Oct. 1, 1957 E. J. GRISET, JR 2,807,862

METHOD FOR BULKING YARN

Original Filed May 12, 1953

Fig. 1.

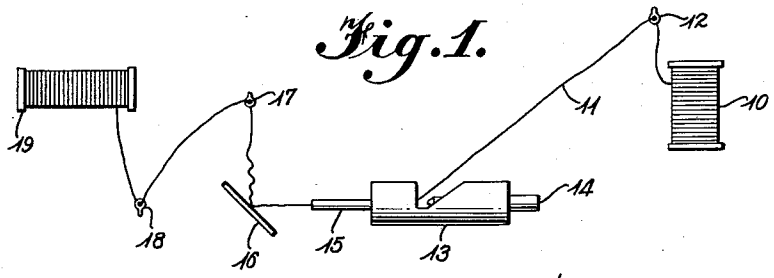


Fig. 2.

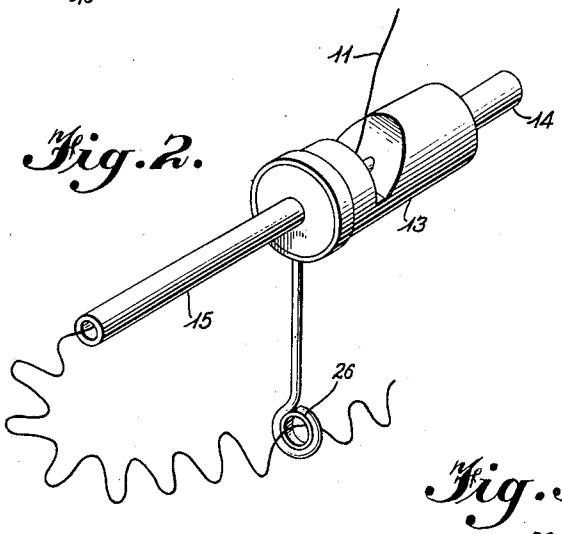


Fig. 3.

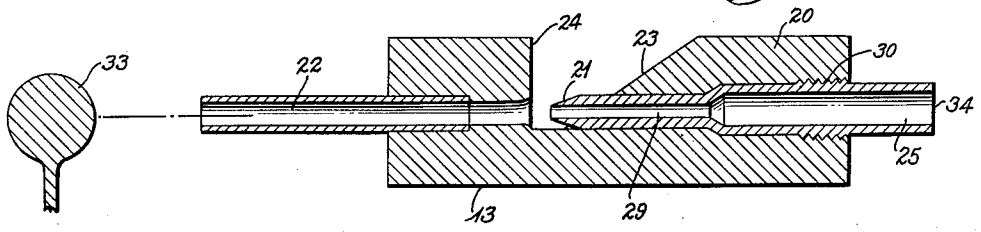


Fig. 4.

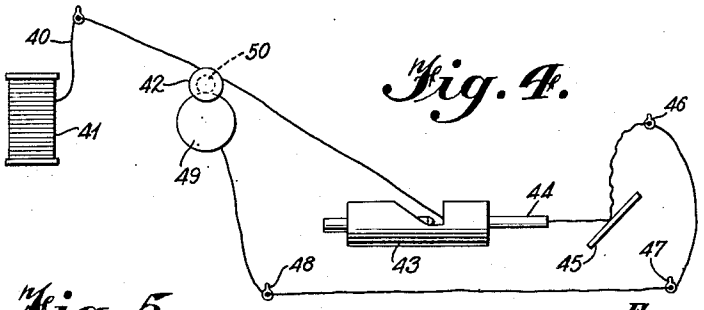
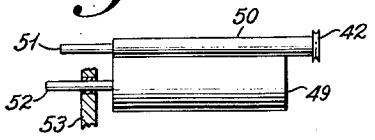


Fig. 5.



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2,807,862

METHOD FOR BULKING YARN

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8 Claims. (Cl. 28—72)

This application is a division of my copending application Serial No. 354,503, filed May 12, 1953, which in turn is a continuation-in-part of my Patent No. 2,661,588.

The present invention relates to the manufacture of yarn and more particularly to an improved method for producing curled or bulked yarn.

In the above mentioned patent there is disclosed an improved suction-type thread collection device which according to my said continuation-in-part application may be utilized to impart a curliness or bulkiness to a continuous strand of twisted or untwisted yarn.

The operation of the present invention will be apparent from the following detailed description when considered in conjunction with the accompanying drawings wherein:

Figure 1 is a schematic illustration of one embodiment of the present invention;

Figure 2 is a perspective of another embodiment of the present invention;

Figure 3 is a sectional view taken along the central axis of the thread collection device and illustrates a third embodiment of the present invention;

Figure 4 is a schematic illustration of an apparatus for practicing the present invention which utilizes a special yarn feed mechanism; and

Figure 5 is a schematic drawing in elevation of the yarn feed mechanism in Figure 4.

In general, the desired properties are introduced into the yarn in the present invention by passing the continuously running yarn into and through the suction device and by changing the direction of travel of the yarn after it emerges from the nozzle of the suction device and while it is still under the influence of the stream of air passing though the device. Preferably, the direction of travel is changed by disposing a baffle member opposite the nozzle of the suction device and causing the yarn to impinge thereon. The yarn is then collected in package form on any suitable take-up.

By controlling the respective rates at which the yarn is fed to and withdrawn from the suction device a most unusal effect is obtained. The yarn treated according to the present invention is characterized by having a pronounced curliness and bulkiness throughout the continuous strand. It thus has properties in common with spun yarn and, in fact, a fabric woven with the present type yarn used as a filling has the same bulkiness and soft feel as a fabric woven from spun yarn.

Referring now to Figure 1, the numeral **10** designates a source of supply for a continuously running yarn **11**. The yarn is passed through guide **12** and introduced into the low pressure area of a suction type thread collecting device **13**. Further details of the device **13** will be obvious from the discussion of Figure 3 below. Air or other gas from any suitable source is introduced into the device **13** through tube **14**. The yarn **11** is caught in the jet of gas and propelled through tube **15** of suction device **13**.

A flat impervious baffle plate **16** mounted by means not shown is disposed a short distance away from the end of the tube **15**. It will be noted that the baffle **16** is inclined at an angle with respect to a perpendicular to the tube **15**. With this arrangement, the yarn is discharged from the end of the tube **15** and into contact with the baffle **16** where it continues to be subjected to a turbulence due to the blast of air. The yarn **11** is then withdrawn via thread guides **17** and **18** to take-up **19**. It is important that the take-up **19** withdraw the yarn **11** from the vicinity of the baffle **16** at a much slower speed than it is fed to the suction device **13**. In other words, it is necessary that a certain amount of slack accumulate in the yarn in the vicinity of the deflector plate and during the time that it is under the influence of the blast of air.

The yarn collected on the take-up **19** has properties completely different from those possessed by the yarn supplied to the suction device **13**. For example, a 450/80 viscose rayon filament yarn containing a twist of 3 T. P. I. after being subjected to the foregoing process is transformed from a smooth constant denier yarn into a yarn having the general appearance and feel of spun yarn. The described process does not actually sever individual filaments of yarn. Instead, the blast of air acts with varying severity on the various filaments with the result that numerous small curls are introduced throughout the length of the yarn. Cloth woven using yarn so treated as filling was found to have a bulky appearance with a fuzzy or loopy surface.

In Figure 2, the member **13** is provided with a thread guide **26** mounted on the bottom side thereof. The yarn **11** to be treated is introduced into the tube **15** and expelled therefrom by means of a stream of air entering at **14**. Upon emerging from tube **15** the direction of travel of the yarn **11** is changed by passing it through thread guide **26** and to a suitable take-up. As previously explained, the yarn is withdrawn by the take-up considerably slower than it is supplied to the suction device **13**. Thus, the yarn between the exit end of tube **13** and guide **26** has a certain amount of slack it it. It is, of course, not necessary that thread guide **26** be attached directly to suction device **13**. Any suitable means for supporting thread guide **26** may be used, its principal function being to change the direction of travel of the yarn as it emerges from the tube **15**.

Figure 3 shows the details of the thread suction device **13**. The numeral **20** indicates generally a solid cylindrical support or housing in which a jet **21** and discharge tube **22** are maintained in spaced axial registry separated by a small gap. A notch cut in the housing **20** is defined by an inclined shoulder **23** and a perpendicular shoulder **24**. The jet **21** projects through the shoulder **23** and an aligned aperture in the shoulder **24** leads to the tube **22**.

The jet **21** is provided internally with two bores of different diameter. The larger bore **25** extends from the outer end about half way along the jet tube. The smaller bore **29** extends to the tip portion of the jet. The two-bore assembly is held in place in housing **20** by means of a threaded section **30** on the exterior of the jet **21** in a radial plane coinciding with a part of the length of large bore **25**.

Air from any suitable source is connected at **34** to the large bore end of jet **21**. The air emerges from the tip of jet **21** at a high velocity, enters discharge tube **22** and finally is emitted to the atmosphere. The high velocity stream of air creates a reduced pressure zone in the notch formed by the shoulders **23** and **24** with the result that any yarn placed in the wedge-shaped proportion is immediately conveyed into the stream of high velocity air and propelled into the tube **22**.

In Figure 3, a sphere **33**, disposed opposite the exit

end of tube 22, serves as the deflecting means for the air and yarn. As in the foregoing embodiments, it is necessary that the yarn be withdrawn from the vicinity of sphere 33 at a rate considerably less than that at which it is supplied to the suction device 13.

Figures 4 and 5 illustrate one means of controlling the rate at which the yarn is fed to the suction device and withdrawn therefrom. Yarn 40 is withdrawn from a source 41 by means of feed roll 42 and supplied to suction device 43 at a rate depending on the speed of rotation of roll 42. Upon emerging from tube 44, the yarn 40 strikes deflector plate 45 where the path of travel is directionally changed and it is then led by way of guides 46, 47 and 48 to a take-up 49. Shaft 52 of take-up 49, rotatably mounted in housing 53, is driven by any suitable means (not shown).

It will be seen from Figure 5 that freely rotatable roller 50 lies in contact with the rotating take-up 49 and is surface driven by the take-up 49 or the package carried thereon. Feed roll 42 is about 25% larger in diameter than the average diameter of roller 50 and is driven by roller 50 to which it is connected. Roller 50 is rotatably mounted on movable arm 51 for sliding movement up and down, depending on the size of the package carried on the take-up 49. In view of the size of feed roll 42, the yarn 40 will always be supplied to the suction device 43 at a rate about 25% faster than it is withdrawn by the take-up 49. As the package builds up on the take-up 49 and the peripheral speed of roller 50 increases, the speed of feed roll 42 increases at an identical rate.

It will be seen that the apparatus dislcosed in Figures 4 and 5 not only controls the rate at which the yarn is supplied to the suction device and withdrawn therefrom but also automatically compensates for the change in the take-up speed as the take-up package increases in size. By the use of this apparatus a substantially uniform curl or bulkiness is given to the yarn throughout the entire package.

Best results are obtained in practicing the present invention if the yarn is supplied to the suction device between about 5% and 40% faster than it is withdrawn therefrom, depending on the size of the yarn being treated and the rate of feed. For example, a very satisfactory curl is obtained with 600/120 viscose rayon yarn if it is supplied to the suction device between about 8 and 34% faster than it is withdrawn therefrom. With 450/80 viscose rayon, a satisfactory range is between 7% and 30%. Good results are obtained by taking the yarn up at a rate of about 100 meters per minute. The present invention may be used to curl either twisted or untwisted yarn. If desired, a quick drying soluble lacquer may be sprayed onto the yarn either before it enters the air stream, during the time it is in the air stream or after it leaves the air stream. This is by no means essential, but it is helpful as it tends to hold the curls in place during processing. After the yarn is woven, the lacquer may be removed by washing.

It is to be understood that the scope of the invention is only to be limited by the appended claims.

What is claimed is:

1. A method for producing a curly yarn comprising establishing a stream of high velocity gas flowing in a substantially straight path, introducing a continuous yarn into said stream at an angle, conveying said yarn through a confined zone while subjecting it to the action of said gas, changing the direction of travel of said yarn, and withdrawing said yarn at an angle with respect to the path of gas flow and at a rate slower than the rate of introduction.

2. A method for producing a curly yarn comprising establishing a zone of high velocity gas flowing in a straight line, continuously introducing a yarn into said zone at an angle, propelling the yarn through a confined zone while subjecting it to the action of said gas, changing the direction of travel of said yarn, withdrawing said yarn at an angle with respect to the path of travel of gas through said zone, and collecting said yarn in orderly arrangement on a take-up.

3. A method for producing a curly yarn comprising establishing a high velocity gas stream flowing in a substantially straight line, introducing succeeding portions of a continuous yarn into said stream at an angle for propulsion thereby through said zone and discharge into the adjacent ambient, thereafter concurrently rapidly decelerating and changing the direction of movement of said yarn while it is still under the influence of said stream, and collecting the yarn at a rate slower than the rate of introduction.

4. A method for producing a curly yarn comprising establishing a zone of high velocity gas flowing in a straight line, continuously introducing a yarn into said zone at an angle, propelling the yarn through a confined zone while subjecting it to the action of said gas, changing the direction of travel of said yarn, withdrawing said yarn at an angle with respect to the path of travel of gas through said zone, and collecting said yarn in orderly arrangement on a take-up, said yarn being introduced into said high velocity zone at a linear speed at least 5% greater than the linear speed at which it is collected by said take-up.

5. A method for producing a curly yarn comprising establishing a zone of high velocity gas flowing in a straight line, continuously introducing a yarn into said zone at an angle, propelling the yarn through a confined zone while subjecting it to the action of said gas, changing the direction of travel of said yarn, withdrawing said yarn at an angle with respect to the path of travel through said zone in orderly arrangement on a take-up mechanism disposed beyond the field of influence of said high velocity gas.

6. A method for producing a curly yarn comprising establishing a zone of high velocity gas flowing in a straight line, continuously introducing a yarn into said zone at an angle, propelling the yarn through a confined zone while subjecting it to the action of said gas, changing the direction of travel of said yarn, withdrawing said yarn at an angle with respect to the path of travel through said zone in orderly arrangement on a take-up mechanism disposed beyond the field of influence of said high velocity gas, said yarn being introduced into said high velocity zone at a linear speed at least 5% greater than the linear speed at which it is collected by said take-up.

7. In a method for producing a curly yarn wherein a continuous yarn is introduced into a high velocity stream of gas, conveyed through a confined zone while being subjected to the action of said gas, withdrawn from the stream of gas at a rate slower than the rate of introduction and collected in orderly form on a take-up, the improvement that comprises altering the general direction of yarn travel at the time it enters the gas stream.

8. The method of claim 7 wherein the yarn is introduced into the stream of gas at an acute angle with respect to the upstream portion of the gas stream.

References Cited in the file of this patent

UNITED STATES PATENTS

2,125,230	Hofmann	July 26, 1938
2,220,024	Pool	Oct. 29, 1940
2,224,923	Pool	Dec. 17, 1940
2,783,609	Breen	Mar. 5, 1957