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APPARATUS FOR TEXTURING YARN

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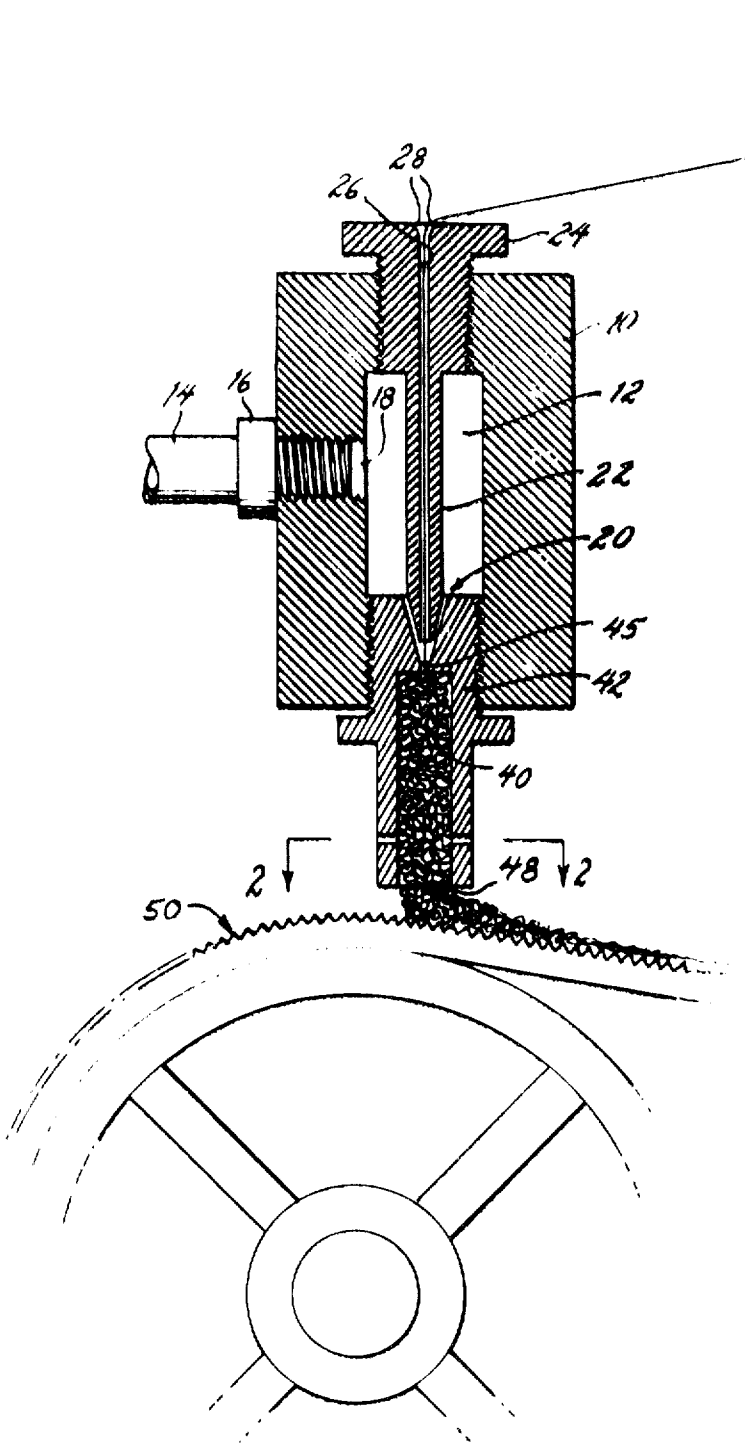


Fig. 1.

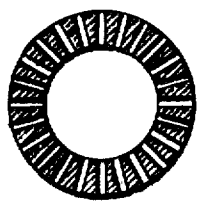


Fig. 2.

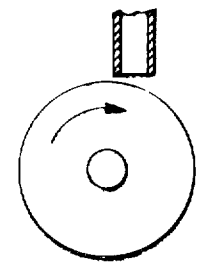


Fig. 3.

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APPARATUS FOR TEXTURING YARN

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U.S. Cl. 28—1.6 1 Claim

ABSTRACT OF THE DISCLOSURE

A source of steam under pressure feeds a steam box from which the steam is emitted through a needle valve into a chamber. Yarn is pulled through the needle valve by the steam and crimped under pressure in the chamber. A knurled surface moves at a spaced distance from the end of the chamber and carries the crimped material away. Most of the steam exits from the chamber before the yarn exits from the chamber.

BACKGROUND OF THE INVENTION

This invention relates to the crimping of monofilament synthetic yarn in a steam filled crimping chamber.

In the prior art, yarns were crimped in a stuffer box crimper which comprised a crimping chamber having a pair of feed rollers at one end and a restricted opening at the other end. As shown in U.S. Pat. No. 2,734,228 the restricted opening can be in the form of a nozzle **53**, FIG. 1 or weight as in U.S. Pat. Nos. 2,854,701; 3,305,897 and 3,353,239. In many of these patents it is known to introduce steam into the crimping chamber. However, all of them utilize the principle of creating a back pressure between the material retained in the crimping chamber by the restricted end thereof, and that being fed into it by the feed rollers.

SUMMARY OF THE INVENTION

My invention provides a new and novel process and apparatus for crimping yarn under pressure. In accordance with my invention the steam being introduced into the crimping chamber through a controlled valve serves to feed the yarn through the chamber and compact it therein against a moving surface spaced from the otherwise unrestritced end of the chamber. In the preferred embodiment of my invention most of the steam exits from the crimping chamber prior to the time the yarn exits from the chamber.

By the use of my invention it is possible to control the crimping by varying the speed of the yarn being fed to the steam jet, the amount of steam pressure on the steam jet, the adjustment of the valve, and the speed and distance of the moving surface with respect to the downstream end of the chamber.

Accordingly, it is an object of this invention to provide a new and better method and apparatus for the production of crimped yarn.

This and other objects of my invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation in section of the preferred embodiment of my invention; and

FIG. 2 is a view taken as indicated by the lines and arrows 2—2 in FIG. 1.

FIG. 3 is a schematic diagram showing the relative position of alternate parts.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claim.

Referring to the figures, the apparatus comprises a metallic housing **10** having a steam chamber **12** therein, Steam is fed into the steam chamber by means of a suitable conduit **14** connected by fitting **16** to the portal **18** in the wall of the housing. The steam exits from the steam chamber **12** through the valve designated generally **20**. To control the exit rate, the valve includes a needle **22** having a tapered or conical end as shown to mate with the similarly formed valve seat. The steam of the needle **22** extends through the steam chamber **12** and is adjustably connected through the wall of the housing by means of the threaded fitting **24**. An axial hole **26** passes through the fitting, stem, and needle portion of the valve. At the upper end of the hole the fitting is preferably rounded as at **28**.

Yarn is fed to this device by the pair of feed rollers **30** which are substantially cylindrical rubber covered rollers as are well known in the art. The uppre rolls **32** is an idler roller while the lower roller **34** is a drive roller which is connected to a variable speed motor (not shown but well known in the art). The rollers are spaced approximately two feet from the opening of the hole **26** and grip the yarn to control the rate at which it is fed to the device, both positively (by driving the yarn) and negatively (by retarding the yarn if the device itself is drawing on the yarn at a higher rate than that of the rollers).

After being threaded through the axial hole, the yarn passes through the valve **20**. A crimping chamber **40** is provided downstream of the valve to receive the yarn. The crimping chamber is a substantially cylindrical chamber in the valve fitting **42**. The fitting **42** is adjustably connected to the housing **10** by an suitable means such as the threaded connection shown, so that it can be moved toward and away from the needle. Thus the amount of steam passing through the valve into the chamber **40** can be regulated by moving either the valve seat, or the needle or both.

The valve seat terminates downstream in a jet or nozzle **45** which is centrally located in the upstream end of the cylindrical chamber **40**. Once the yarn has been fed through the valve, the steam exiting through the nozzle **45** will draw the yarn into the chamber **40**. The yarn will then be fed downwardly and exit through the open end **48** of the chamber. This end is most preferably spaced from the adjoining moving surface **50**.

The surface can be on a drum having a straight knurl thereon and spaced somewhat less than the diameter of the chamber **40** from the free end **48**. By adjusting the fitting **42** toward and away from the drum it is possible to adjust the amount of crimp in the yarn. However, in the preferred embodiment it is desirable to use a plurality of steam crimpers in a line and accordingly, the drum is replaced by a wide belt having a knurl surface **50** to receive the yarn from a plurality of crimpers. It is desirable to place the drum about which the belt is driven directly beneath the open end **48** of the chamber, in order to support the belt against the pressure exerted by the

exiting yarn. Thus as the yarn begins to build up in the chamber a back pressure is created between the yarn exiting against the surface **50** of the belt and the yarn being forced into the chamber by the steam coming through the nozzle **45**. The belt can be made of neoprene or other similar material and is preferably spaced within a quarter of an inch of the open end **48** in order to capture the yarn and carry it away in a pulled-out or slightly unraveled state.

It is further desirable that the steam exit from the chamber before the yarn does. For this purpose I have provided a plurality of small holes on the order of 0.050 inch in diameter shown more clearly in FIG. 2 which are spaced approximately 15 degrees apart around the chamber. These holes allow most of the steam to exit first but not before it has had a chance to compact the yarn and help to inpart crimp therein. For this reason the holes are spaced closer to the end **48** than they are to the entrance at the jet **45**.

Where a drum alone is used, the center of the drum is positioned either in axial alignment with the axis of the chamber **40** or, most preferably, upstream of the axis of the chamber **40** so that there is a larger opening between the end of the chamber and the surface of the drum downstream in the direction of rotation of the drum (which, as shown schematically in FIG. 3, is clockwise).

Where a conveyor belt is supported by the drum as in FIG. 1, the belt moves away from the drum tangentially as the drum rotates clockwise. In this case the housing of the device is most preferably mounted on an angle as indicated in FIG. 3 so that once again there is a larger opening downstream in the direction of travel of the belt between the surface **50** of the belt and the end of the chamber **40**. (It will be appreciated that the belt shown in FIG. 3 runs substantially horizontally in use, and that the device shown would, accordingly, be angled to the left.)

OPERATION

In operation yarn is fed through the feed rollers to the hole **26** of the needle and once it is threaded through the needle and the valve into the chamber, steam is emitted into the steam box and exits through the valve drawing the yarn down into the chamber **40** and compacting it against the moving surface spaced from the end of the chamber. This method was used with the above described apparatus under the following circumstances:

Yarn used: Nylon 1050/68 (drawn feeder yarn).
Yarn speed: 1,000 feet per minute fed to the jet.
Steam pressure: 85 pounds per square inch.
Steam temperature at jet: 325° F. dry steam.
Needle valve opened: ¾ turn from closed position.
Drum adjusted: to 3/16 inch from chamber (less than the diameter of the chamber).
Drum surface speed: 20 feet per minute.

It will be apparent from what has been disclosed that many of the dimensions, distances, pressures and materials described in this specific example could be varied within the scope of the claim by one skilled in the art. In fact, the apparatus has been described to allow for such

modification and adjustment so as to take care of varying conditions and desired results.

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the following claim.

It will further be understood that the "Abstract of the Disclosure" set forth above is intended to provide a non-legal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the United States Patent Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. An apparatus for texturing yarn by treating it with steam in a chamber through which the yarn is being fed, comprising:

(a) a longitudinally extending chamber having an entrance at one end and an exit at the other;

(b) means for feeding a controlled amount of steam through said entrance into said chamber;

(c) means for presenting an end of yarn to be fed through said entrance into said chamber by said steam;

(d) means for removing the yarn exiting from the chamber spaced away from the exit thereof so that the exit is unrestricted, said means comprising a substantially impervious knurled surface moving transversely with respect to the direction of travel of the yarn through said chamber coacting with the steam and the yarn to compact the yarn within the chamber while it is exiting therefrom, said surface being spaced from said exit at a greater distance downstream in the direction of travel of said surface than upstream; and

(e) means permitting the steam to exit from the chamber intermediate the entrance and exit thereof, said means comprising a plurality of holes spaced from the point at which the steam enters said chamber a greater distance than the point at which the yarn exits from said chamber.

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