

May 22, 1962

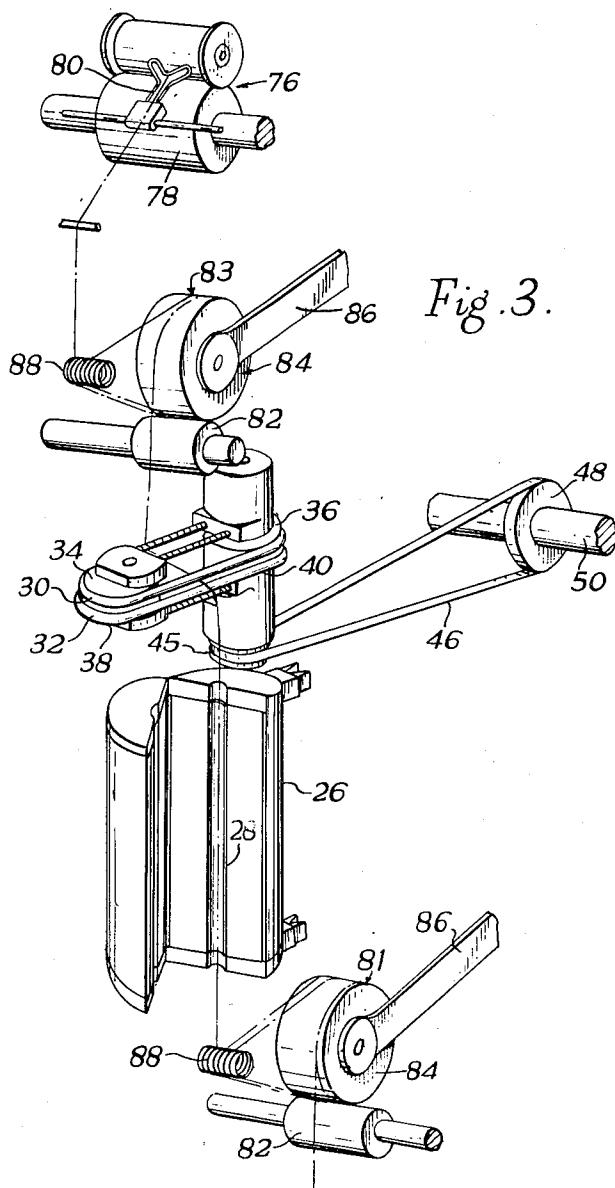
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BELT FALSE TWISTING APPARATUS FOR CRIMPING OF TEXTILE YARNS

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5 Sheets-Sheet 2



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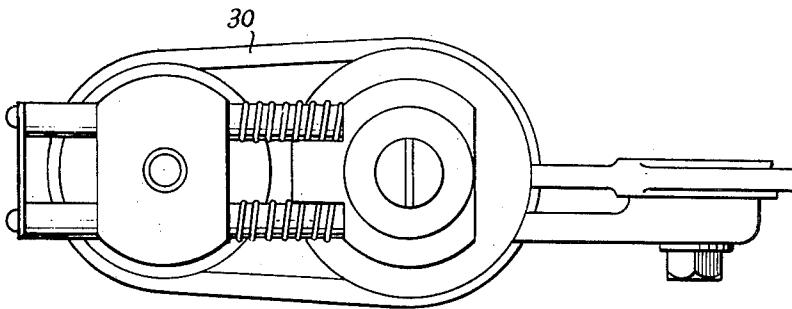


Fig. 5.

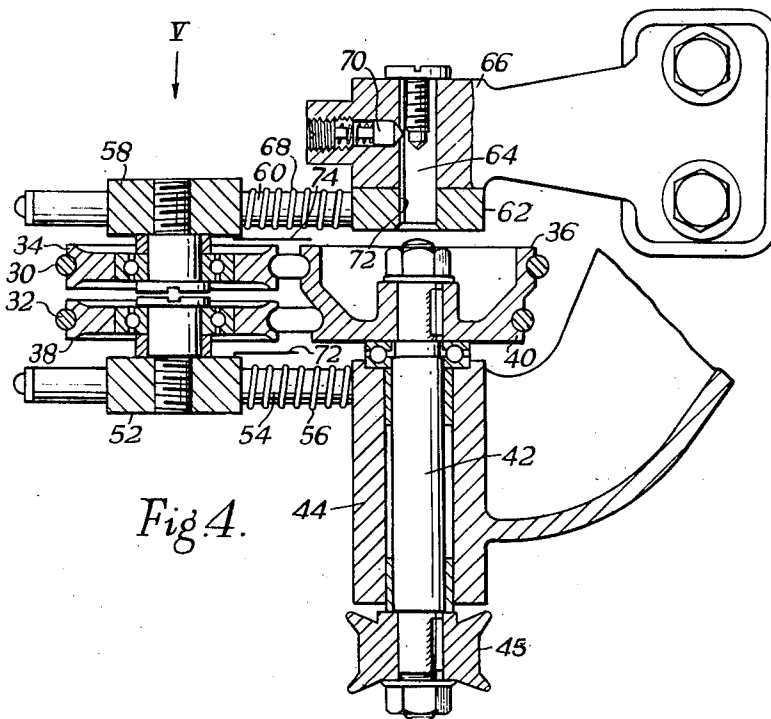


Fig. 4.

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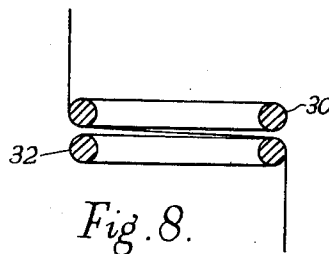
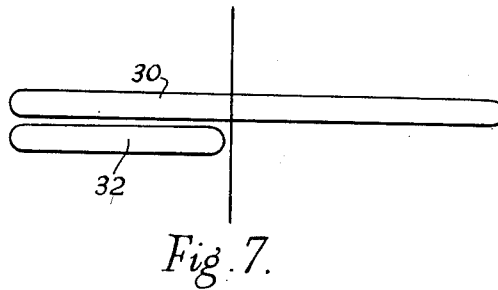
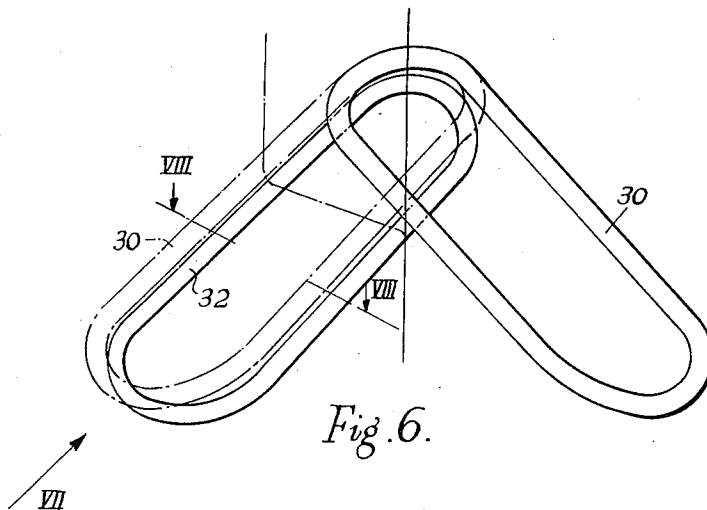
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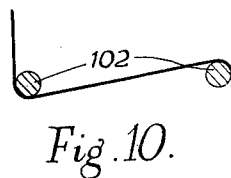
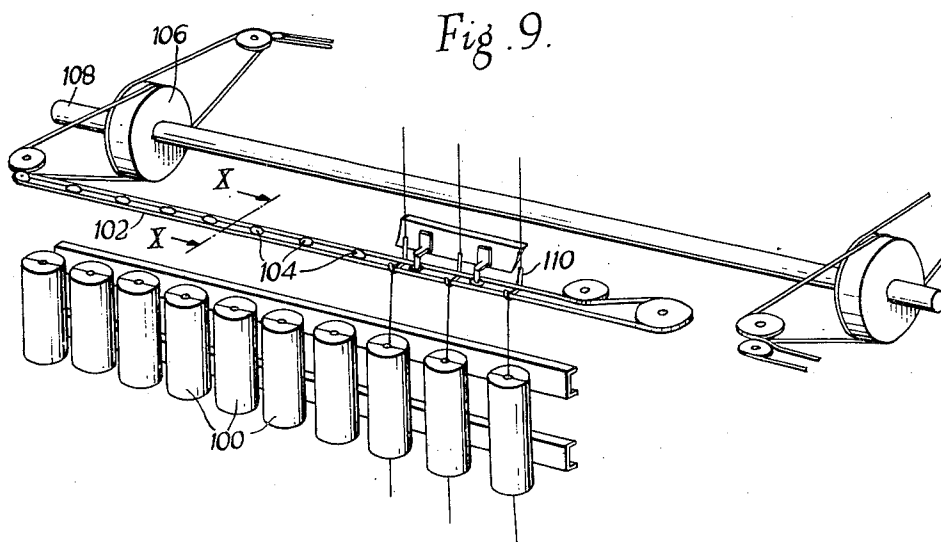
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5 Sheets-Sheet 5



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3,035,397

BELT FALSE TWISTING APPARATUS FOR CRIMPING OF TEXTILE YARNS

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For many purposes it is desirable to impart crimp or corrugations to textile yarns or filaments whereby individual filaments or fibres are coiled or crimped and the yarn is given a soft or woolly feel and appearance, and thereby acquires some of the characteristics of natural fibres, besides having a substantial degree of elasticity.

One method at present in use for this purpose, is to impart twist to the yarn, then set the twist by subjecting the yarn to heat, and finally to untwist the yarn. This method, involving three separate operations, and handling between the operations, is time consuming and expensive, and requires expensive apparatus.

An improvement on this method, whereby the crimping is done in one operation, comprises imparting false twist to the yarn and applying heat to set the twist as the latter is applied. For this purpose the yarn is withdrawn from a yarn package and passed through a heating chamber on its way to a false twist tube where twisting and untwisting takes place, the yarn being twisted where it extends between the tube and the yarn package, including the length of yarn within the heating chamber, and being untwisted as it leaves the tube from which it passes to a known winding device where it is wound on to a paper tube or the like to form a treated yarn package. This single operation method of crimping synthetic yarn is much more efficient than the three operation method, but it requires very expensive mechanism, and the rate of production is limited by the speed at which the false twist tubes can be operated.

The present invention is designed to provide an improved method and means for crimping textile yarns or filaments whereby the false twist tubes are eliminated and the speed of operation can be increased as compared with the said method of imparting false twist.

According to the invention, yarn to be crimped is traversed longitudinally and during such traverse is passed into contact with a belt moving across the direction of traverse of the yarn so as to impart false twist to the yarn, the direction of the yarn being changed as it travels away from the belt, and setting of the twist in the yarn is effected at one side of the belt. Setting of the twist may be effected by applying heat to the yarn. Preferably, the yarn is passed successively into contact with two belt flights moving across the path of travel of the yarn, and such belt flights may be moving in opposite directions. For example, the yarn may be passed over one flight and then under the other flight of an endless belt extending around and between two pulleys. Alternatively two endless belts may be provided, the yarn being passed over one flight of one belt and under one flight of the other belt. Consequently, where the yarn is passed successively into contact with two belt flights, it will follow a sinuous path, its direction of travel being changed as it leaves each belt flight, and its final direction may be substantially the same as or parallel with the direction it followed as it approached the first belt flight. It is preferred that setting of the twist should be effected in the yarn as it approaches the belt flight or the first belt flight, but the twist will be removed as the yarn passes away from the belt flight or the second belt flight as the case may be.

In order that the invention can be clearly understood

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and readily carried into effect, apparatus in accordance with the invention for crimping synthetic textile yarns will now be particularly described, by way of example only, with reference to the accompanying drawings, in which,

FIGURE 1 is a diagrammatic end view showing one form of apparatus in accordance with the invention,

FIGURE 2 is a front elevation of one crimping station of the apparatus shown in FIGURE 1,

FIGURE 3 is an enlarged diagrammatic perspective view of the apparatus shown in FIGURE 2, but with the yarn package omitted,

FIGURE 4 is an enlarged sectional view of means for imparting false twist to the yarn,

FIGURE 5 is a view in the direction of arrow V in FIGURE 4,

FIGURE 6 is a diagrammatic perspective view showing the false twist means in an inoperative position,

FIGURE 7 is a view in the direction of arrow VII in FIGURE 6,

FIGURE 8 is a sectional view on line VIII—VIII in FIGURE 6 when the false twist means is in the operative position,

FIGURE 9 is a diagrammatic perspective view showing an alternative form of apparatus in accordance with the invention, and

FIGURE 10 is a sectional view on line X—X in FIGURE 9.

Referring to FIGURES 1 to 8 of the drawings, the apparatus for effecting crimping of the yarn comprises a frame 20, having a series of yarn crimping stations spaced apart between its ends, at each station means for supporting a yarn package at the bottom of the frame, whilst disposed above each yarn package supporting means, and carried by the frame, is a heating device 22, a false twist device 24 and means for winding the treated yarn into a package.

The yarn package supporting means may be of any convenient or known construction and the number of crimping stations on the frame 20 will depend upon the length of the frame 20.

The heating device comprises a vertically disposed cylinder 26 housing an electrical resistance heating element 28, the said cylinder being split longitudinally and the two parts being hinged together so that the cylinder can be opened, as shown in FIGURE 3 of the drawings to facilitate insertion of yarn into the cylinder.

Control means are provided for controlling the temperature within the cylinder 26 and such control means may incorporate a thermostat device.

The false twist device 24 comprises a pair of endless belts 30, 32, the belt 30 being disposed immediately above the belt 32, whilst each belt 30, 32 passes around a pair of spaced apart pulleys 34, 36 and 38, 40 respectively, the corresponding pulleys of the two belts being rotatable about aligned vertical axes. The two pulleys 36 and 40 are formed integrally with one another and are secured on a shaft 42 which is supported in a bearing 44, carried by the frame 20, and mounted on the shaft 42 is a pulley 45 which is driven by a belt 46 extending around a pulley 48 mounted on a driving shaft 50 extending along the length of the frame.

The other pulley 38 of the belt 32 is rotatably mounted on a bracket 52 which is slidably supported on two spaced apart arms 54 extending from the bearing 44, and a spring 56 is interposed between the bracket 52 and the bearing 44 to urge the bracket 52 away from the bearing and maintain the belt 32 in tension.

The pulley 34 of the belt 30 is also rotatably mounted on a bracket 58 which is slidably supported on two spaced apart arms 60 extending from a bearing 62 supported on the lower end of a shaft 64 rotatably mounted in a

bearing 66, the axis of the shaft 64 being in line with the axis of the shaft 42. To maintain the belt 30 in tension, a spring 68 is interposed between the bracket 58 and the bearing 62 to urge the bracket 58 away from the bearing 62.

The belt 30 is retained in alignment with the belt 32 by means of a spring pressed detent 70 carried in the bearing 66 and engaging in an axial groove 72 in the shaft 64, but the belt 30 can be swung about the axis of the shaft 64 so that it is disposed at an angle to the belt 32 as shown in FIGURES 6 and 7 of the drawings. To retain the belt in the angular position, a further axial groove, not shown, is provided in the shaft 64 for engagement by the spring pressed detent 70 when the belt 30 is turned to the angular position.

It is preferred that the linear speed of the upper belt 30 should be slightly higher than that of the lower belt 32. For this purpose the pulley 36 of the upper belt 30 is of larger diameter than the pulley 40 of the lower belt 32.

In order to guide yarn during its passage through the crimping device a V-shaped yarn guide 73, supported on the bracket 52, is disposed adjacent to the front flight of the lower belt 32 at a point midway of its length, whilst a further yarn guide 74 is disposed adjacent to the rear flight of the belt 30 in a similar position and is supported on the bracket 58.

In the particular construction described above, the belts are disposed substantially at right angles to the front and/or rear side of the machine, and consequently reference to the front flight of a belt indicates the leading flight which faces towards one end of the machine, and a rear flight is one which faces towards the other end of the machine. It will be appreciated that there may be a series of yarn crimping stations along the rear side of the machine similar to those along the front of the machine, the belts for all the yarn crimping stations being driven from a common horizontal driving shaft 50 extending centrally along the length of the machine.

The yarn winding means indicated at 76 in FIGURES 1, 2 and 3 of the drawings is of a well known type and comprises a driving roller 78, which is adapted to be rotated from the driving shaft 50, a yarn traversing mechanism 80 and means for supporting a bobbin or the like, the arrangement being that when a bobbin or the like is mounted thereon its periphery engages with the periphery of the driving roller whereby motion is transmitted to the bobbin or the like.

A yarn feeding device 81 is disposed between the yarn package supporting means and the heating device and a similar device 83 is disposed between the false twist device and the yarn winding means, each of the said feeding devices comprising a driving roller 82, 82' and a freely rotatable roller 84, 84' mounted on one end of an arm 86, 86' pivotally mounted on the frame 20, each of the said arms 86, 86' also supporting a guide eye 88, 88'.

When yarn is to be crimped by the above described apparatus, a yarn package is mounted on the supporting means at the lower end of the frame 20, and the free end of the yarn is then passed through an initial tensioning device 90. The yarn is then passed through the feeding device 81, through the heater 22, where it extends adjacent to the heating element 28, to the false twist device 24, which has the belt 30 arranged at an angle to the belt 32 as shown in FIGURE 6 of the drawings. The yarn is then passed through the guide 73 and taken to the feeding device 83 from whence it is passed to the yarn winding means 76. The heater 22 is then closed and locked, and the belt 30 of the false twist device returned to the position where it is disposed over and aligned with the belt 32, and during the return movement the yarn guide 74 engages with the yarn so the yarn is then drawn over the front flight of the belt 32 and under the rear flight of the belt 30.

The apparatus is then set in motion whereby yarn is

drawn through the false twist device, and as the belts 30 and 32 are moving at right angles to the direction of the yarn, false twist is imparted to the yarn. Although the front flight of the belt 32 will be moving in the opposite direction to the rear flight of the belt 30, each belt will impart false twist in the same direction because they are engaged by opposite sides of the yarn. There will therefore be twist of one hand above the belts and twist of the opposite hand below the belts, but the twist imparted by the belts will not be present in the yarn when it reaches the feeding device 83. The twist below the belts extends along the length of yarn within the heater which serves to set this twist, but above the belts the twist is removed and consequently the individual filaments of the yarn have a tendency to curling when tension in the yarn is released. The speed of the feeding device 83 is so related to the speed of the winding device as to relieve tension in the yarn a predetermined amount. The final result is that a permanent crimped or woolly appearance is imparted in the yarn.

In the particular arrangement described above, a pair of belts are provided for each yarn crimping station for co-operation with a single yarn, but it will be understood that each pair of belts may be arranged to engage with two or more yarns. Furthermore, the belts may be disposed at right angles relatively to the paths of the yarns or they may be relatively inclined, for example at 45 degrees, to the paths of the yarns. It is preferred that the two belts should be parallel with one another, but if desired they may be inclined relatively to one another.

In the arrangement shown in FIGURES 9 and 10 of the drawings, a frame not shown has a series of yarn crimping stations spaced apart between its ends, each crimping station comprising yarn package supporting means, not shown, a heating device 100, which is constructed as described in the previous example, a yarn twisting device, and a winding mechanism, not shown. Apart from the twisting device the apparatus is similar to the previously described apparatus.

The yarn twisting device is common to all the crimping stations and comprises an endless belt 102 which extends along the length of the frame and is disposed above and to the rear of the heating device 100, the front and rear flights of the belt being arranged one behind the other and preferably in the same horizontal plane.

The belt 102 is supported on a series of spaced apart idler or guide pulleys 104 and is adapted to extend around a driving pulley 106 carried on a driven shaft 108, and means, not shown, are provided to enable the speed of the belt to be varied, and yarn guides 110 are disposed at the rear of the belt 102.

Yarn feeding means, not shown, which are constructed in the same manner as those described in the previous example are disposed between the yarn package supporting means and the heating device and between the twisting device and the winding mechanisms. At each station the yarn passes upwardly through the heater 100, over the front flight of the belt 102, then horizontally and slightly downwardly to pass beneath the rear flight, and then upwardly to the feeding device and on to the winding mechanism.

With this arrangement, false twist will be imparted to the yarn as in the previously described construction, the twist in the yarn below the belt being set by the heaters, so that when the yarn reaches the feeding device the twist will have been removed but the individual filaments will be crimped.

It is preferred that the crimping stations should be divided into groups and a separate belt should be provided for each group so as to avoid the belt having to be unduly long. Furthermore, a second series of crimping stations may be provided at the rear of the machine frame, exactly like those at the front of the frame, a common driving shaft extending centrally along the frame for driving all the belts. As shown in FIGURE 9, a guide pulley 104

between and engaging with both flights of the belt is disposed between each two crimping stations, each guide pulley being carried by a bracket secured to a rail extending along the length of the frame. The tension in the yarn will tend to maintain the belt in engagement with the guide pulleys.

The belts for engagement with the yarns may be made of any convenient material and this may depend upon the type of textile yarn or filaments with which they are to be used. The belts should provide the amount of frictional engagement necessary to impart the desired false twist, but they should be sufficiently hard to withstand the wear to which they will be subjected. The belts may therefore be made of natural or synthetic rubber, for example synthetic rubber having a hardness of between 70° and 85° as indicated by the Shore durometer, has been found satisfactory for treating polyester yarns. Furthermore, where two belts are employed, they may be made of different materials and/or have different cross-sectional shapes and/or have different surfaces, that is the surfaces may be smooth or roughened, for example the surfaces may be ribbed or the like. It is preferred that the belts should be circular in cross-section, but any other convenient cross-sectional shape may be used.

What is claimed is:

1. Apparatus for crimping textile yarns, comprising means for traversing the yarn longitudinally, two spaced apart oppositely moving belt flights disposed across the path of traverse of the yarn whereby said yarn passes in engagement over one belt flight and passes in engagement beneath the other belt flight, means for driving said two belt flights in opposite directions relatively to one another so as to impart false twist to the moving yarn, means for changing the direction of the yarn as it travels towards one belt flight and as it travels away from the other belt flight, and means disposed at one side of said belt flights for setting the twist in the yarn.

2. Apparatus as defined in claim 1, wherein said two spaced apart belt flights comprise two flights of an endless belt.

3. Apparatus as defined in claim 1, comprising a heating chamber disposed to heat a length of the yarn approaching said belt flights for setting the twist in said yarn.

4. Apparatus as defined in claim 2, wherein said endless belt is disposed with said two flights parallel.

5. Apparatus for crimping textile yarns, comprising means for traversing yarn longitudinally, two endless belts disposed adjacent to one another and across the path of said yarn whereby said yarn passes sinuously into successive direction changing contact with one flight of each belt as said yarn is being traversed to impart false twist in the moving yarn, said one flight of the respective belts moving in opposite directions and contacting opposite sides of said yarn, and means for setting the twist in the yarn as said yarn is being traversed.

6. Apparatus as defined in claim 5, wherein said two endless belts are so disposed that said yarn passes through a space between said belts in successive contact with the leading flight of one belt and the trailing flight of the other belt.

7. Apparatus as defined in claim 1, wherein at least one of said flights is made of synthetic rubber having a hardness of between 70° and 85° Shore.

8. Apparatus as defined in claim 5, wherein at least

one of said endless belts is made of synthetic rubber having a hardness of between 70° and 85° Shore.

9. Apparatus for crimping textile yarns comprising a frame, a plurality of yarn crimping stations spaced apart between the ends of said frame, each yarn crimping station comprising means for traversing yarn substantially vertically and yarn heating means disposed in the path of said yarn, a continuously driven endless belt having two oppositely moving flights extending across the yarn paths of at least some of said yarn crimping stations, said belt being positioned above said yarn heating means and the two flights of said belt successively engaging with said vertically moving yarn at each station with each yarn to be crimped passing over one of said flights and under the other of said flights.

10. Apparatus as defined in claim 9, wherein said plurality of yarn crimping stations comprise a plurality of groups of stations, a horizontally disposed endless belt is provided for each said group, each said belt extending across the vertical yarn paths of all the crimping stations of its associated group and the two flights of said belt successively being engageable with the vertically moving yarns at all said stations.

11. Apparatus for crimping textile yarns comprising means for traversing yarn longitudinally, two endless belts disposed adjacent to one another and across the path of said yarn whereby said yarn passes sinuously into successive contact with one flight of each belt as the yarn is being traversed to impart false twist in the moving yarn, means supporting one belt in cantilever fashion whereby the gap between the two belts is open at one end for insertion of said yarn therein, and means for setting the twist in the yarn as said yarn is being traversed.

12. Apparatus for crimping textile yarns comprising means for traversing yarn longitudinally, two endless belts disposed adjacent to one another and across the path of said yarn whereby said yarn passes sinuously into successive contact with one flight of each belt as the yarn is being traversed to impart false twist in the moving yarn, means mounting one belt for lateral displacement relatively to the other belt to facilitate insertion of the yarn between said belts, and means for setting the twist in the yarn as said yarn is being traversed.

13. Apparatus for crimping textile yarns comprising means for traversing yarn longitudinally, two endless belts disposed adjacent to one another and across the path of said yarn whereby said yarn passes sinuously into successive contact with one flight of each belt as the yarn is being traversed to impart false twist in the moving yarn, means driving said two endless belts at different linear speeds, and means for setting the twist in the yarn as said yarn is being traversed.

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