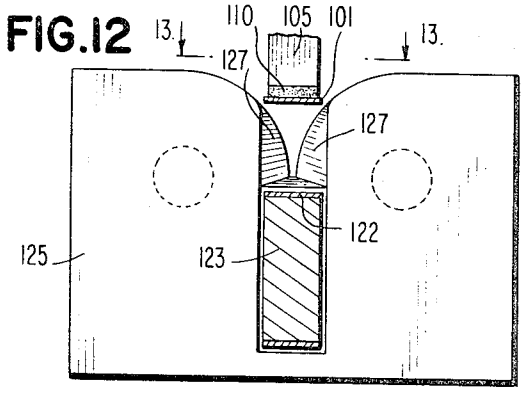


FIG.12

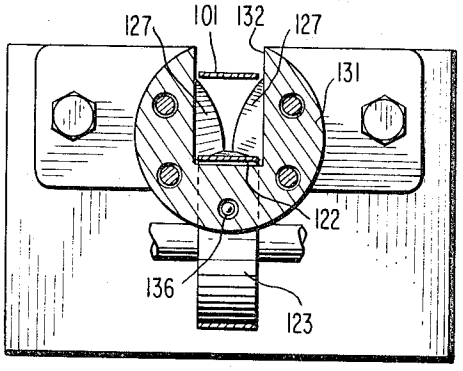


FIG.14

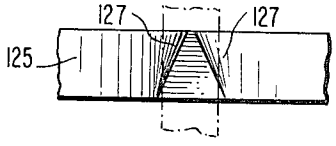


FIG.13

FIG.15

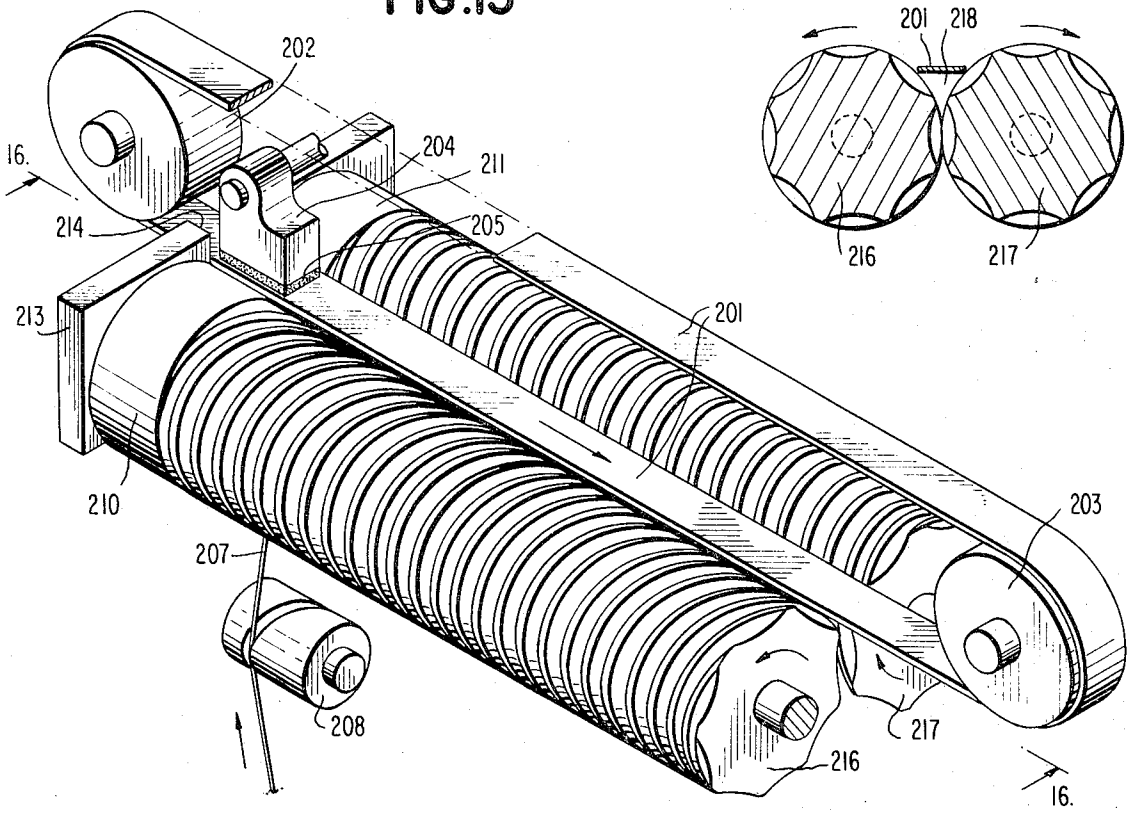


FIG.18

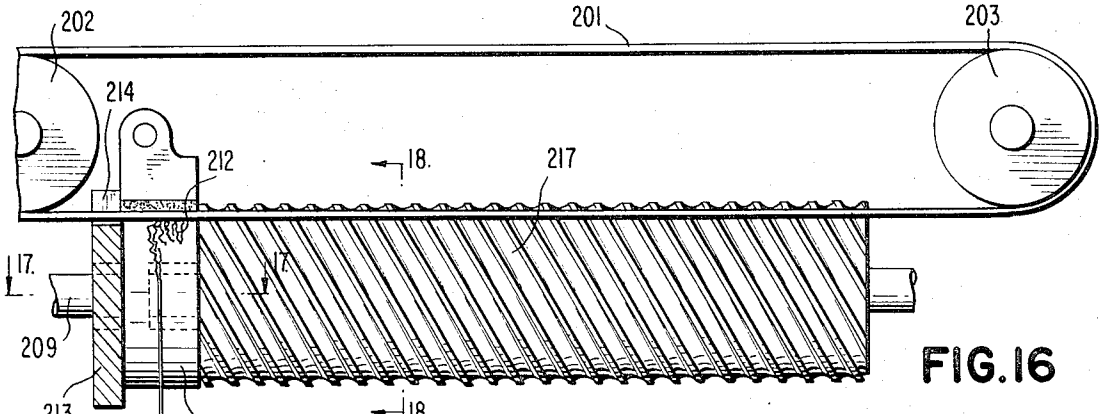


FIG.16

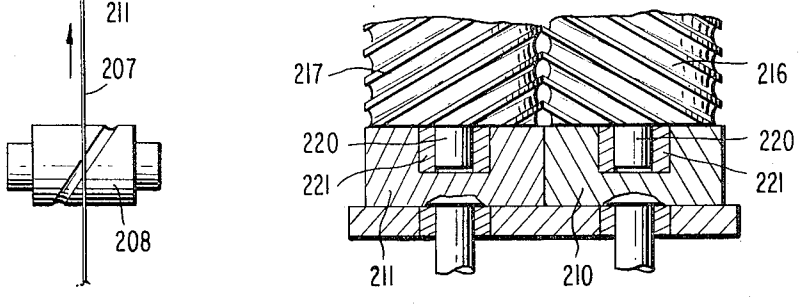


FIG.17

FIG.19

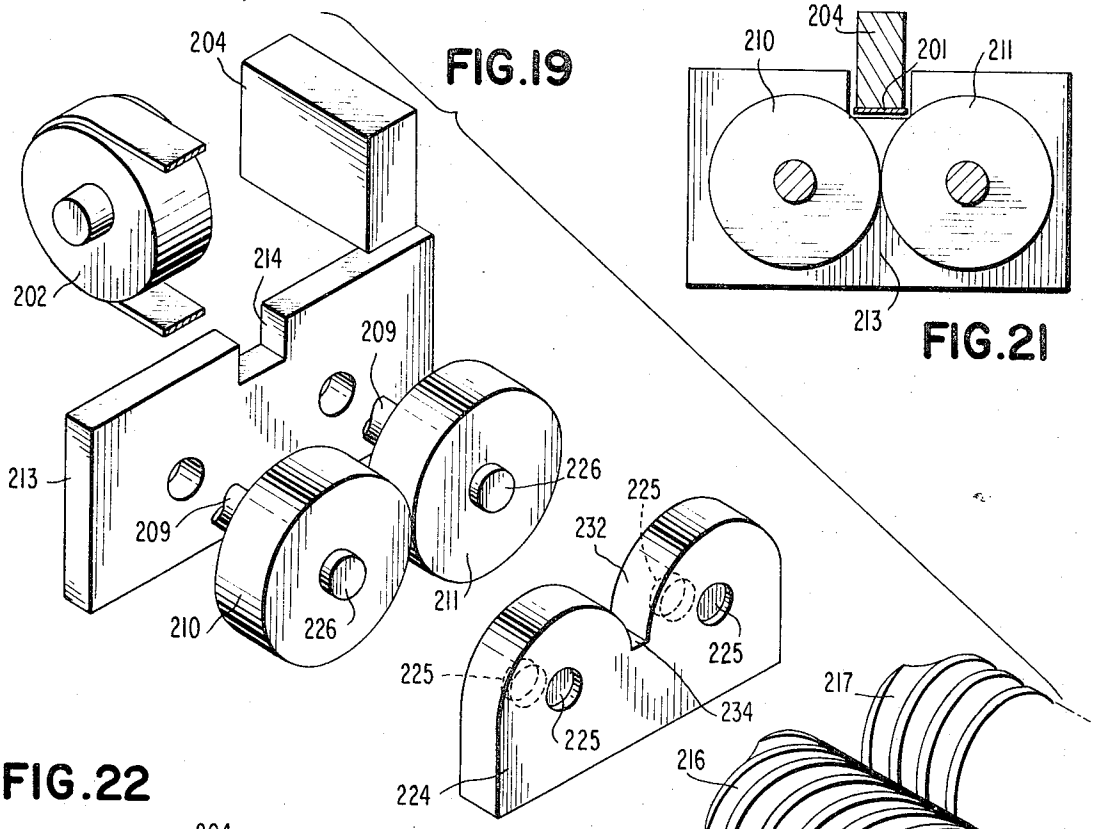
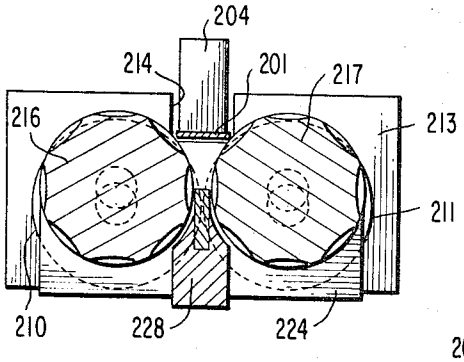
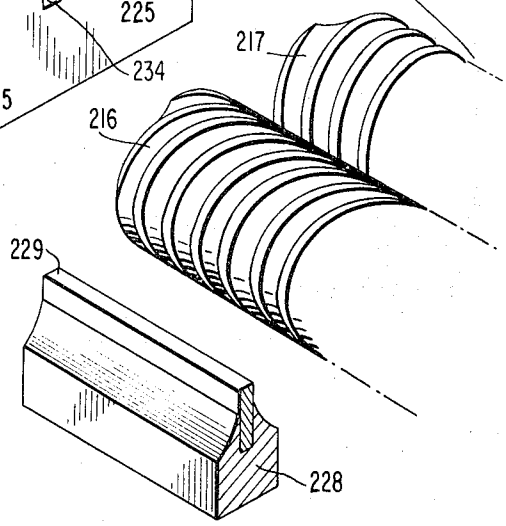


FIG.21

FIG.22





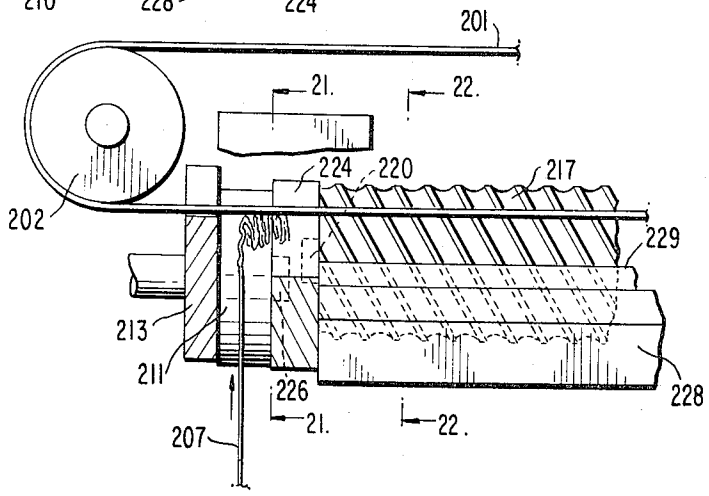


FIG.20

APPARATUS FOR STUFFER-CRIMPING YARN

RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 40,486, filed May 26, 1970, now abandoned.

SUMMARY OF THE INVENTION:

This invention relates to stuffer crimpers for forming an artificial crimp in yarns or filaments.

An object is to provide a crimper of the above type having novel and improved characteristics.

Another object is to provide a stuffer crimper having improved means for accurately controlling the leg length and the angle of the crimp.

Another object is to provide, in a crimper of the above type, mechanism in which fine adjustment of the clearances between the feed rolls and the cooperating parts is greatly reduced or eliminated.

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

These objects are accomplished in accordance with the present invention by providing a narrow conveyor belt which passes over and lies closely adjacent the bite of the feed rolls and advances in a direction parallel to the axes of the feed rolls. The yarn is folded over and crimped as it contacts the surface of the belt and is advanced in the form of a small core between the belt and a heated surface for heating and setting the crimp in the yarn. It may also be advanced through a cooling zone before being extracted and wound onto a package.

A feature of this apparatus is that the leg length of the crimp is determined largely by the distance between the bite of the feed rolls and the contacting surface of the belt or of the preceding yarn which has been crimped and has not yet been carried beyond the crimping zone. The setting of the belt and the consequent leg length of the crimp is thus accurately controlled and can be maintained extremely uniform.

A further feature is the control of the crimp angle. This angle is determined largely by the rate of advance of the belt compared to the rate of feed of the yarn to the crimping zone from the bite of the feed rolls.

Another feature is the elimination of a fixed member such as a nose piece which would span the feed rolls at the bite and which would require accurate clearance and adjustment.

A still further feature is the elimination of a fixed crimping chamber which must be removed for frequent cleaning.

The nature of the invention and the various features of the apparatus will be better understood from the following description, taken in connection with the accompanying drawings in which a specific embodiment has been set forth for purposes of illustration.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a side elevation of a stuffer crimper embodying a first embodiment of the invention;

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

FIG. 3 is a plan view of the apparatus of FIG. 1;

FIG. 4 is a vertical section with parts broken away, taken on the line 4—4 of FIG. 3 showing the mounting for the belt drive mechanism;

FIG. 5 is a partial section taken on the line 5—5 of FIG. 3, but on a larger scale, showing the relationship of the conveyor belt and feed rolls in the crimping zone;

FIG. 6 is a broken section of a modified form of conveyor belt;

FIG. 7 is a diagrammatic view of a portion of a modified form of the crimping apparatus of the first embodiment in which the yarn is fed downwardly to the belt for crimping;

FIG. 8 is a side elevation, partially in section, of a second embodiment of the invention;

FIG. 9 is a section taken on the line 9—9 of FIG. 8;

FIG. 10 is a section taken on the line 10—10 of FIG. 8;

FIG. 11 is a section taken on the line 11—11 of FIG. 8, showing the relationship between the upper conveyor belt and the transfer bridge;

FIG. 12 is a section taken on the line 12—12 of FIG. 8;

FIG. 13 is a section taken on the line 13—13 of FIG. 12;

FIG. 14 is a section taken on the line 14—14 of FIG. 8, showing the relationship between the upper and lower conveyor belts and the trough;

FIG. 15 is a perspective view of the conveying elements of a third embodiment of the invention;

FIG. 16 is a section taken on the line 16—16 of FIG. 15, showing the relationship between the conveyor belt and the screw members;

FIG. 17 is a section taken along the line 17—17 of FIG. 16, showing the mounting of the feed rolls and the screw members;

FIG. 18 is a section taken through the line 18—18 of FIG. 16;

FIG. 19 is an exploded perspective view of a modified form of the third embodiment of the invention;

FIG. 20 is a sectional view showing the relationship between feed rolls, transfer bridge and screw members of FIG. 19;

FIG. 21 is a section taken on the line 21—21 of FIG. 20; and

FIG. 22 is a section taken on the line 22—22 of FIG. 20.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Three embodiments of the invention are described herein. The description of the first embodiment fully describes the entire apparatus, while the descriptions of the other two embodiments are directed only toward the yarn conveying structure.

FIGS. 1–7 show the first embodiment of the invention. A pair of feed rolls 10 and 11 have shafts 12 and 13 respectively journalled in a bracket 14 and are driven by meshing gears 15 and 16. The shaft 12 extends through a second upstanding bracket 17 and is driven by suitable means shown as a pulley 22 and driving belt 23. The brackets 14 and 17 are mounted on a base plate 19. The shaft 13 carrying the feed roll 11 may be spring pressed in a direction to maintain the rolls in pressure engagement at the bite.

A heater block 30 is mounted on a base 31 and is formed with a longitudinal groove 32 in which a channel 33 is seated and held in adjusted positions by clamps 34. The channel 33, at one end, lies adjacent

the end faces of the feed rolls **10** and **11** and at its other end extends beyond the heater block **30** to form a cooling zone for the crimped yarn to be described. The block **30** is heated by electrical heating elements **35** the temperature of which is controlled by a thermosensitive element **36.** At its discharge end the channel **33** carries a pair of rods **38** forming a restricted opening through which the crimped yarn is drawn by a winder not shown. A plate **37,** carried by the base **31,** extends over the face of the feed rolls opposite the channel **33** and has a running clearance with the feed rolls. This plate **37** extends above the bite of the feed rolls and forms a confining member for the crimping zone.

A narrow belt **40** extends around rolls **41** and **42** with its lower flight disposed close to the bite of the rolls **10** and **11.** The roll **41** is mounted on a shaft **43** which is journalled in a vertical bracket **44** carried by an arm **45** and extends through a block **46** to be driven by suitable means indicated as a pulley **47** and belt **48.** A collar **49** turning in recess **50** in block **46** prevents axial movement of the shaft **43.** The arm **45** and block **46** are adjustable vertically in a fixed bracket **51** by means of an adjusting screw **52** and a clamping screw **53.** The block **46** is guided vertically by pins **65** in slots **66.** The bracket **51** is held on a base plate **19.** The belt **40** is shown as tapered in cross section to fit into the bite of the rolls **10** and **11.** The under surface of the belt in contact with the yarn is shown as flat, but it may be made convex or concave according to the requirements. The contacting surface may be composed of friction material such as rubber to assist in advancing the core and in some cases the contacting surfaces may have spaced recesses as to produce a crimped yarn having alternate thick and thin characteristics.

The pulley **42** is journalled in an arm **55** which is pivoted to a horizontal arm **56** and is adjustable by a set screw **57** to maintain a suitable tension on the conveyor belt **40.** The arm **56** is journalled at its free end around the shaft **43** and is adjustable at its first end by a screw **58** resting on the block **30.** A pressure element shown as a pad **60** is disposed over the portion of the conveyor belt **40** at the bite of the feed rolls **10** and **11.** This pad is mounted on a rod **61** which is slidable in the arm **56** and carries weights **62** by which pressure is maintained on the belt at the bite of the rolls. The pad **60** may be formed of low friction material such as Teflon. Other pressure elements such as a roll may of course be substituted for the pad **60.**

In operation a yarn **70** is fed by the bite of the feed rolls **10** and **11** against the under surface of the conveyor belt **40** where it is folded over and crimped against the back pressure produced by the pad **60** and the weights **62.** The spacing of the belt at the bite can be adjusted by means of the adjusting screw **52** which raises or lowers the arm **45.** This spacing determines the leg length of the resulting crimp.

The crimped yarn forms a core **71** which is fed along the heated surface of the channel **33** by the advancing belt **40.** The diameter of the core and the crimp angle are determined by the rate of advance of the belt with respect to the rate of the feed rolls.

As the core **71** advances over the surface of the channel **33** it is heated to setting temperature and is so held for the time necessary for forming setting conditions. The time is determined by the rate of advance of the belt and the length of the heating zone. During this time the core is held compacted by the belt so that the crimp is prevented from opening up and being partially lost. The core is also passed through a cooling zone for a time to cause the crimp to be permanently set in the yarn. The belt **40** may extend along the cooling zone for holding the core compacted if desired. The yarn is then extracted from the core **71** and passes between the rods **38** to be wound onto a package.

The pad **60** provides a definite back pressure against which the yarn is crimped. The width and shape of the belt is such that it extends below the upper peripheral surface of the feed rolls and close to the actual bite so that the crimping zone between the bite and the belt is of the order of a leg length of the resultant crimp.

If a feed roll requires replacement or other service the entire belt mechanism is readily removed to expose the feed rolls. Since the edges of the belt are flexible they may contact the peripheral surface of the feed rolls without damage and the adjustment of the belt with respect to the feed rolls is not critical. Thus the spacing of the belt from the bite may be varied within comparatively wide limits depending upon the characteristics of the yarn and of the desired crimp.

FIG. **6** illustrates a belt **40***a* provided with portions which are further spaced from the bite of the feed rolls so that the bulk of the crimped yarn varies along its length. Belt **40***a* is formed with a series of spaced recesses **75** in its contacting surface. When one of these recesses is disposed in the crimping zone the contacting surface of the belt is spaced further from the bite and the leg length of the crimp is correspondingly increased. In this way a yarn of variable bulk, or "thick and thin" yarn is produced.

FIG. **6** also shows a series of pins **76** spaced along the contacting surface of the belt. Such pins may be used when necessary for improving the feed of the core of crimped yarn.

In the modification of FIG. **7** the yarn is fed downwardly onto the conveyor belt. Also, the belt can be of small diameter, adapted to fit closely into the bite of the feed rolls. A fine crimp of extremely short leg length can thus be produced.

In FIG. **7,** a yarn **80** is fed through a guide **81** into the bite of feed rolls **82.** A belt **84** of small diameter, such as a wire, is passed around drive pulleys **85** and **86** to feed the crimped yarn **87** under a heater such as infrared lamps **88** and along a cooling **89** for setting the crimp, after which the yarn is extracted by delivery rolls **90** for winding onto a package. The crimped yarn rests on the upper surface of the belt **84** by which it is fed through the heating and setting zones. The crimped yarn is not held closely compacted as in the case of the structure of FIGS. **1** to **5.** Hence the crimp angle may be somewhat greater. This will depend upon the type of filament and the back pressure in the crimping zone.

Another preferred embodiment of the invention is illustrated in FIGS. **8–14.** Components of the apparatus common to all the embodiments are described above in regard to the first embodiment, and such description will not be repeated.

In the embodiment pictured in FIG. **8,** an upper conveyor belt **101** is carried by rolls **102** and **103** in a position above the feed rolls **111** and **112** with its lower flight disposed close to crimping zone **106.** Belt **101** is driven in the indicated direction to move the yarn core from crimpimg zone **106.** The belt driving means (not shown) includes means for varying the speed of belt

101 so that a predetermined relationship between the speeds of the feed rollers and the belt can be established. This relationship affects the crimp characteristics such as the crimp angle. To provide belt 101 with sufficient stiffness to impart the necessary back pressure for the crimping operation, a movable pressure pad 105 is provided to back the belt 101 at the crimping zone 106. Pressure pad 105 is adjustably mounted by means of a plurality of slots 107 engaged by mounting screws 108 carried by the machine frame, and thus the position of pressure pad 105 can be adjusted vertically with respect to belt 101. Of course, the entire belt 101 and rolls 102 and 103 can be provided with means to vary its vertical position, as discussed above with regard to the first embodiment of the invention. Pressure pad 105 has a surface 110 of low friction material which engages the back of belt 101. It is contemplated that other mechanisms, such as a roller, can be substituted for pressure pad 105. Also, pressure pad 105 can be extended for the entire length of the yarn engaging portion of belt 101.

Devices for adjusting the tension of belt 101 can be provided, and it is advantageous to mount belt 101 and rolls 102 and 103 in such a manner as to allow them to be pivoted upwardly to facilitate belt changing and to provide easy access to the feed rolls and the rest of the mechanism, explained below.

Crimping zone 106 is a confined zone bounded by belt 101, the surfaces of feed rolls 111 and 112, and by a fixed back plate 114 which is in juxtaposition to feed rolls 111 and 112. Back plate 114 is provided at the top with a groove 115 through which belt 101 passes. Optionally, belt 101 can be in and contact the floor of groove 115, and in such cases an anti-friction insert may be provided.

This embodiment of the invention differs from the first embodiment in that it is provided with a lower conveyor belt 122 mounted on rolls 123 and 124 and driven in the same direction as upper conveyor belt 101 at their points of adjacency. Together, the two belts move the crimped yarn from the crimping zone 106.

Roll 123 is positioned adjacent feed rolls 111 and 112. To allow the yarn core to move smoothly into the chamber 130 established between the belts, a fixed transfer bridge 125 is interposed between the circular periphery of roll 123 and the straight sides of feed rolls 111 and 112, corresponding with the respective shapes. Transfer bridge 125, as shown in FIG. 11, has a generally V-shaped opening in its upper portion with curved sides 127 matching the curvature of feed rolls 111 and 112. Therefore, yarn smoothly flows from crimping zone 106, over transfer bridge 125 and then between belts 101 and 122.

Rotating feed rollers 111 and 112 are adjacent to fixed back plate 114 and fixed transfer bridge 125, and therefore slight gaps will probably exist between these components due to manufacturing tolerances and alignment. The yarn in the crimping process, being under pressure, will tend to migrate into these gaps. To prevent this occurrence, filler elements 128 and 129 are provided to fill the gaps. Filler element 128 spans the gap between the rotating feed rollers 111 and 112 and the fixed transfer bridge 125, and is seated in a slot or indentation in transfer bridge 125, extending outwardly therefrom to wipe the sides of feed rollers 111 and 112. Similarly, filler element 129 is carried by back plate 114, and spans the gap between back plate 114 and the feed rollers, terminating in a wiping action against the side of the feed rollers. Filler elements 128 and 129 can be manufactured of any suitable material such as felt or Teflon.

The yarn engaging surfaces of the belts 101 and 122 can be horizontally aligned and of equal distance throughout their length, or they can be non-parallel. The characteristics of the crimp can be affected by the relationship of the two belts, and it is therefore within the scope of this invention to alter the relationship of belts 101 and 122 to promote the desired characteristics, although means for doing, such as adjustable mountings for belt rolls 102, 103, 123 and 124 are not shown. Furthermore, while belts 101 and 122 are each shown mounted upon a pair of rolls, other arrangements, such as four small rolls, for example, are contemplated.

Furthermore, various types of surface materials and various cross-sectional designs may be provided on the belts. For example, the yarn engaging surface of one or both of the belts can be covered by bristles, felt, or coarse material. The belts can be perforated or can have raised protuberances or ribs. The width of upper belt 101 can vary, and the more narrow the width the closer belt 101 can be placed to the bite of feed rolls 111 and 112.

Conveyor belts 101 and 122 together form the top and the bottom of a chamber 130 through which the crimped yarn moves. Sides can be provided for this chamber in order to positively confine the core of moving yarn for at least a portion of the traverse between the belts. To accomplish this, a channel member 131 having a trough 132 is installed so that the belts are received in trough 132 in the manner shown in FIG. 14. Channel member 131 originates adjacent transfer bridge 125 and extends along the path of belt 122. A cutout 133 is provided to receive roll 123 and to bring belt 122 into the channel. The floor of trough 132 advantageously functions as a backing element for belt 122, and may be provided with a surface of anti-friction material.

Usually, a crimp is set into the yarn by a setting process including a heating step and a cooling step. These steps can be accomplished while the yarn is confined in trough 132. A heater 136 is inserted in an opening 137 in the lower portion of channel member 131, to heat the yarn passing above. Although a conduction type heater 136 is shown, other types of heaters can be used. For example, channel member 131 can be provided with openings communicating with trough 132 and superheated steam can be provided through these openings to flow upwardly into chamber 130 to heat the yarn. A cooling zone can also be established in chamber 130 by providing cooling means installed in channel member 131, although such means is not shown. Of course, such heating and cooling means can also be installed downstream of the belts. Additional yarn treatment steps, such as dyeing, can also be performed while the yarn is in trough 132, or the belts can be extended beyond trough 132 to carry the crimped yarn into treatment zones.

While the drawings show rolls 102 and 103 mounted above the crimping zone, these rolls could also be positioned below the crimping zone, outside of the envelope established by belt 122 and rolls 123 and 124. However, the yarn engaging surface of belt 101 is still above the yarn engaging surface belt 122, so their rela-

tionship at the yarn remains the same as described above.

The interrelationship of the various components can be varied to affect the characteristics of the crimp placed in the yarn. One of the most important relationships is that of the speed of the feed rolls versus that of the belts, which has a direct effect upon the leg length and the crimp angle. The distance between upper belt **101** and the bite of the feed rolls affects the leg length of the crimp. Furthermore, crimp characteristics can also be affected by providing the two belts with differing linear speeds, or by causing them to be convergent or divergent, rather than parallel, as shown. This invention contemplates such adjustable features, and although all of them have not been illustrated, it should be realized that they are to be considered as within the scope of the invention.

The operation of the second embodiment of the invention is like that of the first embodiment. The yarn is received in the bite of feed rolls **111** and **112** via tranverse mechanism **121**. The yarn is crimped against belt **101** or the mass of previously crimped yarn adjacent thereto, and is then moved out of crimping zone **106** across transfer bridge **125**, initially by the action of upper belt **101**, and then by the action of both belts. Setting treatment as well as other yarn treatment can be accomplished while the crimped yarn is moved by the belts through trough **132**.

A third embodiment of this invention is illustrated in FIGS. **15** through **22**. In this embodiment, an upper belt like those previously described is used in cooperation with a pair of oppositely threaded helical screw members operating in the manner of a screw conveyor.

Looking now to FIG. **15**, an upper belt **201** is mounted for movement in the direction indicated on a pair of rollers **202** and **203**. Belt **201** is backed by a pressure pad **204** appropriately placed to provide the back pressure necessary for the crimping operation, and pressure pad **204** is advantageously covered with a low friction pad **205** to engage the belt **201**. Yarn **207** passes, via a traversing element **208**, into the bite of a pair of feed rollers **210** and **211** which function in the normal manner to pass the yarn upwardly to crimping zone **212**, where the yarn is crimped against belt **201** or the mass of previously crimped yarn. A back plate **213** is provided adjacent feed rolls **210** and **211** and is provided with a slot **214** through which belt **201** passes. Feed rolls **210** and **211** are mounted on shafts **209** that are journaled in back plate **213**. Drive to the feed rollers can be imparted through shafts **209**.

Cooperating with belt **201** to move the mass of crimped yarn from the crimping zone **212** at a controlled rate are a pair of oppositely threaded helical screw members **216** and **217**, which are mounted in parallel relationship adjacent one another. Screw members **216** and **217** are driven in opposite directions by suitable drive means, not shown. The type and pitch of the threads provided can be chosen to fit particular requirements. The rate of rotation of screw members **216** and **217** is normally such that the speed of linear movement imparted to the yarn by the screw members is the same as that imparted to the yarn by belt **201**. However, it should be recognized that a difference in speeds between belt **201** and screw members **216** and **217** can be provided if such is advantageous. Screw members **216** and **217** are usually rotated in the direction shown so that the yarn tends to be pushed upwardly against belt **201**, to preclude migration of the yarn into the nip between the screw members. Belt **201** and screw members **216** and **217** cooperate to form a generally triangular-shaped passage **218** through which the yarn is moved. The ends of screw members **216** and **217** are placed close to feed rolls **210** and **212**. One method for mounting screw members **216** and **217** is shown in FIG. **17**. In this arrangement, one end of the screw members **216** and **217** is supported by the feed rolls by means of screw member stub shafts **220** and journal bearings **221** carried by the feed rolls. However, the screw member can be separately mounted. The feed rolls are usually driven independently of the screw members and therefore can be turning at a different rate. The relationship between the belt **201** and the screw members **216** and **217** is best shown in FIG. **18**.

FIGS. **19** through **22** show a modification of the structure described above. In this modification a transfer bridge **224** is interposed between feed rollers **210** and **211** and screw members **216** and **217**. One function of transfer bridge **224** is to provide bearing support for the feed rolls and the screw members. A plurality of bearing surfaces **225** engage stub shafts **226** carried by the feed rollers and stub shafts **220** of the screw members. As shown in FIG. **22**, by this arrangement the feed rollers and screw members need not be of equal diameter, nor need they be coaxial. A base member **228** is interposed in the nip between screw members **216** and **217**. Base member **228** has a surface **229** that forms the base of the chamber **218** through which the yarn is moved. When base member **228** is used, screw members **216** and **217** can be spaced apart. The relationship of upper belt **201**, feed rollers **210** and **211**, screw members **216** and **217**, and base member **228** is best shown in FIG. **22**.

Transfer bridge **224** is provided with inward facing curvatures **232** which coincide with the shape of curvature of feed rollers **210** and **211** on the one hand, and with the curvature of screw members **216** and **217** on the other hand. If a base member **228** is utilized, transfer bridge **224** must include a base portion **234** to correspond with surface **229**.

It is advantageous to construct the embodiment just described in such a way as to allow belt **201** and its associated rollers **202** and **203** to be pivotally installed upon the fixed portion of the machine so that they may be rotated upwardly in order to provide access to crimping chamber **212** and to screw members **216** and **217**.

The crimp setting operation can take place in this embodiment by providing the screw members with means for heating and/or cooling at least portions of them. As an alternative, jackets can be constructed around the yarn moving mechanism to form heating, cooling, or yarn treatment chambers.

The operation of the third embodiment is the same in principle as the other embodiments. Yarn **207** is received in the bite of feed rollers **210** and **211** and is then crimped against belt **201**. Thereupon, the yarn is moved over transfer bridge **214** by belt **201**, and is further engaged by the rotating screw members **216** and **217**. Confined in chamber **218** between belt **201** and the screw members, the crimped yarn is moved through or to a setting operation. As above stated, the varying of speeds and distances between cooperating elements can be used to control certain crimp characteristics.

It should be understood that although particular features are described with regard to one embodiment of the invention, these features are not intended to be limited to that one embodiment but, where applicable, can be used in the other embodiments. Suitable adjustment means for varying speeds and distances, for the most part not contained in the drawings in the interest of clarity, are to be provided.

Many variations and modifications of this invention may become apparent to one skilled in the art, and it should be realized that the invention is not to be considered as restricted to the structure shown and described, but is limited only by the scope of the following claims.

What is claimed is:

1. Apparatus for crimping yarn comprising:

a pair of driven feed rolls having a bite through which yarn is fed for crimping,

a first driven conveyor belt mounted to pass between said feed rolls adjacent the bite and parallel to the axes of said feed rolls, said first conveyor belt cooperating with said feed rolls to form a crimping zone wherein the yarn is crimped as it is fed from said bite against the surface of said first conveyor belt,

a second driven conveyor belt disposed in opposed relationship to said first conveyor belt and cooperating therewith to form a confined area along which said crimped yarn is moved, said second conveyor belt being mounted on a plurality of belt rollers, one of said belt rollers being in juxtaposition to said crimping zone, and

a transfer bridge spanning the gap between said crimping zone and said second conveyor belt to facilitate smooth passage of yarn from said crimping zone to said second conveyor belt, said transfer bridge comprising a plate having an opening therethrough for the passage of yarn and a first filler element aligned with said opening and wipingly engaging said feed rollers at the bite thereof to insure that yarn cannot intrude between said rotating feed rollers and said transfer bridge.

2. Apparatus as set forth in claim 1 including a pressure element disposed against said first belt in the zone of said bite for providing the back pressure required for crimping.

3. Apparatus as set forth in claim 2 in which said element is mounted for vertical movement and yieldable means is provided for holding said element against the surface of said first belt.

4. Apparatus as set forth in claim 3 in which said element comprises a pad having a low friction surface in contact with said first belt.

5. Apparatus as set forth in claim 1 in which adjustable means is provided for mounting said first belt whereby the spacing of said first belt from said bite may be controlled.

6. Apparatus as set forth in claim 1 in which the contacting surface of said first belt is formed with spaced recesses for producing areas wherein crimps of different leg length are formed.

7. Apparatus as set forth in claim 1 wherein spaced pins are carried by the contacting surface of said first belt.

8. Apparatus as set forth in claim 1 further comprising a fixed member having a channel therethrough, said conveyor belts passing through said channel and together therewith forming a confined chamber through which said crimped yarn is moved.

9. Apparatus as set forth in claim 8 wherein said channel has an input end disposed adjacent one face of said feed rolls and a back plate is disposed adjacent the opposite face of said feed rolls at said bite to form with said feed rolls and said conveyor belt a confined crimping zone.

10. Apparatus as set forth in claim 1 in which said belts are substantially parallel to one another.

11. Apparatus as set forth in claim 1 wherein said first and second conveyor belts define a yarn setting zone downstream of said feed rollers.

12. Apparatus as set forth in claim 11 in which said setting zone includes heating and cooling zones.

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