May 2, 1961 C. J. GONSALVES 2,982,000

APPARATUS FOR BULKING YARN

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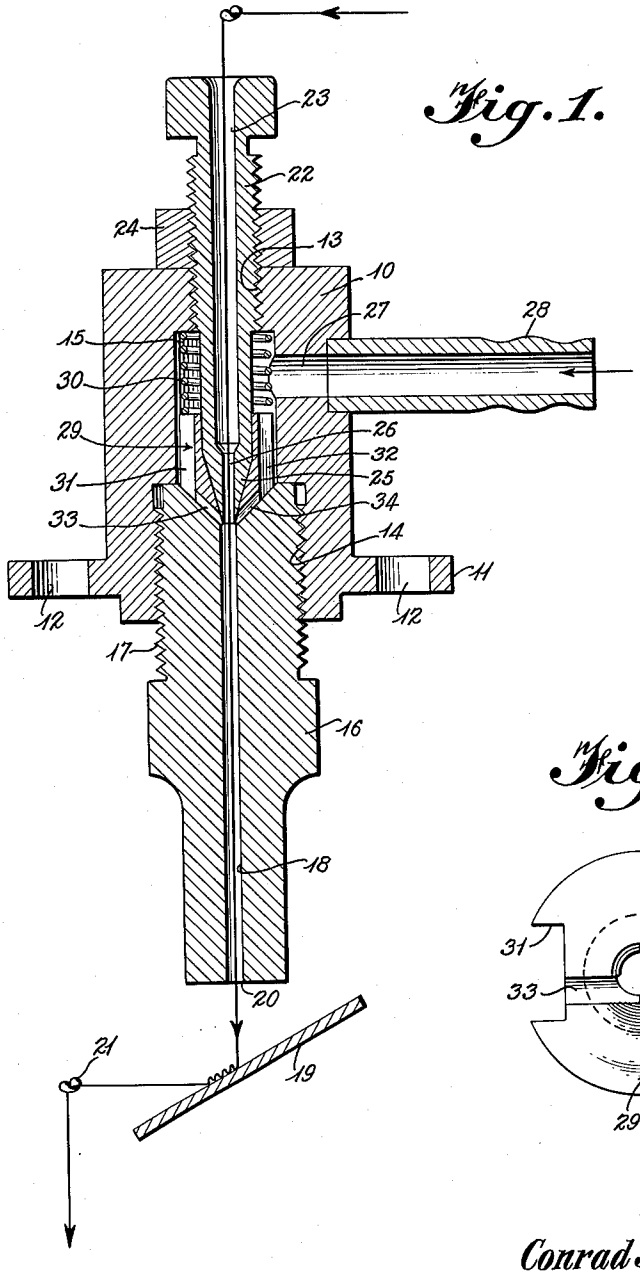

Fig. 1.

Fig. 2.

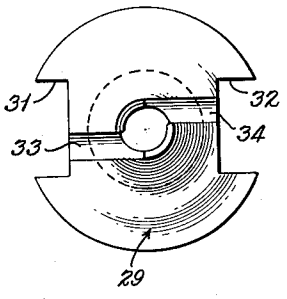

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Fig. 3.

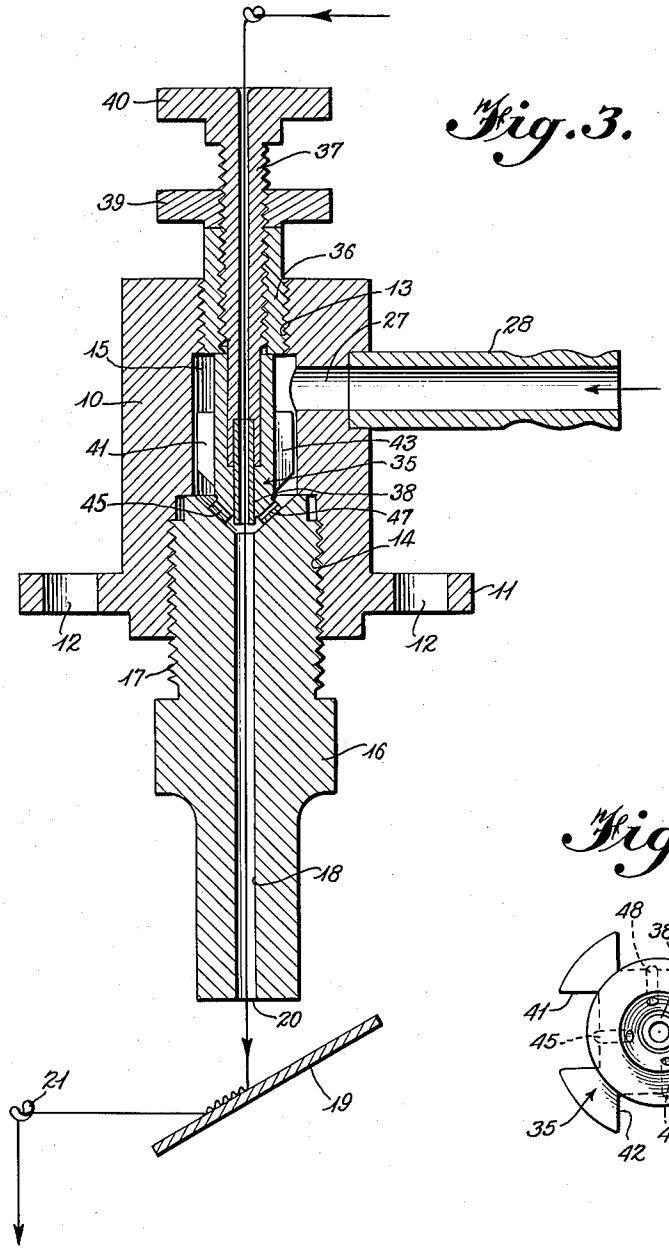

Fig. 4.

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United States Patent Office 2,982,000 Patented May 2, 1961

2,982,000

APPARATUS FOR BULKING YARN

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Filed July 19, 1956, Ser. No. 598,842

4 Claims. (Cl. 28—1)

This invention relates to the manufacture of bulked yarn and is more particularly concerned with an apparatus for the continuous bulking or fluffing of multi-filament yarn to produce a textile product characterized by a large number of individually curled filaments.

It is known to produce synthetic continuous filament yarn having a fluffy appearance by subjecting succeeding lengths of a parallel filament yarn to an air blast and then, by some means, locking the curl and fluff in position. There are a good many types of apparatus which will produce satisfactory results in the manufacture of curled yarn, but the art continues to seek easier and more reliable operation and the production of fluffiness that is better controlled and is more uniform through the long lengths of bulked yarn.

It is an object of the present invention to provide a method and apparatus for bulking yarn whereby an increased curling effect is achieved; the yarn produced according to the present invention being characterized by good handle, good knitting and weaving properties and excellent over-all appearance.

It is a further advantage of the present invention that the amount of compressed air used to bulk a given length of yarn is somewhat reduced as compared to prior art requirements.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of several embodiments thereof in connection with the annexed drawings, wherein:

Figure 1 is a view in vertical section of an air jet constructed in accordance with the principles of the present invention;

Figure 2 is an end elevation of the bushing of the Figure 1 assembly through which air streams are supplied to the yarn or thread path;

Figure 3 is a view similar to Figure 1, but showing a different type of air supply bushing; and

Figure 4 is a view in end elevation of the air supply bushing of the assembly of Figure 3.

Referring now to Figures 1 and 2 in greater detail, the numeral **10** represents a body from which the entire air jet is supported. In this regard, note that the body **10** is provided with a flange **11** having therein bolt holes at **12**. The body **10** has coaxial bores therein of three different diameters. At the upper end, it is provided with an internally threaded bore **13** and, at the lower end, there is an internally threaded bore **14** of larger diameter than the bore **13**. In between the bores **13** and **14**, there is a cavity or bore **15**, greater in diameter than the bore **13** but smaller than the bore **14**. Threaded into the bore **14** is a somewhat elongated externally threaded nipple **16** having a frusto-conical concave upper surface. The nipple **16** is provided with a central, axial passageway at **18** through which the yarn emerges to impinge upon a baffle **19** disposed adjacent to the mouth **20** of the nipple **16** as can be seen in the drawing. The fluffed and curled yarn is withdrawn from the baffle **19** over a guide **21** to a collecting device not shown.

In the upper bore **13** of the body **10** there is located a nozzle **22** having an externally threaded portion and a central axial bore at **23**. The nozzle **22** is held in position of adjustment by a lock nut **24**. The lower end of the nozzle **22** terminates in a frusto-conical tip **25** and within the tip there is an axial continuation of the bore **23** forming an orifice **26**. The orifice **26**, however, is of smaller diameter than the bore **23**. When the nozzle **22** and the nipple **16** are in position, it can be seen that the cavity at **15** coaxially surrounds the nozzle **22**, the bottom of the cavity being defined by the inverted frusto-conical base of the nipple **16**.

The cavity at **15** in the body **10** is provided with a radial access channel at **27** to which air is supplied through a fitting at **28**. A bushing **29** having a conical lower surface surrounds the lower end of the nozzle **22** and rests on the upper conical surface of nipple **16**. This bushing is held in position with respect to tip **25** and nipple **16** by a coil spring **30** coaxially surrounding a portion of the nozzle **22**. The bushing **29** has axial ports extending therethrough so that air may be supplied from a source, not shown, through the fitting **28**, channel **27**, cavity **15** and thence through the ports in the bushing **29** to lateral contact with the yarn. An important part of the present invention resides in the aperturing of the bushing **29** and so that this may be easily understood, a bottom plan view of that bushing appears in Figure 2. The bushing has a central aperture in which the tip **25** of the nozzle **22** lies, the nozzle mouth being countersunk from the lower end of the nozzle tip to a small extent. The bushing is provided with two cut out channels at **31** and **32**; these channels defining with the adjacent walls of the cavity **15** a pair of air passageways parallel to the central passage **23** in the nozzle **22**. At the bottom of the two passages **31** and **32** they connect with two sloping lateral passages **33** and **34** which extend to a position immediately adjacent the outlet end of the nozzle **25**. In view of the tangential disposition of the pasageways **33** and **34** in relation to the orifice **26**, a swirling action of the air in relation to the thread is produced. The air has a component of motion tangential or chordwise of the yarn passageway **23—26—18**, as can be seen from Figure 2 and a component axially of the yarn path as can be seen in Figure 1. While the swirling action is desirable in any event, it has been found that it is particularly good when the air swirl has the same direction as the twist which is in the thread before it enters the air jet.

It has been found as a part of this invention, that the location of the outlet of the channels **33** and **34** in relation to the outlet of the orifice **26** in the nozzle tip **25** is very important. It can be seen that the spring **30** will hold the bushing **29** in position and by loosening the nut **24**, the nozzle **22** can be freed for vertical adjustment to a critical extent by screwing it up or down in the threaded bore **13** as may be necessary. It is then locked in the desired position of adjustment by tightening the nut **24**.

The form of air jet shown in Figure 3 differs from that shown in Figure 1 in the shape of the bushing and in the manner of locating it within the cavity. Parts which correspond to those shown in Figure 1 bear like numbers. Different parts are differently numbered. The bushing of Figure 3 bears reference numeral **35** and is pressed against the upper surface of nipple **16** by a sleeve **36** which is both internally and externally threaded. The external threads of the sleeve **36** mesh with the threads of the bore **13** and the internal threads receive an externally threaded nozzle **37** which passes centrally through the bushing **35** and terminates in a sleeve **38**. Thus, the bushing **35** is held in position by the sleeve **36**. By this arrangement, the spring **30** of Figure 1 is rendered unnecessary. The nozzle **37** is adjusted axially by rotating it about its threads within the sleeve **36** and is held in

adjusted position by lock nut 39. For the purpose of this adjustment, the nozzle is provided with a wrench-receiving flange at 40. The bushing 35, unlike the bushing 29, is provided with four axially extending air passageways, bearing numerals 41, 42, 43 and 44. At the base of these air passageways, there are four ports 45, 46, 47 and 48 respectively. These ports terminate, as can be seen in Figure 4, in a swirling chamber 49 constituting a part of the bushing 35. The tube 38 projects slightly into this chamber 49. The nipple 16, the body portion 10, the air fitting 28, as well as the baffle 19, correspond in structure and function to the apparatus already described in conjunction with Figures 1 and 2.

It will be noted that the ports or passageways 45, 46, 47 and 48 are equally circumferentially spaced as are the channels 33 and 34 of Figures 1 and 2. The ports 45 to 48 inclusive, slope inwardly in the direction of yarn travel and they project an air stream tangentially or chordwise across the yarn passageway as viewed in Figure 4. At the plane of view of Figure 4, the yarn passageway is defined by the tube 38. The swirling air stream may advantageously circulate in the same direction as the twist in the yarn being treated.

The bushings 29 and 35 are not full equivalents. The arrangement of Figure 2, while it produces satisfactory bulked yarn, tends to consume more air for bulking a given quantity of yarn than is the case with the bushing of Figure 4. When the relatively high consumption of air of the Figure 2 arrangement was observed, it was thought that precision machining of the channels would help. It has been found, however, that punching the orifices as in the case of Figure 4, within very close tolerances, i.e., within a few microns, will improve the consumption of air. The diameter of the punchings 45, 46, 47 and 48 is 0.5 mm. The orifices slope parallel to the frusto-conical base of the bushing and they are arranged as can be seen in the drawing.

What is claimed is:

1. An air jet for bulking twisted yarn comprising a nozzle, means defining coaxial yarn passageways leading to and from said nozzle, the means defining the passageway leading from the nozzle being a longitudinal bore within a nipple having a conical entrance surface close to the exit end of the said nozzle, a bushing coaxially surrounding said nozzle and having channels therein sloping inwardly in the direction of yarn travel and discharging adjacent the nozzle tip in a direction generally chordwise of the yarn path and in the same direction as the twist in the said yarn, means including an air supply to said bushing for whipping the yarn about and forming curls therein, means to adjust the relative axial position of the nozzle tip and the bushing, and means positioned at the exit end of the passageway to change the direction of yarn travel abruptly.

2. An air jet as claimed in claim 1, in which the channels are two, which are equally circumferentially spaced.

3. An air jet as claimed in claim 1, in which the channels are four, which are equally circumferentially spaced and which are punched to a diameter of 0.5 mm. and to a tolerance of not more than about a few microns.

4. The air jet as claimed in claim 1 in which the said bushing is held in position by a spring.

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