

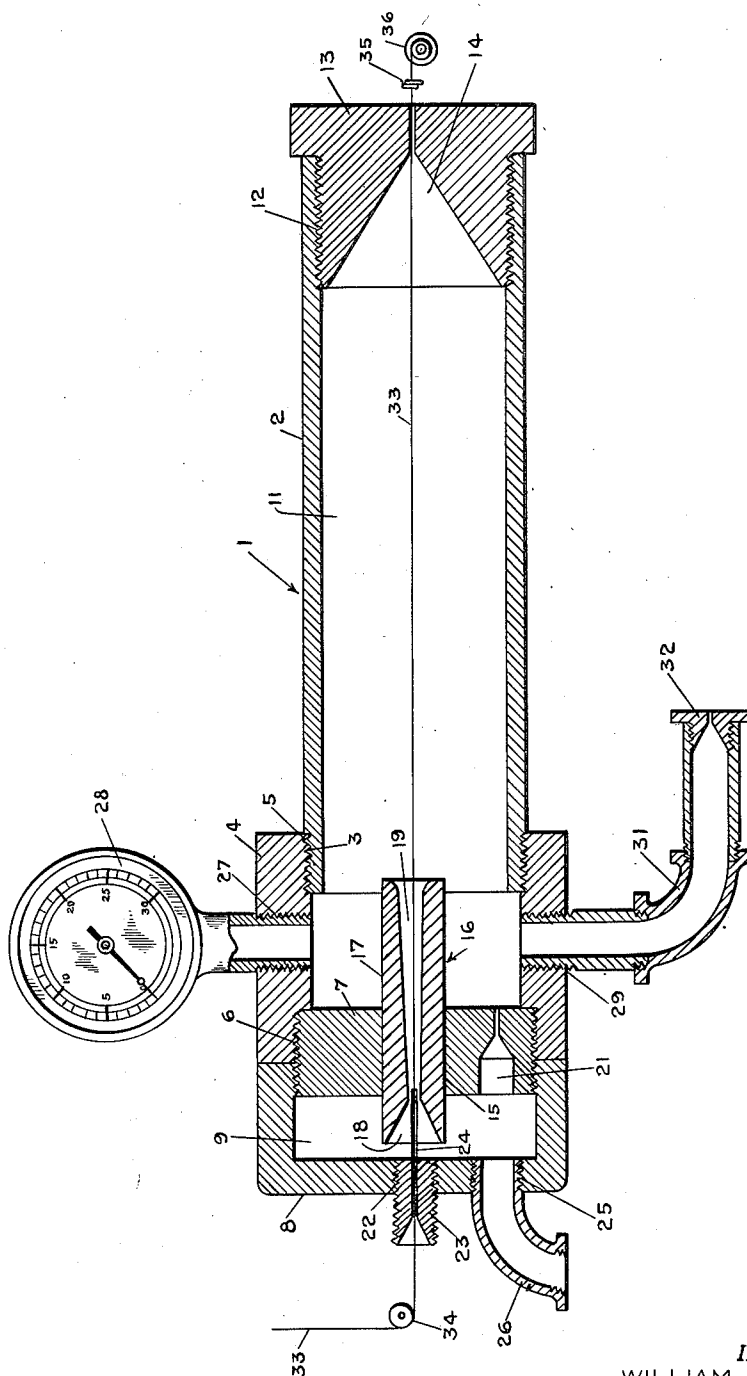
Feb. 26, 1952

W. J. ELVIN ET AL

2,586,800

APPARATUS FOR THE TREATMENT OF FILAMENTARY MATERIALS

Filed Oct. 23, 1946



INVENTORS.
WILLIAM J. ELVIN.
LUTHER A. WARREN

BY

Robert A. McWhirter
ATTORNEYS

UNITED STATES PATENT OFFICE

2,586,800

APPARATUS FOR THE TREATMENT OF
FILAMENTARY MATERIALSWilliam J. Elvin and Luther A. Warren, Frost-
burg, Md., assignors to Celanese Corporation of
America, a corporation of Delaware

Application October 23, 1946, Serial No. 705,122

1 Claim. (Cl. 68—5)

1

This invention relates to apparatus for the treatment of filamentary materials, and relates more particularly to novel apparatus for stretching filamentary materials to increase the tensile strength thereof.

Filamentary materials such as filaments, yarns and threads, hereinafter referred to as "yarns," of improved tensile strength and having other desirable properties are formed by subjecting the yarns to a stretching operation in the presence of fluid media under pressure. Heretofore, the apparatus in which the stretching was effected comprised an end chamber having rolls for pulling the yarn into the chamber, and a stretching chamber. The end chamber was maintained at a pressure within a few pounds of the stretching chamber pressure to minimize the tensions produced at the jets on the high denier input yarn. The enclosed rolls tended to complicate the design of the stretching apparatus and required that the apparatus be stopped for doffing. It is, accordingly, an important object of our invention to provide an improved stretching apparatus which will be free of the above and other disadvantages and which will be especially efficient in operation.

Another object of our invention is the provision of an injection stretching apparatus which operates on a single end of yarn without the use of enclosed feed rolls for pulling the yarn into the stretching chamber.

Other objects of this invention, together with certain details of construction and combinations of parts, will appear from the following description and drawing.

In the drawing wherein a preferred embodiment of our invention is shown,

The figure is a cross-sectional view of the stretching apparatus constructed in accordance with our invention.

Referring to the drawing, the reference numeral 1 indicates generally a sectional treatment vessel comprising a cylinder 2 which is externally threaded at one end as shown at 3, and has threaded thereon a collar 4 internally threaded at 5. The collar is also internally threaded at 6 and has threaded therein a plug 7. A cup-shaped end plate 8 is threaded onto plug 7 thus forming in the vessel two chambers, a small chamber 9 in which the treating fluid is first entered and a large chamber 11 where the stretching is effected. The other end of the cylinder is internally threaded at 12, which end is closed by a threaded plug 13 provided with an orifice 14.

2

The plug 7 is provided with an opening 15 in which is inserted an injector device generally indicated by reference numeral 16. This injector device comprises an elongated tube 17 having a constricted passageway therethrough. At the input end of the injector device, the passageway is sharply tapered towards the inside thereof for a short portion of the length of the passageway as is shown at 18. The remainder of the passageway is gently flared towards the output end thereof as is shown at 19. The plug is also provided with a tapered opening 21. The end plate 8 is provided with a threaded opening 22 in which is plugged a tapered orifice 23 to which is affixed a tube 24 of such a length that it extends just beyond the constricted portion of the passageway extending through injector device 16. The end plate 8 is provided with a second threaded opening 25 which is adapted to receive a conduit 26 attached to the treating fluid supply (not shown). The collar 4 is provided with an opening 27 in which is threaded a pressure gauge 28. Collar 4 is provided with a second threaded opening 29 in which is threaded a drain 31 provided at its outlet end with an auxiliary jet 32.

In operation, a yarn 33 from any suitable source not shown, is guided around idler roller 34 and is threaded through input orifice 23, injector 16 and output orifice 14 by means of a suitable needle, and then passed through pigtail guide 35 and onto a particular driven take-up roller 36. Treating fluid, in this case steam, is then passed through chambers 9 and 11 causing the yarn to be continuously pulled into the chamber 11 by the action of the steam forced through the injector 16. In order that the injector 16 may function to feed the yarn into the stretching chamber 11, a greater volume of steam than would otherwise be needed must be employed. Since to increase the size of the output jet 14 to accommodate the extra steam would damage the yarn, the auxiliary jet 32 serves the purpose of relieving the extra steam.

This invention is applicable to the stretching of thermoplastic threads or threads capable of being softened by solvent vapors and/or liquids such as those made of or containing derivatives of cellulose. Examples of derivatives of cellulose are the organic acid esters of cellulose such as cellulose acetate, cellulose formate, cellulose butyrate, cellulose propionate and cellulose acetate-propionate; the cellulose ethers such as ethyl cellulose, methyl cellulose and benzyl cellulose; the partial or completely saponified esters of cellu-

3

lose; regenerated or reconstituted cellulose; and the linear polymers of high molecular weight such as the linear condensation products of a polyamide, condensation products of dicarboxylic compounds with diamine compounds and condensation products of diketenes with compounds containing two reactive hydrogens as diamines, glycols, etc. The threads may be monofilaments or a plurality of filaments grouped together either with or without twist to form a thread.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

Apparatus for treating a running yarn comprising a substantially closed vessel including an end chamber having a restricted yarn entrance orifice for introducing yarn into said end chamber and a treating chamber having a restricted yarn outlet orifice for leading yarn out of said treating chamber, means for supplying fluid under pressure into said end chamber only, a plug in said vessel separating said end chamber and said treating chamber, an injector tube extending through said plug from said end chamber to said treating chamber and having a constricted passageway therein, and a tube connected to said yarn entrance orifice and extending beyond the constricted portion of the passageway in the injector tube for guiding the yarn into the treating chamber, said plug hav-

4

ing a tapered opening extending therethrough between the end chamber and the treating chamber and having its smaller end opening into the treating chamber, the flow of fluid from said end chamber into said treating chamber through the constricted passageway in said injector tube carrying the yarn from said end chamber into said treating chamber, and said treating chamber having a second outlet orifice through which a stream of fluid flows continuously from said treating chamber whereby a larger volume of fluid can be passed from the end chamber through the injector tube and into the treating chamber than can be exhausted from the treating chamber through the yarn outlet orifice.

WILLIAM J. ELVIN.
LUTHER A. WARREN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,595,486	Minton	Aug. 10, 1926
2,005,580	Ferre	June 18, 1935
2,080,518	Underwood	May 18, 1937
2,194,565	Moss	Mar. 26, 1940
2,317,448	Dreyfus et al.	Apr. 27, 1943
2,371,579	Cole et al.	Mar. 13, 1945
2,398,856	Reel	Apr. 23, 1946
2,425,037	Jackson	Aug. 5, 1947
2,450,045	Jackson et al.	Sept. 28, 1948
2,468,081	Koster	Apr. 26, 1949