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Buck

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[54] **METHOD AND APPARATUS FOR DEPHASING AND ENTANGLING CRIMP YARN**

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[51] **Int. Cl.**.....**D02q 1/20**

[58] **Field of Search**.....28/1.2, 1, 1.3, 1.4, 1.6, 72.1, 28/72.11, 72.12, 72.14; 19/66, 65

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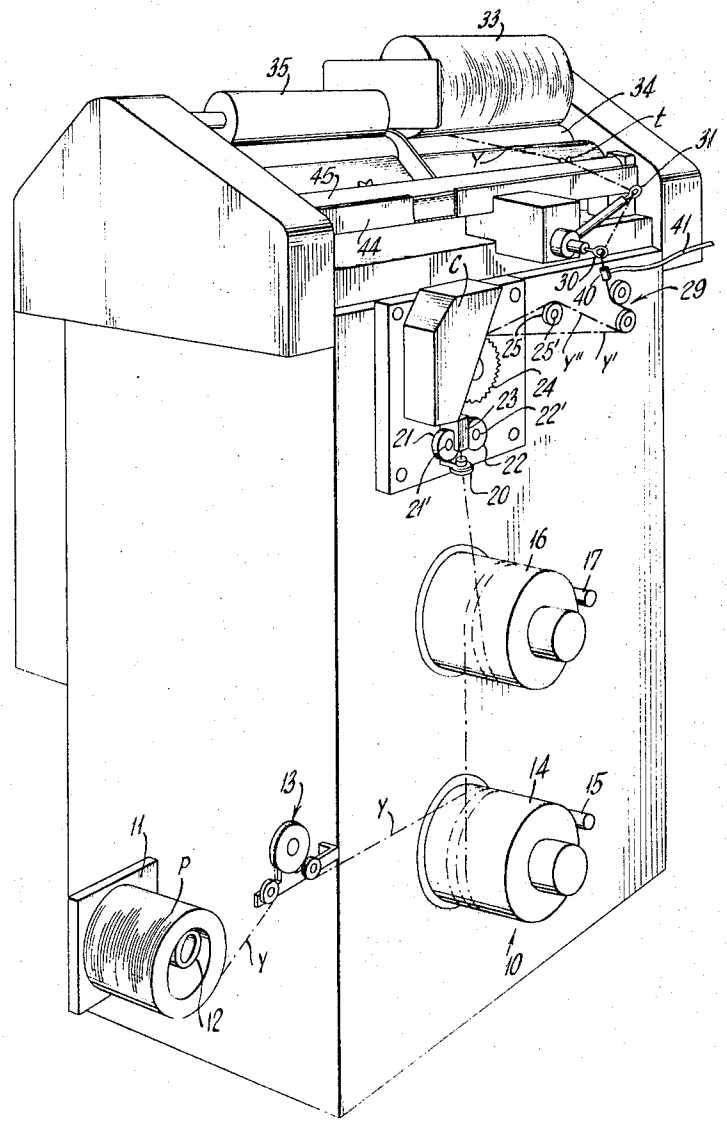
[57] **ABSTRACT**

Multifilament crimped yarn is dephased while the yarn is on the run by separating some of the filaments thereof from the rest of the filaments, advancing both groups of filaments to a point at which the two groups are brought together to form again a single yarn, and between the points of separating and rejoining, guiding one of the groups of filaments over a path of greater length than the path of the other group of filaments.

5 Claims, 1 Drawing Figure



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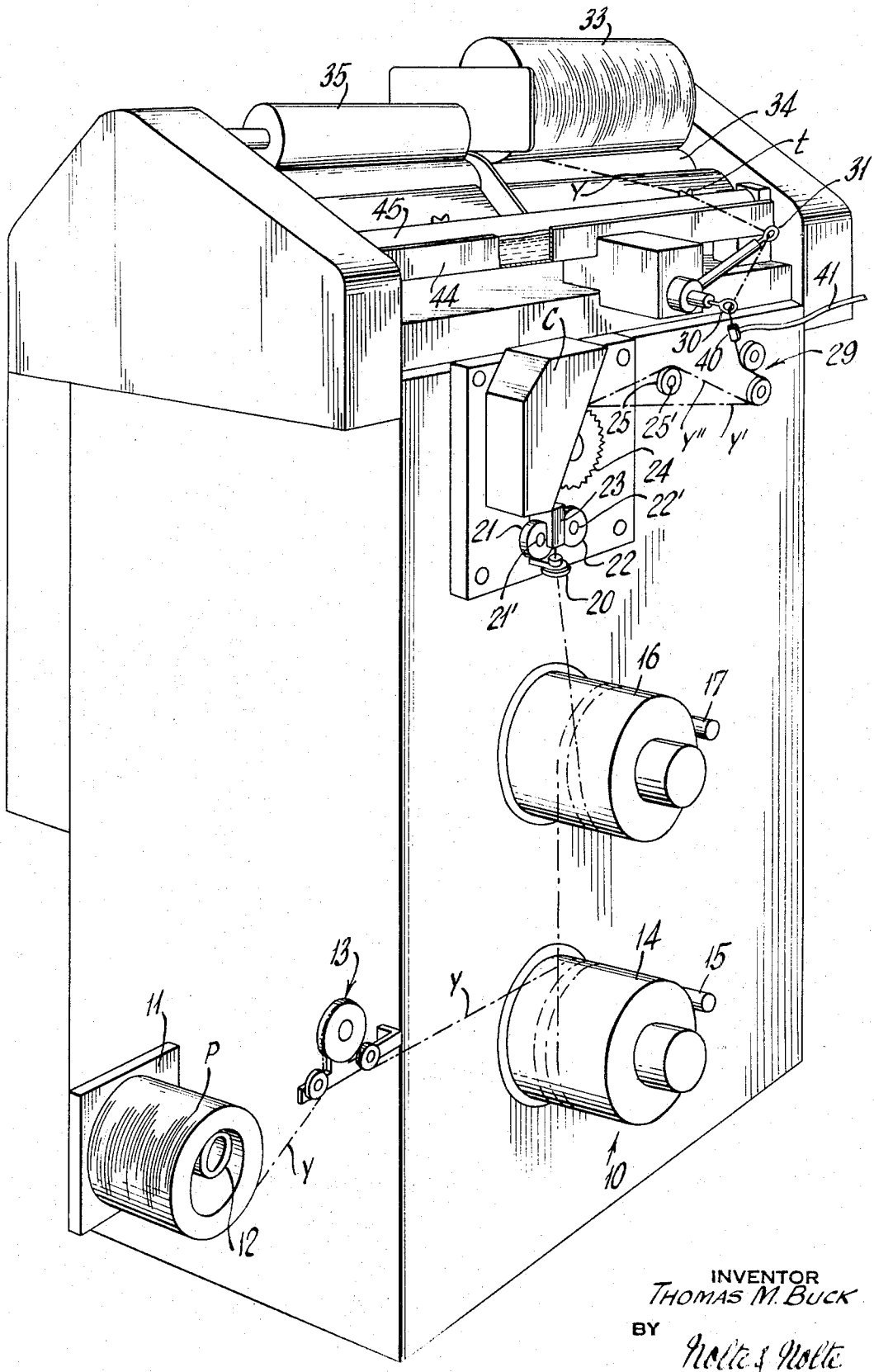

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METHOD AND APPARATUS FOR DEPHASING AND ENTANGLING CRIMP YARN

This invention relates to a method and apparatus for processing a multifilament crimped yarn in which the crimps in essentially each filament are essentially in phase with the crimps in the other filaments. The method and apparatus of the invention serve to dephase the yarn, i.e., transform the yarn to a condition in which the crimps in a substantial proportion of the filaments are not in phase with the crimps in a substantial other portion of the filaments.

Many methods of crimping a multifilament yarn impart to essentially each filament a crimp which in frequency, amplitude and orientation is essentially like the crimp in each other of the filaments and, moreover, cause the crimps in each of the filaments to be essentially in phase with the crimps in each of the other filaments. Such yarn lacks the bulkiness and randomly textured appearance normally desired in a crimped multifilament yarn. Typical of crimped multifilament yarns in which the crimps in the respective filaments are in phase with the crimps in the other filaments are multifilament yarns which have been crimped by means of longitudinal compression of the yarn, i.e., stuffer box crimping, or by means of gear teeth or the like, i.e., gear crimping.

Frequently, subsequent handling and processing of in-phase multifilament crimped yarn tends to dephase the yarn to a considerable extent even though not specifically directed to that objective. Such coincidentally dephased multifilament crimped yarns are in many instances commercially acceptable. However, the appearance and bulkiness of such yarns are sometimes marred by the occurrence of "shiners", which are short portions of the length of the yarn in which portions the filaments are still in phase. These portions are known as "shiners" because they tend to reflect light to a greater degree than portions of the yarn which have been dephased.

According to the invention, a multifilament in-phase crimped yarn is dephased while on the run. Specifically, the in-phase crimped multifilament yarn is separated into at least two groups of filaments, the two groups of filaments are caused to travel over paths differing in length from each other and then the groups of filaments are brought together to form again a single yarn. It is found that this suffices greatly to decrease the incidence of shiners.

This method of dephasing crimped multifilament yarn is found to be particularly effective when combined with passing the recombined groups of filaments through an entanglement zone whereby the filaments of each of the groups are intermingled with the filaments of the others of the groups.

Apparatus according to the invention in its simplest form is constituted of means for guiding individual groups of filaments comprising the yarn along divergent paths of differing length and means for converging the groups of filaments back together to reconstitute the original yarn. The optional entanglement zone may be constituted preferably by a fluid entanglement jet. Such jets are commonly known in the textile arts and the fluid commonly though not necessarily is a compressed gas, typically compressed air.

It will be appreciated that dephasing apparatus according to the invention may conveniently be integrated with crimping apparatus to provide a continuous crimping and dephasing process.

The invention is illustrated hereinbelow in conjunction with a particular apparatus for crimping yarn, though this is intended merely as an example of application of the invention.

The drawing is a front and side elevation, in perspective, of an apparatus for a crimping process, incorporating the present invention.

Referring to the yarn processing apparatus **10**, "raw" (unoriented and untexturized) continuous thermoplastic multifilament yarn Y is taken off supply package P supported on an open ended cylindrical package support **12** of an apertured plate **11** and led through a guide and tensioning device **13**.

From the tensioning device **13**, yarn Y is led to a driven roller or godet **14** and its associated yarn positioner idler roller **15** around which the yarn is wound and from whence it is led to and wound around a driven roller or godet **16** and its associated yarn positioner idler roller **17**.

Godet **14** is heated electrically by heater elements and according to desired results and yarns used, etc., godet **19** may also be heated. In the instance being discussed, the peripheral speed of godet **16** may be between **2** and **4** times faster than the peripheral speed of godet **16** whereby the yarn Y is oriented between the two godets. For specific details of construction and operation of the godets, reference is made to U.S. Pat. No. 3,454,998, the disclosures of which hereby are incorporated by reference.

The yarn Y having now been heated is ready to be crimped, and, to this end, it is led through guide **20** by means of which it is guided into the nip of driven rollers **21**, **22**, which are driven via shafts **21'**, **22'**. Rollers **21** and **22** form a portion of the lower end of crimping chamber **23** where the yarn is crimped via linear compression. Crimping crimping chamber **23** communicates at its upper end with an arcuate passage of an arcuate member situated under cover C. The toothed periphery of wheel **2** driven via a shaft carries the crimped yarn, now in the form of a plug, through the arcuate passage. The arcuate member may be heated by heaters, in order to retain or implement the heat imparted to the yarn in the previous step where the yarn was heated, thus providing a zone through which the plug of crimped yarn is transported with substantially no slippage and without changing the characteristics of the crimped yarn enabling the yarn to set or heat set, as the case may be.

The yarn crimped in the crimping chamber **23** and subsequently heat set while carried by the toothed periphery of wheel **24** is constituted of crimped filaments the crimps of essentially each of which are essentially in phase with the crimps of the other filaments. According to the present invention, there is provided adjacent the toothed wheel **24** a pulley **25** freely rotatably mounted on a shaft **25'**. Downstream therefrom is provided a tensioner apparatus **29**. When the machine is threaded up, the yarn coming off the wheel **24** is divided into two groups of filaments. One of the groups of filaments is led directly to the tensioner apparatus **29** while the other group of filaments is deflected over the pulley **2** between the wheel **24** and the tensioner apparatus **29**. At the tensioner apparatus

29 the two groups of filaments Y' and Y'' converge to form again a single yarn. The length of the path over which the group of filaments Y'' travels between the wheel **24** and the tensioner apparatus **29** is longer than the corresponding path traveled by the group of filaments Y'. Accordingly, when the two groups of filaments Y' and Y'' are brought together at the tensioner apparatus **29**, the crimps in the filaments of former group Y' are no longer in phase with the crimps of the filaments of former group Y''. From the tensioner apparatus **29** the yarn Y passes through a fluid entanglement jet **40** which is supplied with compressed air through tubing **41**. The filaments of the two former groups of filaments Y' and Y'' are thereby intermingled. The yarn Y then passes through eyelets **30**, **31** of an oscillatable arm **32**, over and in contact with a driven doctor roll **41** immersed in a trough **40** of finishing agent, through a traverse guide *t*, from which it is finally wound onto package **33** driven by a roller **34**, the roller **34** engaging the package **33** and being driven by a motor.

In the apparatus shown, means are provided for transferring the yarn being taken up from package **33** to a second take-up package **35** after package **35** is completed. These mechanisms form no part of the present invention.

It will be appreciated that it is also within the comprehension of the present invention to divide the filaments into more than two groups which are passed through paths of different lengths before being recombined. It will also be appreciated that inherent in the converging of the groups of filaments back into a single yarn is some degree of intermingling of the filaments of the various groups but that the entanglement zone herein disclosed as an optional feature of the present invention is one which superimposes upon such coincidental intermingling a greater degree of intermingling.

What is claimed is:

1. A method of dephasing a crimped multifilament yarn the crimps of the respective filaments of which are in phase with the crimps of other respective filaments of which, comprising advancing the yarn from a first point to a second point, between the first point and the second point dividing the yarn into at least two groups of filaments, bringing the two groups of filaments back together at the second point and between the first point and the second point guiding the two groups of filaments over yarn paths of respectively different lengths.

2. A method according to claim **1**, further comprising passing tee recombined groups of filaments through an entanglement zone in which the filaments of the one former group are intermingled with the filaments of the other former group.

3. Apparatus for dephasing multifilament crimped yarn the crimps in at least some of the filaments of which are in phase with the crimps in at least some other filaments of which, comprising means for advancing the yarn from a first point to a second point, between the first point and the second point means for dividing the yarn into at least two groups of filaments and guiding the groups of filaments over paths of respectively different lengths and at the second point means for bringing the two groups of filaments back together.

4. Apparatus according to claim **3**, further comprising means defining an entanglement zone positioned to receive the yarn from the second point.

5. Apparatus according to claim **4**, in which the means defining an entanglement zone comprises a fluid operated entanglement jet.

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