United States Patent

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[54] **TANGLING JET**
1 Claim, 1 Drawing Fig.

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[50] **Field of Search** 28/1.4, 72.12, 1.4

[56] **References Cited**
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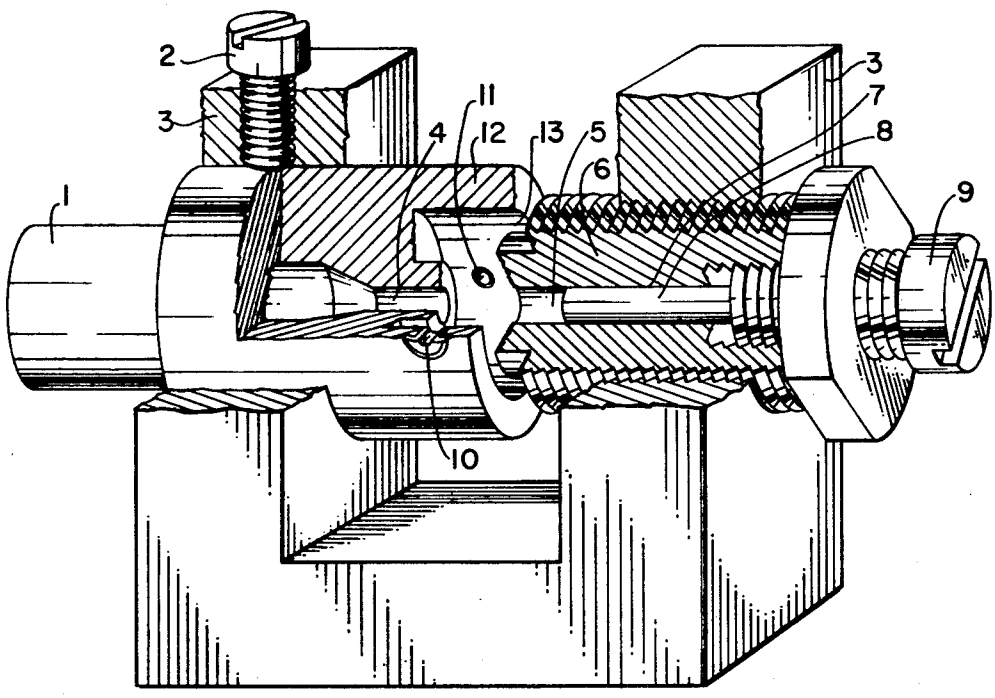
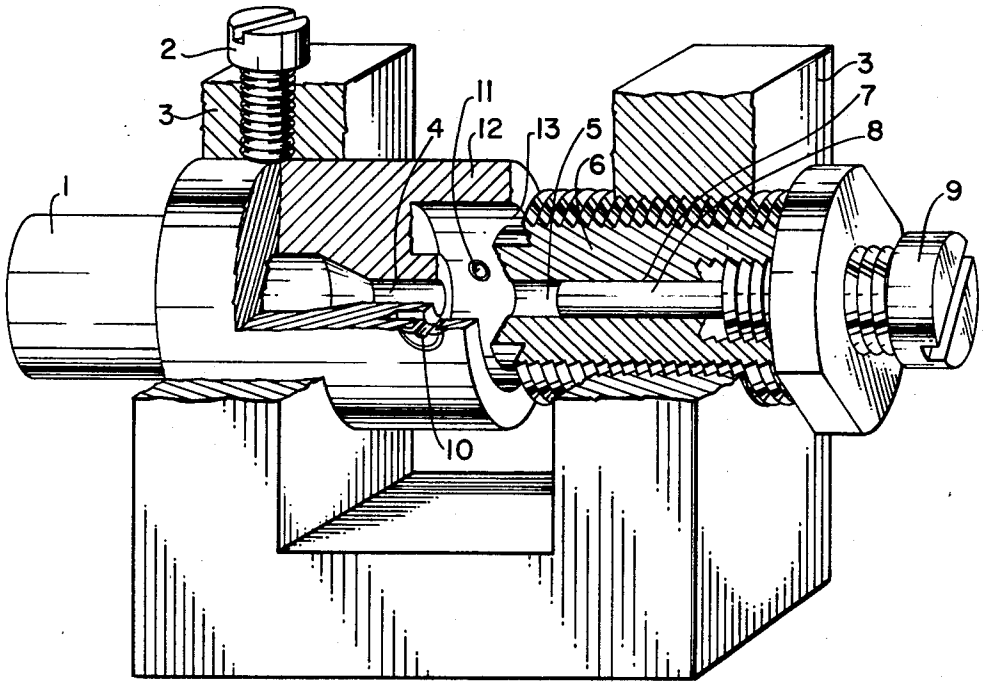
ABSTRACT: A tangling jet having a nozzle member and a resonance chamber member positioned coaxially therewith is improved by adding a tubular body concentrically around the nozzle member and the resonance chamber member, and by providing thread guide openings in the tubular body so that a thread bundle passing therethrough intersects the common centerline of the nozzle and resonance chamber members.





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TANGLING JET

The invention relates to an apparatus for treating a thread bundle with a jet of fluid, which apparatus comprises a nozzle, a resonance chamber positioned coaxially with an opposite said nozzle, and a partially enclosed system of thread guides for guiding a thread bundle between the nozzle and the resonance chamber. A conventional thread-advancing device, such as supply and withdrawal rollers (not shown), is utilized.

A typical prior art jet is represented by Canadian Pat. No. 554,150; with this apparatus, treatment of the thread bundle with the fluid supplied through the nozzle, more particularly a gas, is effected. However, some difficulty arises when a number of these known apparatuses are used side-by-side; for example, the construction of these thread guides is such that any slight displacement thereof relative to the nozzle will give rise to point-to-point differences, which means that the thread bundles treated in the various apparatuses do not have the same resulting properties.

This drawback can be obviated by modifying the construction of the thread guides of this known apparatus in the manner illustrated by the present invention.

The present invention includes the apparatus of the type indicated above as known; the thread guides, however, are formed by openings in a tubular body which concentrically surrounds the nozzle and at least part of the resonance chamber, with some clearance being left around said chamber, said tubular body being rigidly attached to at least one of said members.

The provision of the thread guides in the form of openings in the tubular body insures that the thread guides will remain accurately spaced at the same predetermined distance. Since the tubular body is attached to the nozzle and/or the resonance chamber, the path of the thread bundle relative to the aforementioned members also can be fixed.

To provide ease of setting of the resonance chamber relative to the nozzle and of disassembling the apparatus, it is preferred that the tubular body should be attached to only one of said members. It has been found that the thread path position relative to the nozzle is somewhat more critical than that relative to the resonance chamber. Therefore, it is preferred that use should be made of the embodiment in which the tubular body is attached only to the nozzle member and formed integral therewith.

The tubular body provided with the thread guide openings can be attached to the nozzle or the resonance chamber with or without air passages being left between them in the area of attachment. Air passages are left if the tubular body is attached to the nozzle or to the resonance chamber by means of, for instance, only a few rod-shaped connecting pieces; construction without such air passages is preferred. In the latter case, the tubular body is, at one of its edges, attached to the nozzle or to the resonance chamber. The simplest construction is obtained if the tubular body is formed integral with the particular member. It is preferred, however, that between the tubular body and the member to which it is not rigidly attached there should be a passage which extends in circumferential direction of the tubular body.

The apparatus according to the invention can be used for treating different types of yarns, such as yarns on a basis of regenerated cellulose, polyamides, polyesters and other polymers such as polyacrylonitrile, etc., which may have various deniers. The treatment can be applied in any stage of the manufacturing process and the fluids used may have a relatively low or high temperature. As a fluid use may in the first instance may be made of a gas which is preferably inert to the polymer, but also liquids and vapors such as steam may be used. The temperature of the fluid may be chosen between room temperature and the temperature at which under the processing conditions applied the filaments will hardly or not be subject to fusing. For instance, under certain conditions use may be made of gases having temperatures in the range of from 180° to 500° C.

Depending on the processing conditions and the envisaged application, the thread bundle should be fed to the space between the nozzle and the resonance chamber at the rate which is equal to or different from that at which said thread bundle is withdrawn therefrom. For instance, the rate of withdrawal chosen will be less than the rate of feed if, under the influence of fluid applied or owing to the properties of the threads such as a tendency to relax the threads, upon being passed through the apparatus, are subject to shrinkage.

For satisfactory operation of the apparatus according to the invention it has been found essential that the thread bundle should intersect the common centerline of the nozzle and the resonance chamber. To this end, the yarn tension should be maintained sufficiently high. It should be added, for comparison, that in the British Patent Application No. 924,089 it has already been proposed to keep the thread bundle in the stream of gas issuing from the nozzle by means of the walls of a channel and by maintaining a sufficiently high yarn tension. However, in the apparatus according to the present invention there is no such channel. Between the nozzle and the resonance chamber, the tubular body leaves a disc-shaped space, which as a rule is in open communication with the ambient atmosphere by way of an annular slit.

The invention will be further described with reference to the accompanying drawing, which is an elevational and sectional view of one embodiment.

In the drawing, the numeral **1** refers to a nozzle, which is by a setscrew **2** secured in a frame **3** which is, for instance, attached to a draw-twisting machine in place of the top eyelet. The nozzle **1** is connected to a compressed air line (not shown) and has a constricted exit **4**. The nozzle exit is coaxial with a resonance chamber **5** which is provided in a holder **6**.

The holder **6** is adjustably mounted in the frame **3** with the aid of a screw thread. For the purpose of adjusting the depth of the resonance chamber **5**, there is provided in a holder **6** a central bore **7** in which is fitted a pin **8** connected to a setscrew **9**. The pin **8** is displaced in the bore **7** by turning the setscrew **9**, so that depending on the direction in which the setscrew is turned, the depth of the resonance chamber **5** is increased or decreased.

For the purpose of guiding a thread in front of the exit **4** of the nozzle **1**, two eyelets **10** and **11** are provided in a tubular body **12**. This tubular body forms an annular collar and concentrically surrounds the nozzle **1** and the resonance chamber **5** while leaving an annular slit **13**. The collar **12** is formed integral with the nozzle **1**. In the drawing the nozzle **1**, the annular collar **12** and the holder **6** have been partially broken away so that the interior of the apparatus will be exposed to view.

With the apparatus according to the invention the nozzle diameter is preferably between 0.5 and 2.5 mm. for instance 1.5 mm. The inner diameter of the tubular body, which defines the distance between the two eyelets, should not be too large; this diameter should be related to the yarn tension applied, the diameter of the nozzle and that of the opening of the resonance chamber. In order that the supplied medium may effectively treat the yarn bundle, (and the extent of treatment is reflected, for instance, in the amount of filament entanglement), it is necessary for the thread bundle always to return into the air jet after it has been blown away therefrom. This implies that, in the case of increased yarn tension, or larger diameters of the nozzle and the opening of the resonance chamber, the inner diameter of 8 mm. will be acceptable.

To obtain entanglement of the filaments, the yarn tension applied must not be so high as to prevent separation of the filaments or to prevent a rapid vibration of the filament bundle. The depth of the resonance chamber is less critical than its volume. In order to obtain the desired effect, the latter must be chosen in conformity with the pressure of the treating medium applied, the yarn tension and the type of yarn being processed.

With the representative embodiment shown in the drawing, the resonance chamber volume is at all times readily adjusta-

ble in that between the holder 6 and the head of the setscrew 9 spacing rings of suitable thickness can be inserted. It is preferred that the opening of the resonance chamber have a diameter which is equal to or somewhat larger than that of the nozzle exit.

The thread-guiding openings in the tubular body serve to keep the thread bundle as much as possible in the jet of the treating medium or to cause said bundle always to return to it. The dimensions of said openings must, however, not be so small as to have an undue tensioning effect on the thread bundle.

I claim:

1. In an apparatus for treating a thread bundle with a jet of fluid, said apparatus comprising a nozzle member and a resonance chamber member positioned coaxially with and opposite said nozzle member, the improvement comprising, in combination,

1. a tubular body concentrically surrounding said nozzle member and said resonance chamber member, said tubular member being rigidly attached and formed integral with said nozzle member, the interior of said tubular body being in open communication with ambient atmosphere,
2. fixed means relative to said nozzle member defining thread guide openings in said tubular body for receiving said thread bundle, the thread guide openings being positioned so that the thread bundle passing therethrough intersects the common center line of said members,
3. said resonance chamber having a uniform diameter which is equal to or somewhat larger than the exit diameter of said nozzle member, and
4. said tubular body and said resonance chamber being contained in a common frame.