April 9, 1963 W. RODENACKER 3,084,393

PROCESS FOR STRETCHING FILAMENTS

Filed Jan. 12, 1959 2 Sheets-Sheet 1

FIG. 1

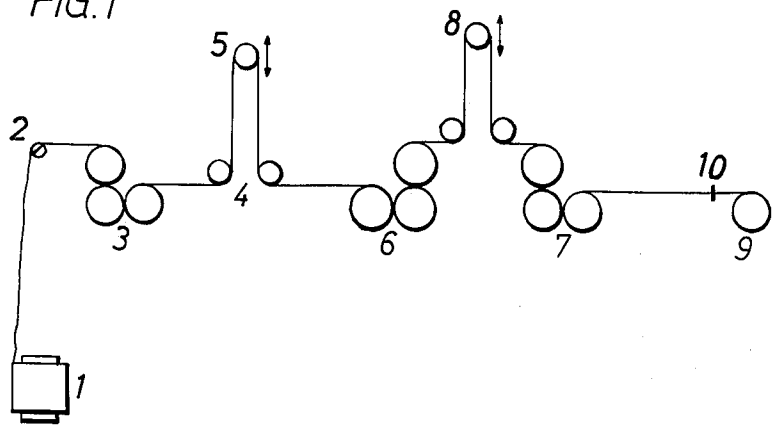

FIG. 2

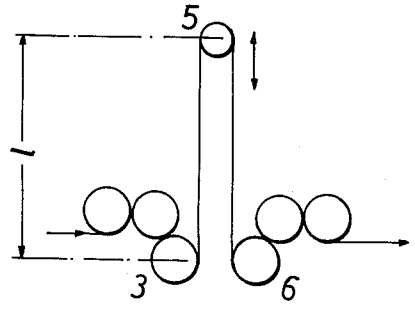

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FIG. 3

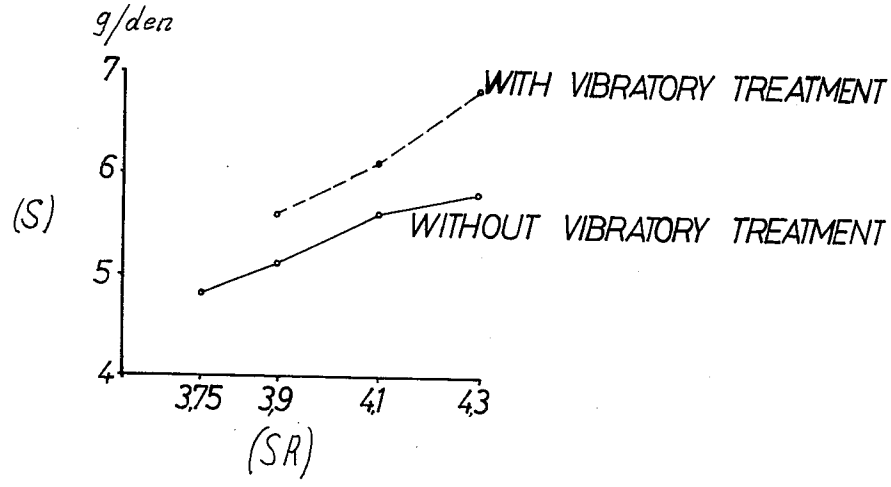
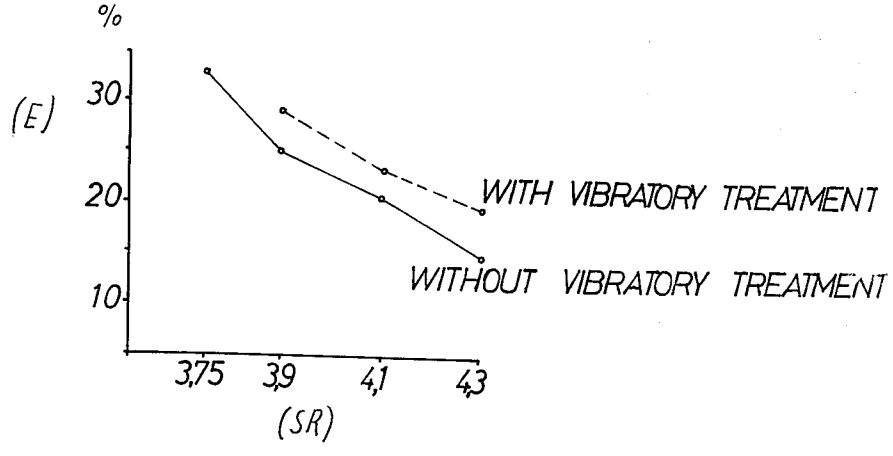


FIG. 4



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PROCESS FOR STRETCHING FILAMENTS

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Claims priority, application Germany Jan. 14, 1958
2 Claims. (Cl. 18—48)

This invention relates to the art of forming artificial filaments and is particularly concerned with improvements in the stretching of filaments and threads composed of synthetic linear polymers.

A whole series of processes are known for stretching synthetic filaments or threads and are used in order to produce the best possible orientation of the material, and thus cause it to have a high strength value with either a prescribed or else a lowest possible elongation. Processes in which the properties of the filament are improved under the drafting tension are also known. Examples of such processes are steaming or thermal fixing, either in the drafting zone itself or after stretching.

It is an object of this invention to produce filaments and threads composed of synthetic linear polymers, with improved textile properties. It is another object of this invention to obtain filaments and threads which exhibit a high tensile strength, high elasticity and a high breaking strength.

It is a more specific object of this invention to provide a special process for stretching filaments and threads in order to improve the textile properties.

It has been found that filaments or threads composed of synthetic linear polymers can be improved by subjecting the moving filament to a vibrational stress either during or after the drafting, providing the filament is still under tension. This vibratory stressing causes a change in the length of the filament subjected to tension. This change in length is at all times dependent on the mean length of the filament which is subjected to the stressing by vibration, and also on the frequency of the vibration. A further factor influencing the process is the speed of the travelling filament.

A complete understanding of the invention may be obtained from the following detailed description read in conjunction with the drawings, in which—

FIG. 1 shows an arrangement for carrying out the invention;

FIG. 2 shows a modification of such an arrangement;

FIG. 3 shows a comparison of the strength of treated and untreated fibers; and

FIG. 4 shows a comparison of the elongation of treated and untreated fibers.

As mentioned above, the vibratory stressing can take place in the drafting zone itself or in a subsequent zone where tension occurs, and may be independent of the drafting frame. As will be seen from FIG. 1, the process can be carried out on any of the known drafting frames or after-treating machines.

The filament is withdrawn from the top of a bobbin 1, through the thread guide 2, and introduced into the supply mechanism 3, of a drafting frame. The filament travels through the system 4, over the vibrating roller 5, through the drafting roller system 6, and is fed under tension over an identical vibrating roller system 8 into another drafting roller system 7 in order to be wound on a winding bobbin 9 by means of a traversing mechanism 10.

The arrangement of the vibrating roller 5, between a drafting roller system 3 and 6, but without the guide rollers 4 is shown in FIG. 2. This arrangement provides the possibility of the length *l*, of filament being

changed in a comparatively simple manner. The vibrating roller 5 can be driven by any desired drive means such as for example eccentrics mounted on driving shafts, or vibrating magnets which produce a vibration of 100 c.p.s. in this mains frequency.

The number of vibrations can be raised in any desired manner, and with the use of means known per se to within the ultrasonic vibration range. In order to change the length of filament which is to be subjected to vibration, it is also possible to dispense with the roller, comprising an eccentric or vibratory drive means or other gears, by providing a drafting roller system having a non-uniform drive.

When using drawing nozzles for stretching synthetic materials, a vibratory movement can be impressed on such nozzles, thereby producing the same effect as with the arrangement which has been mentioned. The said stretching can be carried out together with the drafting processes using a constant tension, in contrast to the constant elongation usually employed, providing that the thread-brake device used in the process carries out the vibratory movements. The process may be used for spinning or combined spinning and stretching, in which case the filament is stretched during the spinning.

The process generally is suitable for synthetic filaments which require a final stretching after the spinning operation. Examples of some results obtained when carrying out the process are listed in the table below. The values differ one from another by amounts which are of practical interest. The curve of FIG. 3 represents the stability of the strength (S), the curve of FIG. 4 the elongation (E) with respect to the stretching ratio (SR). The comparison is given between the untreated material (—) and the material treated with vibrations with a stroke of 10 mm. at 2800 strokes per minute (--). For equal elongation, a considerable improvement in the strength value is obtained.

Examples	Alteration of textile data under the action of stresses caused by vibration		
	Without vibration	With vibration	Alteration, percent
(1) Mono-filament, 20 den.—Strength.	6.3 g./den.	7.3 g./den.	16
(2) Mono-filament 20 den.—Elasticity.	0.109	0.132	20
(3) Sliver, 200 den./ 30 filaments—Strength.	3.9 g./den.	4.4 g./den.	14
(4) Bristles, 5,700 den.—Breaking Strength.	504	732	45

What I claim is:

1. In the process of continuously stretching filaments composed of synthetic linear polymers, said filaments having uniform orientation and denier both during and after the stretching operation, the step which comprises subjecting said filament to a large number of vibrational stresses during the stretching operation, while coordinating the length of the drafting zone, the speed of the filament therethrough and the vibration frequency, so that any given point on the filament must remain within the drafting zone for a time at least as great as the period of vibration.

2. Process of claim 1 wherein said filaments are subject to 2800 vibrations per minute with a stroke length of about 10 millimeters.

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