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[54] **PROCESS FOR STABILIZING THE DRAWPOINT ON A FEED GODET ROLL IN DRAWING POLYESTER FILAMENTS**

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[52] **U.S. Cl.** ..... **264/290 T,** 264/DIG. 73

[51] **Int. Cl.** **B29c 17/02**

[58] **Field of Search** ..... 264/290 T, 210 F, DIG. 73; 28/71.3, 72 R, 290 R, 290 N, 290 T

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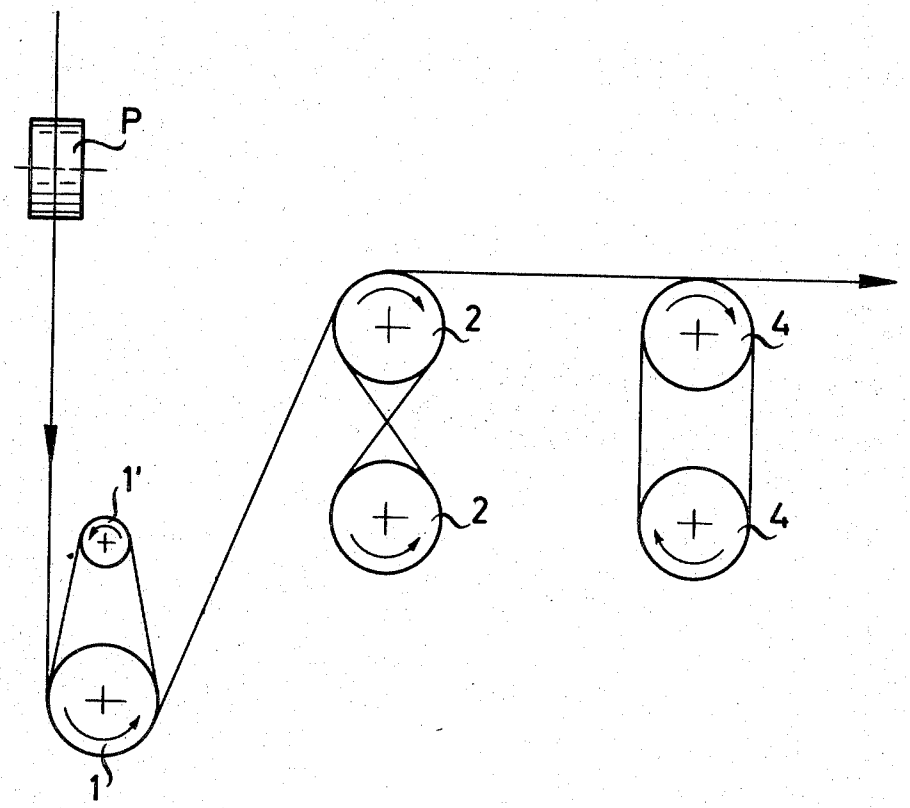
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[57] **ABSTRACT**

A process is described according to which filaments made of synthetic linear polyesters and having coarse titers are drawn at a high running speed from heated pairs of feed godets. One of the two feed godets is maintained at a temperature lower than that of the other godet. The difference in temperature is in the range of from 1° to 35°C. The draw point is stabilized on the hotter godet and regularity of the filaments is improved.

2 Claims, 2 Drawing Figures



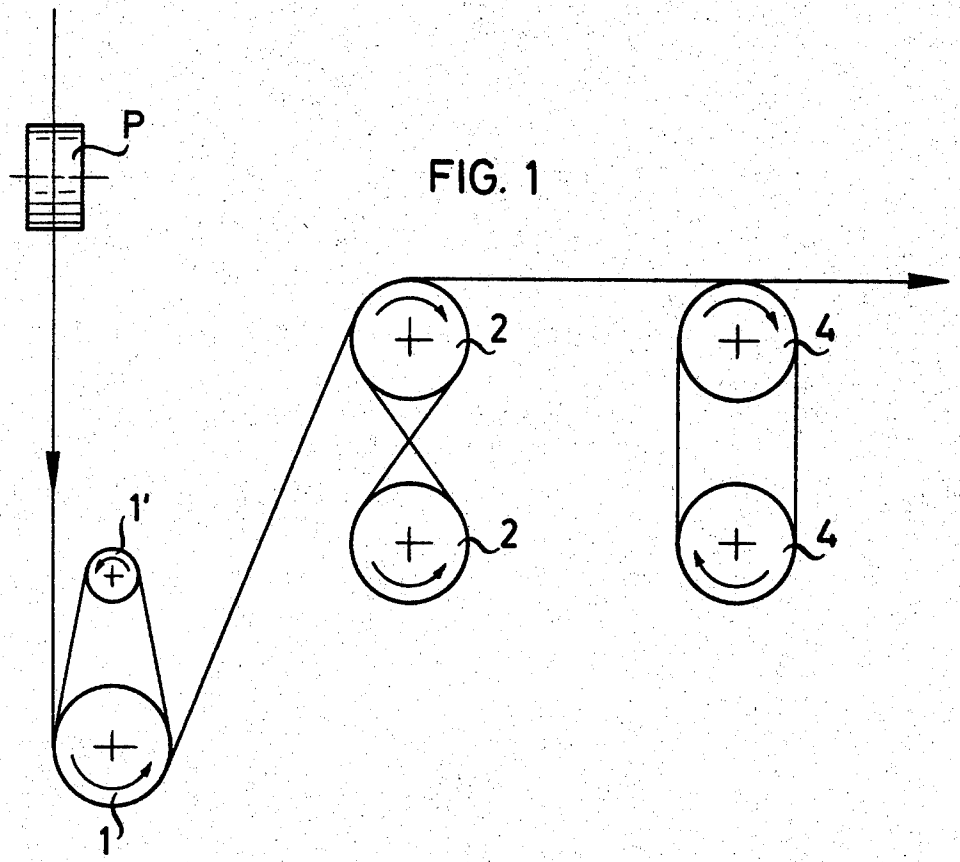


FIG. 1

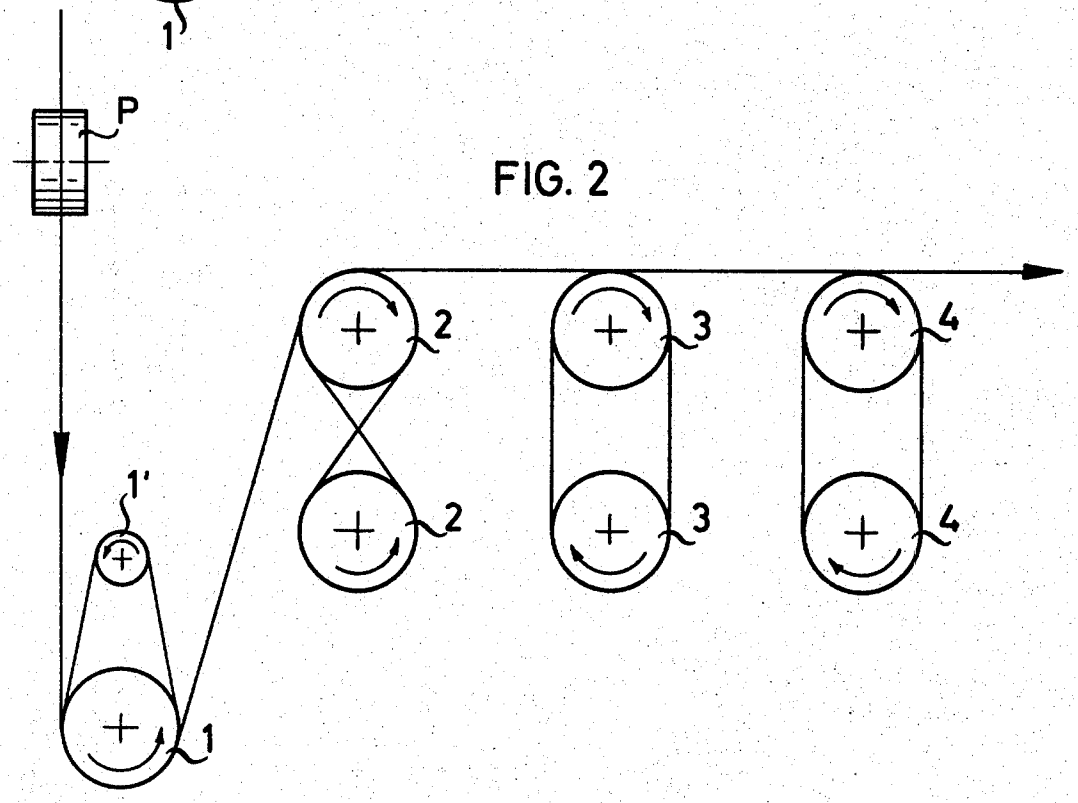


FIG. 2

PROCESS FOR STABILIZING THE DRAWPOINT ON A FEED GODET ROLL IN DRAWING POLYESTER FILAMENTS

The present invention relates to a process for the drawing of filaments made of polyethylene terephthalate and having a coarse titer, at a high running speed from a heated pair of feed godets.

It has been known how to draw polyester filaments from heated godets. In this process it is difficult, however, to fix the draw point, and as a result there is often an irregular drawing, as the draw point may be in the last windings of the filament.

In order to achieve a good fixation of the draw point, a draw pin is usually applied between the heated feed godets and the draw godets. By means of this process the draw point is well fixed, indeed; however, the windings round the draw pin result in an increased mechanical damage to the filaments, which becomes evident by breaks of the capillaries. This is due to the fact that of the many individual capillaries of the filament, those which come into direct contact with the draw pin, are pressed against the said pin by the outer capillaries and are thus mechanically damaged.

It is also known to draw filaments from heated feed godets at a rounded-off edge, in order to reduce the mechanical damage.

In the case of filaments having coarse titers, i.e. more than about 550 dtex for polyethylene terephthalate, and particularly in the case of a high drawing-off rate in spinning, i.e. of more than about 200 m per minute, a draw pin as well as a guiding pin cause increased damage to the filament.

The present invention therefore provides a process for the drawing of filaments having coarse titers with a high running speed of the filament, providing filaments of a very regular cross section and only with minor mechanical damage.

According to the invention, this aim is achieved in that one of the two feed godets has a temperature which is lower than that of the other feed godet by from 1° to 35°C, preferably from 5° to 25°C, particularly from 10° to 20°C.

The drawing according to the process of the invention may be effected in one or several steps; normally, the total drawing ratio is in the range of from 1:3.5 to 1:6.5, according to the desired properties of the filaments; however, in special cases higher or lower drawing ratios are also possible. As linear high molecular weight polyesters there are suitable in particular those of terephthalic acid with aliphatic diols, preferably polyethylene terephthalate. Use may also be made of copolyesters of terephthalic acid with several diols, for example the copolyester of terephthalic acid, ethylene glycol and neopentyl glycol, or copolyesters which contain another dicarboxylic acid component besides terephthalic acid.

Although the process of the invention is, in principle, suitable for the manufacture of high-quality filaments of any titer, it is nevertheless particularly suitable for the manufacture of filaments having a coarse titer, which are especially difficult to produce uniformly, according to the known processes. By coarse titer there is to be understood a titer of more than about 550 dtex for polyethylene terephthalate. The essential advantages of the process of the invention become evident at a high running speed of the filament, i.e. at a running

speed of more than about 200 m per minute, at which speed it is particularly difficult, according to the known processes, to obtain filaments having a regular diameter over their whole length with only a minor mechanical damage.

The heating of the pairs of feed godets may be effected by means of known methods, the feed godets may have a high-gloss chromium-plated or dull surface.

In accordance with the invention, the heated pair of feed godets consists of two driven godets arranged at a distance from each other and running at a determined speed. These two godets, which together form the pair of feed godets, can be heated individually, for example, by electric heating or, according to a preferred variant of the process, by means of a hot liquid at their inner surface.

The gist of invention is to be seen in the fact that one of these two godets has a temperature which is lower by from 1° to 35°C than the temperature of the other godet; however, which is still above the second-order transition temperature of the material to be drawn. Preference is given to a difference in temperature of from 5° to 25°C, in particular from 10° to 20°C, between the two godets. By means of this difference in temperature between the feed godets, the draw point is stabilized on the hotter godet, where the filament runs from the feed godet to the drawing godet. With an increasing difference in temperature between the two feed godets, the running of the filament within the range of the last windings around the two feed godets becomes at first more steady, and the regularity of the filament, the so-termed "Uster", is improved. With a difference in temperature of from 5° to 25°C between the two feed godets, even a better regularity of the filament is obtained, and filaments having a maximum regularity, i.e. the smallest Uster value, are obtained with a difference in temperature between the two feed godets of from 10° to 20°C. Smaller differences in temperature than 1°C also lead to improved filaments, although the regularity of the filament noticeably increased with the increasing difference in temperature. A difference in temperature which exceeds 35°C may, in principle, also be applied, however, there is the difficulty that the temperature of the cooler feed godet should also exceed the second-order transition temperature of the material of the filaments to be drawn, i.e. in the case of filaments made of polyethylene terephthalate, the temperature must be above 80°C approximately. On the other hand, feed godets should not be heated to a temperature exceeding a range of from 115° to a maximum of 120°C.

It goes without saying that the process of the invention can also be applied to multi-stage drawing processes. In these processes, the respective feed godets are heated at different temperatures, the drawing godets of the first drawing stage being the feed godets for the second drawing stage. In principle it is also possible to use more than 2 godets instead of a pair of godets; in this case it is important that at least one of these godets has a temperature which is lower than that of the other godets by the range indicated above.

The regularity of the filament is measured by means of an Uster device, i.e. a regularity testing device, model C, with integrator, by Apparatus and Machine Works of Uster, Switzerland.

A device to carry out the process of the invention is illustrated diagrammatically by way of example in the accompanying drawing.

FIG. 1 represents a front view of a drawing device with a one-stage drawing. The undrawn filament runs at first over a preparation godet P, and subsequently over the unheated drawing-off godets 1 to the pair of feed godets 2, around which it passes about 10 times in order to reach a temperature above the second-order transition temperature, while being heated in a most regular way. The drawing zone is in the range of the eighth to the tenth windings around the feed godets 2, as can be seen by measurements of the filament speed and the filament temperature. Within this range the run of the filament is very unsteady. In accordance with the invention, one of the two feed godets is then adjusted to a temperature which is lower than that of the other godet by about 1° to 35°C, the drawing zone thus being fixed on the hotter feed godet where the filament is drawn off. The run of the filament on the feed godets is far more steady, and the Uster value of the drawn material is improved by about 30 percent. Subsequently, in the case of textile filaments, the filament runs to the drawing godets 4. It is drawn in one stage.

In the case of a two-stage drawing - as shown in FIG. 2 -, as it is commonly applied to high-strength filaments, the filament runs from the feed godets to a heated pair of godets 3 having both feed and drawing functions, and thereafter it runs to the drawing godets 4. According to the invention, the pair of godets 3 is operated with a difference in temperature of from 1° to 35°C.

The following Examples serve to illustrate the process of the invention.

EXAMPLE 1

Polyethylene terephthalate having a specific viscosity of 940, measured at 25°C with a 1 percent by weight solution in a mixture of phenol/tetrachlorethane in a proportion of 3 to 2 parts by weight, was spun through a spinneret at a rate of 230 g per minute, at a spinning temperature of 305°C, to yield a filament consisting of 200 individual capillaries. The individual capillaries were bundled, and the spun filament was provided with a preparation by being guided over a preparation roller P. Subsequently it was passed twice around a drawing-off godet 1 with a shift roller 1', in the shape of a 0, the circumferential speed being 360 m per minute. After having left godet 1, the spun filament was passed 13 times around the pair of feed godets 2, in the shape of an 8, the upper godet having a temperature of 85°C, and the lower godet of 95°C, both godets running at a circumferential speed of 362 m per minute. The filament tension between drawing-off godet 1 and the heated pair of feed godets 2 was about 400 p.

From the heated pair of feed godets 2 the filament was drawn in two drawing stages in the ratios of 1:4 and 1:1.5 to 6 times its original length, and subsequently it was wound off. The filaments thus obtained of 1100 dtex showed a strength of more than 7 g/dtex, with an elongation at break of from 10 to 13 percent, calculated on the titer at break, and an Uster value of 1.75 percent. These filaments were suitable for the manufacture of safety belts, V-belts, conveyor belts, etc.

Comparative Example

With equal temperature of the feed godets 2, the other conditions being like those in Example 1, an Uster value of 2.20 percent was measured. The running of the filament on feed godets 2 within the range of the last windings was less steady than in Example 1.

EXAMPLE 2

Use was made of the same raw material and the same drawing device, together with the same spinning conditions, as has been described in Example 1. The upper godet of the heated pair of feed godets 2 had a temperature of 75°C, and the lower godet, of 95°C. The filament was passed 13 times around these godets in the shape of an 8, subsequently the filament was drawn in two drawing stages to six times its original length, and then it was wound off. The filaments thus obtained of 1100 dtex had a strength of more than 7 g/dtex, with an elongation at break of from 10 to 13 percent calculated on the titer at break, and an Uster value of 1.6 percent. The filament manufactured according to the method described ran far more steadily on the feed godets 2, and the Uster was improved by about 30 percent, as compared with an example, in which the feed godets were both heated at the same temperature.

Comparative Example

With equal temperature of the pre-heating godets, the other conditions being like those in Example 2, an Uster value of 2.25 percent was measured. The running of the filament on feed godets 2 within the range of the last windings was far less steady than in Example 2.

What is claimed is:

1. A process for the drawing of filaments having a coarse titer of more than 550 dtex made from synthetic linear polyesters, consisting essentially of running said filaments at more than 200m/min from a heated pair of driven feed godets, maintaining the temperature of one of the two driven feed godets lower from that of the other godet from 5° to 25°C, passing said filaments around the pair of heated godets a sufficient number of times such that the temperature of the filaments will be above the second order transition temperature of said polyester, the temperature for both godets being above the second order transition temperature of said polyester and drawing said filaments whereby a draw point is stabilized on the hotter godet and regularity of the filament is improved.

2. A process as claimed in claim 1, wherein the temperature of one of the two driven feed godets is lower than that of the other godet from 10° to 20°C.

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