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YARN CRIMPING APPARATUS

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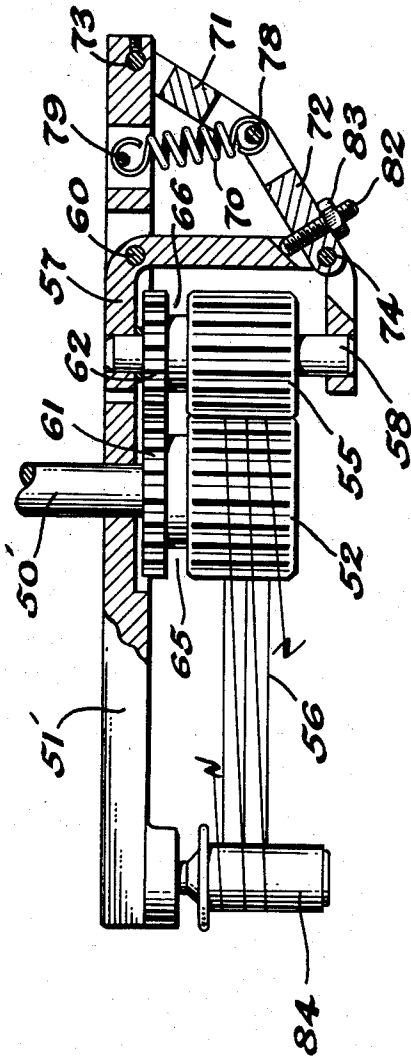


Fig. 3.

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1

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**YARN CRIMPING APPARATUS**

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4 Claims. (Cl. 28—1)

This invention relates to yarn crimping apparatus and more particularly to yarn crimping apparatus having yieldably mounted crimping rolls.

One of the disadvantages of yarn crimpers of the gear type used in the past is that the crimping gears are sometimes jamming by the buildup of yarn thereon. The yarn buildup or accumulation might be caused by a defect or a break in the yarn, the yarn then wrapping around and accumulating on one of the rotating crimping gears. Yieldable crimping gears have been used in the past but they are subject to much damage when separated and then reunited during the crimping operation. The reason for this is that these gears almost always get out of mesh when separated by a yarn buildup. Then, upon clearance of the buildup, the moving gears come together out of mesh. This results in considerable damage to the teeth of the gears. Even a small amount of damage necessitates a gear replacement, since roughened gear teeth will damage the yarn. With this problem in mind, one of the objects of this invention is to provide a novel and improved crimping apparatus.

A further object of this invention is to provide a yarn crimper having a yieldably mounted crimping gear.

Another object of this invention is to provide a yarn crimping apparatus having a pair of separable crimping gears which remain in operating alignment even when separated.

A further object of this invention is to provide a yarn crimping apparatus having a pair of crimping gears, one of which is pivotally mounted about an axis radially and longitudinally beyond the gear.

An apparatus illustrating the principles of the invention may include a pair of yarn crimping gears, a first of which is driven through a shaft and the second of which is mounted on a yoke which is pivotally supported. The gears have attached thereto spur gears which serve as a driving connection from the first crimping gear to the second. The pivot point of the yoke is at a location about 45° from the center of the second crimping gear, with the spur gears being adjacent to the pivot point. The yoke is resiliently urged toward the first crimping gear. Because of this construction, a yarn accumulation on the first crimping gear moves the yoke and separates the crimping gears while leaving the spur gears in mesh. Thus, when the yarn buildup clears the crimping gears, these gears will reunite without engaging each other.

Other objects and advantages of the invention will become apparent when the following detailed description is read in conjunction with the appended drawings, in which:

FIGURE 1 is a side view of one embodiment of the invention with portions broken away to show the mounting of a gear-supporting yoke;

FIGURE 2 is a fragmentary top view of the disclosure of FIGURE 1 taken along line 2—2 and showing springs used for withdrawing the gear-supporting yoke; and

FIGURE 3 is a side view of a second embodiment of the invention showing a linkage mechanism used for holding a yoke in operating position.

Referring now in detail to the drawings, a frame 11 (FIG. 1) is shown supporting a first crimping gear 12 which is driven in a well known manner through a shaft 13. The gear 12 cooperates with a second crimping gear 16 which is rotatably mounted on a shaft 17 attached to a U-shaped yoke 18. The configuration of the teeth on

2

the crimping gears is such that heated thermoplastic yarn passing between these gears has a crimp imparted thereto. These teeth are not suited for driving another gear or being driven by another gear. In fact, it is very important that the gears 12 and 16 do not touch each other, since engagement of these gears will damage the gear teeth.

Since the teeth on the driven first crimping gear 12 are not suited for driving the second gear 16, ordinary spur gears 21 and 22 are provided for this purpose. The spur gears 21 and 22 are secured to but spaced from the crimping gears 12 and 16, respectively, so that the second crimping gear 16 is driven from the shaft 13 through the spur gears 21 and 22. Thus, the crimping gears 12 and 16 are driven without actually touching each other.

To provide for separation of the crimping gears 12 and 16 upon a yarn buildup, the yoke 18 is pivotally mounted on a pin 25 which is secured to the frame 11 at a point both longitudinally and radially beyond the crimping gear 16. In other words, neither a radial nor longitudinal extension of the second crimping gear 16 would intersect the axis of the pin 25, the axis of the pin 25 being perpendicular to the axes of the crimping gears 12 and 16. Relative to a point at the center of the crimping gear 16, the pivot pin 25 is located at an angle of about 45° from the axis of the shaft 17. The pivot pin 25 is adjacent to or lies substantially in the plane defined by the spur gears 21 and 22 and is perpendicular to a plane through the axes of the shafts 13 and 17. The pin 25 is also adjacent to the periphery of the spur gear 22.

It can be seen that, upon initial movement of the yoke 18, the second crimping gear 16 will move away from the first crimping gear at about a 45° angle relative to the axis of the drive shaft 13, while the spur gear 22 will move in a direction almost parallel to the axis of the drive shaft 13. Thus, the crimping gears 12 and 16 may be completely separated while the spur gears 21 and 22 remain in mesh. Since the spur gears 21 and 22 remain in mesh, the crimping gears 12 and 16 cannot get out of mesh and damage each other upon reuniting after clearance of the fault which has caused the separation.

The yoke 18 is urged toward operative position by a plunger 26 of an air cylinder 27 which is connected by a line 28 to a source 29 of compressed air. Since the pressure medium utilized in the cylinder 27 is a gas, the yoke 18 can move against the action of the plunger 26 when a yarn buildup occurs.

The operating position of the second crimping gear 16 relative to the first crimping gear 12 may be adjusted by means of a stud bolt 32 which is secured by a lock nut 33. The stud bolt 32 is threaded through the yoke 18 and engages the frame 11.

Tension springs 38 connected in parallel between brackets 39 and 40 secured to the yoke 18 and the air cylinder 27, respectively, serve to urge the yoke 18 in a clockwise direction (FIG. 1). Thus, when the air cylinder 27 is disconnected from the air source 29, the springs 38 move the yoke 18 to separate the crimping gears 12 and 16 for purposes of inspection or lacing up of the yarn prior to operation.

The yarn 41 to be crimped passes around a heated draw pin (not shown) of a well known type where the yarn is heated to a temperature suitable for crimping. The draw pin is a conventional unit, mounted in the usual manner on the frame 11. After passing over the draw pin, the yarn 41 takes several turns or wraps around the first crimping gear 12 and an idler roll 46 mounted on the frame 11, as shown in FIGURE 1. The yarn 41 then leaves the crimping apparatus and is taken up by a conventional mechanism (not shown).

A switch 47 mounted above the air cylinder 27 is provided with a plunger 48 which is moved by the yoke 18 to

3

close the switch when a yarn accumulation separates the crimping gears 12 and 16. The switch 47 is connected through a cable 51 to a yarn-sewing device 52. Such a yarn-severing device is disclosed and claimed in copending application Serial No. 70,044, filed November 17, 1960, in the name of William H. Hills for "Filament Severing Devices." Closure of the switch 47 by movement of the yoke 18 will thus cause the yarn to be severed so that no more yarn will be fed to the crimping gears to add to the accumulation.

In operation of this embodiment of the invention, the yarn 41 is advanced past a heated draw pin and takes several turns or wraps around the idler roll 46 and the first crimping gear 12. The gears 12 and 16 cooperate to apply a crimp to the yarn 41.

In the event of a fault in the yarn of such a nature to cause an accumulation or buildup of yarn on the first crimping gear 12, this added yarn thickness forces the second crimping gear 16 and the yoke 18 to pivot clockwise (FIGURE 1). Because of the location of the pivot pin 25, the crimping gears 12 and 16 separate while the spur gears 21 and 22 remain in mesh.

Movement of the yoke 18 moves the plunger 48 to close the switch 47 and actuate the yarn-cutting device. This severs the yarn at a point in advance of the crimping gears and thereby stops the yarn feed to the crimping gears so that the yarn buildup clears itself as the gears 12 and 16 continue to rotate.

Upon clearance of the yarn from the gear 12, the gear 16 will be carried by the yoke 18 back into operating position. Since the spur gears 21 and 22 have remained in mesh, the crimping gears 12 and 16 will reunite without touching and without damage.

A second embodiment of the invention is shown in FIGURE 3. A shaft 50' rotatably mounted on a frame 51' carries a first crimping gear 52 adapted to cooperate with a second crimping gear 55 to crimp a yarn 56. The shaft 50' is driven in a well known manner.

The second crimping gear 55 is mounted on a shaft 53 secured to a yoke 57 which is pivotally mounted on a pin 60 secured to the frame 51'. Since the gears 52 and 55 are not suited for driving each other, spur gears 61 and 62 are provided for establishing a driving connection from the shaft 50' to the second crimping gear 55. The spur gears 61 and 62 are secured to the crimping gears 52 and 55, respectively, grooves 65 and 66 being provided for spacing the spur gears from the crimping gears.

To urge the yoke 57 toward operative position, a spring 70 and a pair of links 71 and 72 are used. The link 71 is pivotally attached to the frame 51' by a pin 73, while the link 72 is pivotally attached to the yoke 57 as shown by a pin 74. A pin 78 serves to connect the ends of the pins 71 and 72. The spring 70 is connected between the pin 78 and a pin 79 secured to the frame 51'.

From FIG. 3, it will be obvious that the spring 70 urges the pin 78 toward the fixed pin 79 to urge the yoke 57 clockwise toward its operative position. To adjust the operative position of the second crimping gear 55, a stud bolt 82 secured by a lock nut 83 extends through the link 72 and engages the yoke 57. By turning the stud bolt 82, the positioning of the second crimping gear relative to the first can be adjusted.

An idle roll 84 mounted on the frame 51' cooperates with the first crimping gear 52 to form a plurality of turns or wraps in the yarn 56. In other words, the yarn 56 passes between the gears 52 and 55, around the idle roll 84, and back between the crimping gears several times.

In the event of a yarn buildup or accumulation on the first crimping gear 52, the second gear 55 is free to move against the action of the tension spring 70. Because of the location of the pivot pin 60 relative to the yoke 57, movement of the yoke will separate the crimping gears 52 and 55 but will not separate the spur gears 61 and 62. In this respect, the second embodiment operates as does the first embodiment.

4

The second embodiment has an additional advantage; in that the force necessary to separate the gears 52 and 55 decreases with separation of the gears. In other words, a heavy force is required to first move the gear 55, but a decreasing force will displace the gear 55 further. This is because of the arrangement of the links 71 and 72, the pins 73, 74 and 78 being almost in line when the yoke is in operative position.

It is to be understood that the embodiments of the invention disclosed herein may be altered or modified and that numerous other embodiments may be contemplated which will fall within the spirit and scope of the invention.

What is claimed is:

1. A device for crimping a yarn, comprising a frame, a first gear rotatably mounted on the frame, a yoke, a second gear rotatably mounted on the yoke for cooperation with the first gear, said yoke being pivotally attached to the frame at a point adjacent to one end of the second gear so that movement of the yoke pivots said second gear toward or away from the first gear, adjustable means on the yoke for limiting movement of the yoke toward the first gear, a spring connected to the yoke for urging said yoke in a direction away from the first gear, and a fluid cylinder mounted on the frame for urging the yoke toward the first gear against the action of the spring.

2. An apparatus for crimping a yarn, comprising a frame, a first crimping gear rotatably mounted on the frame, a driving gear connected to the first crimping gear for rotation therewith, a U-shaped yoke attached at one corner of the U to the frame for pivotal movement about an axis perpendicular to the axis of rotation of said first crimping gear, a shaft supported by the legs of the U-shaped yoke, a driven gear mounted on the shaft adjacent to said axis of pivotal movement, a second crimping gear mounted on the shaft for cooperation with the first crimping gear, means connected to the yoke for urging said yoke in a direction to separate the crimping gears, a fluid cylinder having a plunger engaging the yoke for urging the yoke to carry said second crimping gear toward said first crimping gear, a set screw attached to the yoke for engaging the frame to limit movement of said yoke toward the first crimping gear, and means on the frame for producing a signal in response to a predetermined amount of movement of the yoke away from the first crimping gear.

3. Apparatus for crimping a yarn, comprising a frame, a drive shaft rotatably mounted on the frame, a first crimping gear mounted on the drive shaft, an idle roll mounted on the frame and spaced from the first crimping gear for cooperating with said gear to carry a plurality of wraps of a yarn, a driving gear mounted on the drive shaft, a yoke pivotally attached to the frame, a second shaft mounted on the yoke, a second crimping gear mounted on the second shaft for cooperation with the first crimping gear, a driven gear mounted on the second shaft and meshed with the driving gear, said yoke being pivoted to the frame about an axis substantially in a plane defined by the driving and driven gears, means for urging the yoke to carry the second crimping gear toward the first crimping gear, means for producing a signal in response to movement of the yoke against the urging means, and means connected to the signal producing means for severing the yarn in response to said signal.

4. A device for crimping a yarn, comprising a substantially flat frame, a first crimping gear rotatably mounted on the frame, an idle roll mounted on the frame at a point spaced from the first gear for cooperating with said gear to carry a plurality of wraps of yarn, a yoke mounted on the frame for pivotal movement about a line lying in a plane of the frame, a second crimping gear rotatably mounted on the yoke for cooperating with the first gear to crimp the yarn passing therebetween, a fluid cylinder mounted on the frame and having a plunger engaging the yoke for urging said yoke toward said first gear, a spring connected between the yoke and the frame for moving the

5

yoke away from said first gear when the fluid cylinder is rendered inoperative, said yoke having thereon a projection extending past a portion of the frame, and a set screw threaded through said projection and engaging the frame for limiting movement of the yoke toward the first gear. 5

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