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GB 1534587 **GB 1365975** **GB 1259031**
GB 1381458 **GB 1300379** **GB 0837573**

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(54) **Process for shrinking thermically shrinkable fibres**

(57) A process for the continuous shrinking of a top of thermically shrinkable fibres in which thermal (heat) treatment by means of saturated or humid steam is carried out simultaneously with a crimping phase. The process is carried out at the outlet of a stretch-breaking machine.

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SPECIFICATION

Process for shrinking thermally shrinkable fibres

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The present invention relates to a process for shrinking thermally shrinkable fibres, and more particularly to a process for the continuous shrinking of a top of thermally shrinkable fibres.

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By the term "top", as used in the present specification, there is meant a ribbon without an appreciable twisting, constituted of discontinuous fibres practically parallel and partially overlapping each other.

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As is generally known, thermally shrinkable synthetic fibres, such as acrylic polymer fibres, are produced by wet or dry spinning, in the form of a bunch of continuous filaments, generally known as "tow".

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These continuous filaments are successively subjected to a stretch-breaking and crimping process in order to obtain discontinuous fibres of variable length, practically parallel and partially overlapping each other, forming the "top".

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Usually the "tops" are subjected, under relaxed conditions, to a high-temperature thermal treatment in the presence of humid or saturated steam in order to confer to the discontinuous fibres a greater dimensional stability under heat.

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Such thermal treatment is in general carried out by subjecting the top previously gathered in a container with drilled holes alternately to a vacuum and to vapour under pressure.

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The above mentioned thermal treatment is carried out in a discontinuous way and involves a series of drawbacks both as far as cost as well as quality is concerned.

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The increase in cost is due to the handling of the tops, to the consumption of motive power and to the high consumptions of steam. In fact, the impossibility of completely filling the useful space inside the autoclaves used for the shrinking operation as well as the necessity to have recourse to successive vacuum/steam cycles do affect in a sensible way the steam consumption.

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From the qualitative point of view, the discontinuous operation systems in autoclaves have the drawback of exhibiting a not altogether complete homogeneity of treatment, as a result of which either poorly annealed and/or humid zones will be met in the top. In any case, the discontinuous systems involve treatment gradients which lead to the formation of defects in the end products of the textile cycle.

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In order to obviate the above drawbacks, there have been realized devices for the continuous shrinking of the tops.

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These devices, in general, are added after the crimping and determine a considerable increase in the overall dimensions of the ma-

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chinery.

Furthermore these are rather complex apparatuses both from the point of view of running as well as of the maintenance involved. Moreover, the discharge of the material subjected to a vaporization treatment is not always correct and may cause drawbacks both in respect of the working of the machinery downstream as well as in respect of the quality of the finished product.

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The present invention accordingly aims to provide a process for the shrinking of a top of thermally shrinkable fibres, that overcomes or at least mitigates the above mentioned disadvantages.

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According to the invention, the top of thermally shrinkable fibres, on leaving a stretch-breaking machine, is subjected to a thermal treatment by humid or saturated steam contemporaneously with a crimping phase.

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The process of the present invention for the shrinking of a top of thermally shrinkable fibres is cheap, easy to run and allows the obtaining of a complete and homogeneous treatment of all the discontinuous fibres that form the top.

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The process of the present invention may be carried out by feeding into a crimping chamber humid or saturated steam, upstream of the crimping bar and perpendicular to the feed of the top.

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To this purpose, the walls of the crimping chamber may be provided with a series of small holes through which the steam is fed to the discontinuous fibres of the top. The holes may be suitably drilled along the walls of the crimping chamber.

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The feeding in of the steam is carried out upstream of the crimping bar and preferably within the zone comprised between the crimping bar and the roller at the outlet of the stretch-breaking machine, which feed the top. The temperature of the steam is preferably higher than 100°C, more preferably from 105°C to 120°C. The treatment time shall correspond to the dwelling time of the top inside the crimping machine and in general will be below 30 seconds.

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The process of the present invention may be used on any crimping machine and for all thermally shrinkable fibres. The process will be particularly suited for acrylic fibres, that is for fibres obtained by either wet or dry spinning of polymers containing at least 70% by weight of acrylonitrile or of polymer mixtures in which the total content in polymerized acrylonitrile is greater than 70% by weight.

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The process of the present invention does not adversely affect the operational speed and output of crimping machines. In fact, there may be attained working speeds of up to 250 m/min. and an output of up to 400 Kg/hr. Moreover, the total denier of the top is that usually used in crimping machines, that is up to 40 g/m.

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With the process of the present invention, the crimping imparted to the top occurs on the fibres which are in a humid heat condition and, thus, the crimping proves more effective and heat-stabilized with a consequential ease of processing in the successive setting passages, given the excellent cohesion imparted to the fibre. Such an advantage cannot be obtained with the continuous shrinking devices and/or processes of the prior art, in which the shrinking operation occurs downstream of the crimping chamber. Moreover, the process of the present invention allows a drastic reduction in the consumption of steam, due to the small internal volume of the apparatus and to the high packing of the fibre. Due to the small volumes involved, there do not exist problems of thermal inertia during the starting step.

The crimped and stabilized top obtained by the process of the present invention shows a perfect regularity and is placed in gathering containers in a compact and uniform way.

CLAIMS

1. A process for the continuous thermal shrinking of a top of thermically shrinkable fibres, at the outlet of a stretch-breaking machine, by means of a heat treatment with humid or saturated steam, wherein the heat treatment is carried out contemporaneously with a crimping phase.
2. A process as claimed in claim 1, wherein the steam is fed into a crimping chamber downstream of a crimping bar and perpendicular to the direction of feed of the top.
3. A process as claimed in claim 2, wherein the steam is fed in through holes in the walls of the crimping chamber.
4. A process as claimed in any of claims 1 to 3, wherein the temperature of the steam is greater than 100°C, and the time of treatment is below 30 seconds.
5. A process as claimed in claim 4, wherein the temperature of the steam is from 105 to 120°C.
6. A process as claimed in any of claims 1 to 5, wherein the top consists of acrylic fibres.
7. A process according to claim 1 for the continuous thermal shrinking of a top of thermically shrinkable fibres, substantially as herein described.