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Bezeichnung der Erfindung: a process for manufacturing a bulky flat yarn
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : D02G 1/20, D02J 1/08

ENTSCHEIDUNG / DECISION

vom / of / du 23 May 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Teijin Limited

Einsprechender / Opponent / Opposant : 01 Enka AG
02 Rhone-Poulenc Fibres
03 Hoechst AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 56, 100(b), 114(2)

Schlagwort / Keyword / Mot clé : "Inventive step"
"Sufficiency of disclosure"
Late submission of arguments"

Leitsatz / Headnote / Sommaire

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Case Number : T 44/87 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 23 May 1989

Appellant : (Opponent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 27 November 1986 rejecting the opposition filed against European patent No. 0 037 118 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : P. Delbecque
Members : M. Huttner
F. Benussi

Summary of Facts and Submissions

I. On 26 September 1984, European patent No. 37 118 was granted with 17 claims in response to the European patent application No. 81 102 405.8 filed on 31 March 1981 claiming the priorities of the earlier applications in Japan of 2 and 17 April 1980.

Claim 1 as granted was worded as follows:

"A process for manufacturing a bulky flat yarn comprising:

a step for preparing at least two kinds of thermoplastic synthetic yarns in not fully drawn states having different natural draw ratios, respectively;

a step for simultaneously drawing in absence of any simultaneous texturizing operation said prepared yarns at a draw ratio which is at least the smallest natural draw ratio of said yarns and which is at most the largest natural draw ratio of said yarns;

and
a step for mixing said prepared yarns."

II. Three opponents, filed notice of opposition to the grant of the European patent and requested revocation of the patent in its entirety on the grounds of non-patentability under Art. 100(a) EPC and a non-sufficient disclosure under Art. 100(b) EPC. In support of their allegations they submitted documents (1) to (12) not cited in the patent granting procedure.

III. The Opposition Division rejected the opposition in a decision dated 27 November 1986 arguing essentially that the subject-matter of Claim 1 differed in important aspects from the most relevant state of the art, i.e. GB-A-844 368 (document D2), in that the latter discloses a method for producing a bulky yarn by winding a composite yarn containing different types of fully oriented continuous filaments under a tension of such magnitude that both kinds of filaments are extended, one fully recoverably and the other permanently. Therefore, there is no suggestion on how to arrive at the method expressed in the effective Claim 1, wherein two kinds of filaments in the not fully drawn states having different natural draw ratios are mixed and drawn at a rate between these ratios to produce a highly bulked and resilient yarn of silky touch.

The further documents DE-A-2 409 053 (D1) and DE-A-1 242 790 (D10) relied on by the Opponents, relating to bulk development by a subsequent heat treatment, are neither suggestive of the utilisation of an elastic recovery nor to the selection of the process parameters as set forth in Claim 1. Thus, even a combined consideration of the Opponents' citations D1, D2 and D10 fails to lead the skilled person to the subject-matter defined in Claim 1.

Likewise, the scientific papers (D6) Faserforschung und Textiltechnik or H. LUDEWIG, "Polyesterfasern" 1965 (D11), in particular the stress-elongation (draw-ratio) curves depicted therein, would only be somewhat suggestive to the skilled person to select the components and draw ratios as claimed with the benefit of ex post facto analysis.

The Division further held the objections raised under Art. 110(b) EPC as unjustified.

IV. An appeal against the decision was lodged by the three opponents on 21 and 30 January 1987 respectively and the appeal fees paid at the same time. The Appellants requested that the decision under appeal be set aside and the European patent revoked in its entirety and, in addition, two of them asked, as an auxiliary request, for oral proceedings. They submitted the Statement of Grounds either simultaneously or within the prescribed time therein referring to one new document in support of the appeal namely DE-A-1 915 821, (hereinafter referred to as document D13).

V. The Appellants' submissions may be summarised as follows:

One Appellant (Opponent 01, Enka) primarily argued that the subject-matter of Claim 1 lacks an inventive step in that the draw ratios disclosed in citation D13 comprehend a range within which the specific draw ratios set forth in Claim 1 are located and their selection is implicitly revealed in that citation.

The second Appellant (Opponent 02, Rhone-Poulenc) additionally asserts, inter alia, that the natural draw ratio relied on in the Respondents' specification and Claim 1 to define the invention is not an unequivocal parameter due to its dependency on operation conditions which are not derivable from the process data contained in the specification and thus raises the objection of insufficient disclosure (Art. 100(b)).

Still further, based on the disclosure of different elastic recoveries imparted to the filaments by the process known from citation FR-A-1 323 806 (D4), they consider the making use of such recoveries in the process set forth in citation D2 as obvious to the skilled person, and thus lacking inventive step. Accordingly, the subject-

matter of Claim 1 would not fulfill the requirements of Art. 56 EPC.

The third Appellant (Opponent 03, Hoechst) relies mainly on his submissions filed in the opposition proceedings and queries the validity of the statements in the decision as to the teachings of citation D2. They contend, the Respondent has simply applied the method taught by citation D2 to polyester filament components which must be considered as mere routine work in view of the disclosure of citations D6 or H. LUDEWIG "Polyesterfiber" 1971 (D9).

VI. The Respondent, in refuting the arguments advanced by the Appellants, stressed the point that the effect of the drawing stage performed according to citation D1 is such that the drawn yarn components exhibit a shrinkage differential, which gives rise to a length differential upon the subsequent heating in a hot air interlacer. In contrast, the process according to the invention produces the length differential of the constituent filament types by mere application of an appropriate drawing ratio generating the resultant different elastic recovery potentials of the constituents so drawn. The optional heat treatment following the drawing step serves an entirely different purpose, to wit, primarily the fixation of the imparted bulk.

The newly introduced citation D13 would simply refer to a combined drawing and false twisting crimping method for obtaining a core yarn, containing a core component of set false twisted continuous filaments and a wrapped component forming helices. Although the Respondent concedes the utilisation of undrawn filamentary components with differing natural draw ratios to achieve varying extensibility, they contend that the false-twisting step still performed teaches away from the invention.

VII. In a communication pursuant to R.Pr.B.A. Art. 11(2), the Board pointed out why it held that the objection raised under Art. 100(b) did not seem to be persuasive and the teachings of the prior art emphasised by the Appellants during the appeal proceedings on the one hand would not possibly be compatible and on the other hand largely rely on heat shrinkage to bring about the length differential required for obtaining bulk.

VIII. Sufficiently prior to the oral proceedings Appellant 02 cited a further publication FR-A-2 004 868, being the French counterpart to document D13 which, taken in combination with FR-A-1 305 832 (D3), would render the subject-matter of claims of the present invention obvious.

IX. The arguments dealt with during the oral proceedings held on 23 May 1989, which incidentally Appellant 02 did not attend, can be summarised as follows:

Both Appellants argued that the natural draw ratios upon which Claim 1 relies for delimiting the material range of the draw ratio within which both constituents of the yarn are to undergo a common drawing action cannot be unequivocally determined at the prescribed preheating temperatures preferably to be selected between 100 and 150 degrees. They based their views largely on evidence available in the textbook entitled "Polyester Fibres" by Hermann Ludewig, citation D9, page 227 in whose stress/-strain diagram of the filament drawn at 90 degrees (Figure 6.3) a constriction is absent and thus there cannot possibly exist a natural draw ratio at the operating temperatures ranging from 100 - 150 degrees as recommended by the patent in suit.

Although, in view of the dependence of the natural draw ratio on temperature, the indication of the temperature at which the natural draw ratio values are to be established,

seems absolutely essential for the feasibility of the invention, the skilled person vainly seeks any such indication to that effect in the impugned patent. They further referred to the stress/strain curves represented in the graphs of Figs. 2 and 5 as militating against an interpretation of the natural draw ratios established at room temperature.

With respect to the question of inventive step, the Appellant 01 firstly expressed the conjecture that although citation D1 is silent on the elastic behaviour of the constituent filaments, an elastic recovery inevitably had to take place. They also had recourse to DE-A-2 232 251, (D14), so far not dealt with in the proceedings subsequent to the examination procedure, and in particular to both Example 1 and the yarns illustrated in Figs. 1 and 2 as documentary evidence to the elimination of previously produced filament loops by heat shrinkage analoguous to that contemplated in column 7, lines 47-51 of the disputed patent. Accordingly, the subject of the instant invention allegedly would be reduced to a selection of specific draw ratios that enhance the formation of loops. And such selection would not involve an inventive step in view of the process performed with the parameters set forth in said Example 1, which likewise produces such loops.

The Appellant 03 in essence asserted lack of inventive step concurring with the submissions of Appellant 01 with respect to D14 and adducing the Example 1 of citation D10 by which a specific method is disclosed wherein a yarn as an intermediate product is produced that shows elastic shrinkage characteristics analoguous to those of the yarn

obtained by the method of the patent in dispute, because one of the constituents would generate loops due to its higher range of elastic recovery prior to the winding into a package.

In refuting the arguments with respect to the non-enabling disclosure of the patent in suit, the Respondent pointed out that the teachings of the patent in suit would not make sense at all if anything else than the natural material draw ratio relating to room temperature would be taken into consideration.

Reasons for the Decision

1. The appeal complies with the provisions of Arts. 106-108 and Rule 64 EPC and is admissible.

2. The patent in dispute does disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art as required by Art. 100(b) EPC for the simple reason that the values of the natural draw ratios indicated throughout the specification are to be understood as property characteristics of the filamentary material consequent upon the preceding production stages such as melt spinning, cooling and winding (vide citation D13, page 8). Consequently, the conditions under which these preparatory stages are performed determine the physical structure of the resultant cold undrawn yarn and in particular the degree of molecular orientation, of which the birefringence or, correlated thereto, the natural draw ratio is an indicator. That degree is measured and determined at room temperature (vide citation Chemiefasern/Textilindustrie (D12), page 116, column 1, 5th paragraph). This explains why persons skilled in the art refrain from explicitly

stating such fact when specifying natural draw ratios in the technical literature unless the natural draw ratios were exceptionally determined at temperatures other than room temperature.

This may be corroborated on the basis of the common established practice becoming apparent from the patent literature made available in the instant case, "inter alia", citations D1, D13 and GB-2 035 406. Neither the given birefringence nor the draw ratio values are accompanied by any temperatures to which they relate.

Still further, in the Board's opinion, the path of the curves depicted in Figs. 2 and 5 of the patent do not militate against the above finding, for several reasons. Firstly, the hypothetical curves in question are simply representations of a schematic nature serving to elucidate the qualitative phenomenon of the different elastic recoveries obtained due to the widely deviating curve paths. Thus a claim for extracting therefrom any quantitative inference or conclusion cannot be sanctioned by the Board. Secondly, and even if this were not so, one particular constituent filamentary material may very well, also at room temperature, exhibit a short flow zone passing over to a yield zone in which the stress begins to rise markedly at small draw ratio (elongation) in contrast to another material having an extended flow zone terminating at a comparatively large draw ratio. Consequently, the Board is not in a position to subscribe to the allegation of an insufficient disclosure raised by the Appellants.

3. Concerning the newly discussed citation D14 there is no doubt that the method disclosed aims at producing a polyester yarn with a good coherence having a high potential shrinkage differential which confers the fabric

made therefrom an excellent hand. The heat treatment subsequent to the common hot drawing action is carried out at a temperature somewhat higher than the drawing temperature and at a tension so as to allow a shrinkage of 1 to 5% within which range the loops are virtually caused to disappear and hence a good coherence is assured. Consequently, the disclosure is concerned with the elimination of the overlength of the loops resulting from the drawing operation. Its authors are yet absolutely silent whether the shrinkage attained stems from utilisation of the elastic recovery potential or from any other reason. The disclosure thus is irrelevant to the judgment of inventive step of the process according to the patent in suit. Consequently, the facts emerging from this citation are likewise not relevant to the decision.

After the Board has itself ascertained these circumstances, it has therefore made use of the power conferred on it by Art. 114(2) EPC and decided to disregard the Appellant's submission related thereto since they were introduced in the opposition proceedings for the first time only during the oral appeal proceedings, which is not to be considered in due time particularly since the citation was uncovered by the search report and has been on file and available to the public from virtually the beginning of the examining procedure. Hence it was not found late. In addition, there was no reason given why it could not be dealt with at an earlier stage in the procedure.

4. Since the existence of novelty has not been in dispute, the question now arises whether the subject-matter set forth in Claim 1 involves an inventive step as required by Arts. 52(1) and 56 EPC.

4.1 According to the Board, the main idea on which the invention defined in this claim is based resides in taking advantage of the different elastic recovery behaviour of synthetic filament components that have been subjected to a common drawing step of equal draw ratio. Such different behaviour stems from different molecular orientation imparted in previous production stages and is represented by different natural draw ratio values. By drawing these components simultaneously in a range between the two natural draw ratios an increased difference in residual lengths is produced upon relaxation which gives rise to sufficiently high bulkiness.

4.2 In the Board's opinion the citation D2 does not constitute the closest prior art from which the invention sets out, although the method disclosed makes use of the different elastic properties of two yarn constituents. It aims at making a fabric exhibiting a crepe effect by winding such yarn into a package under moderate tension of such magnitude that both constituents are either permanently or recoverably extended. In order to impart the tension required, the yarn is passed through a thread tension device. Thence, the package is supplied to a knitting machine whereupon the yarn is knitted into the fabric. In this manner no significant change of molecular orientation can be generated due to the absence of any substantial permanent attenuation of the filaments involved.

Since one constituent is not drawn at all but merely elastically extended, this citation could not lead the skilled person to take advantage of the different elastic recoveries generated by the very simultaneously drawing action to which both constituents are subjected. On the contrary, he would rather be dissuaded from adopting such a method. Furthermore, the problem which is solved by the present invention cannot in the opinion of the Board be

objectively determined from this rather remote background art.

4.3 In contrast, the problem underlying the invention is correctly evaluable from the paragraphs of the introductory portion of the description and may be summarised as follows:

The invention aims at providing a process for making bulked yarn by generating an increased difference in length residual after allowing for elastic recovery of the constituents and avoiding the drawbacks hitherto encountered in the known methods wherein false twisting, wrapping of a yarn around the core by a fluid jet nozzle and heat treatment for developing the imparted heat shrinkage properties are used. The acknowledged known methods are considered by the patentee as either complicated and/or producing insufficient bulkiness.

4.4 As pointed out in the Board's communication, the citation D1 relates to a process to produce a bulked polyester yarn of drawn potentially crimpable bicomponent filaments having a greater potential shrinkage than the other constituent of drawn uncrimped homofilaments. These filaments are subjected to the action of an interlacer utilising jets of heated gaseous medium at a temperature of from 170°C to 250°C while simultaneously allowing them to relax. Thereby a crimp in the bicomponent filaments develops and the thus obtained overlength of the homofilaments is caused to form loops in the interlacer which wrap about the bicomponent filaments. Thus this method relies on the crimping potential of the latter due to its bicomponent construction. A conjectural significant elastic recovery potential allegedly produced by the heat treatment lacks cogency. The Board takes the position that such mere conjecture, which the Appellant 01 failed to

substantiate, cannot be used to deprive Claim 1 of inventive subject-matter.

4.5 Citation D10 relates to a method of making flat polyester yarns which develop bulk due to the different shrinkage properties of the constituents of the composite filament yarn caused by a heat treatment imposed subsequent to a common drawing step either prior to or preferably after fabrication. However, no information whatsoever as to the natural draw ratios of the two constituents other than the inference that they must be different may be extracted from the disclosure by the skilled person. It is generally available specialist knowledge in the art of continuous drawing polyester filaments (vide citation D11, 1st paragraph, page 198) to apply a draw ratio situated in the yield zone of the stress/elongation curve. From this fact the inference can properly be drawn that the drawing usually takes place at a draw ratio higher than the natural draw ratio. In the absence of a statement contrary to this in D10, it must be presupposed that such likewise is the case in the process disclosed therein. The Board cannot find and the Appellants have not directed its attention to anything in document D10 itself giving the skilled person any information on how to modify the known process to the end of increasing the length difference between the two constituents upon elastic recovery, nor any information which would lead him to so modify the process as to correspond to the one claimed.

Furthermore, if the constituents after having undergone common drawing would already at this stage exhibit bulkiness comparable to the one obtained with the process of the invention, it is hardly conceivable why then a skilled person would have a real incentive to add a separate further heat treatment step in order to develop the very same bulk again once more.

4.6 According to the disclosure D13 the drawing step of two constituents having different birefringence values is combined with a false twisting operation. Due to the greater extensibility of the component with lower birefringence value, a helix of alternating direction wraps around the other component having a latent crimp. The Board notes the extremely limited and thus negligible length differential whose development in the following relaxation zone may not be ruled out completely but remains highly conjecturable. The Board leaves open the question whether this would contribute somewhat to the shrinkage of the core component, simply because the skilled person unquestionably conceives the imparted heat treatment as predominantly accounting for the greater shrinkage of one constituent. Hence, this citation taken at its face value would advise the skilled person to take advantage of the heat shrinkage rather than to residual elastic shrinkage.

4.7 The problem the method of D3 intends to solve resides in the provision of an interlaced compact yarn exhibiting cohesion comparable to that of a conventional twisted yarn. To achieve this end filaments of identical or different types are passed through a hot fluid jet interlacer prior to or subsequent to the drawing step. From this fact the Appellant 02 derives that interlacing and twisting a filament yarn would be equivalent and thus interchangeable. But even if this were an acceptable proposition, which incidentally it is not, the Board still cannot find any logic in the combination of the teachings of citations D3 and D13, since the latter produces the bulk by a false twisting operation imparting an alternating helix direction, which in no way equals conventional twist. For the reasons advanced, the two references resist combination or if they were to be

combined against any reason, Patentee's invention would certainly not result.

4.8 It must be emphasised that of all citations relying on a drawing step simultaneously performed on two different constituents which have been dealt with above, none has revealed or even only foreshadowed that a sole common drawing step would suffice to produce satisfactory bulk, if only and simply the machine ratio were selected in the manner taught by the invention. Without any question, the Respondent for the first time has appreciated this and thus has been successful in avoiding the hitherto deemed indispensable further cumbersome steps such as false-twisting, intermingling, wrapping and/or heat treatment, which amounts to significant process simplification accompanied with considerable energy savings. This is of paramount importance, since achieving simplicity without the sacrifice of quality is indicative of non-obviousness (T 106/84, OJ 5/1985, 132).

4.9 This conclusion is also not shifted when combining the teachings of all these citations with that of citation D2. What this citation actually reveals is to produce short slack loops by applying an extension step to the two constituents of a fully oriented yarn. To apply this teaching consistently to any of the known methods would thus factually lead to the addition of an extension step for producing the loops after the drawing operation has been completed. Such procedure however would not be feasible due to the fact that all citations dealing with a drawing step inevitably require subsequent relaxation and by contrast no extension. Consequently, the teachings of D2 are not consistent with any of the teachings of the citation involving a drawing step such as D1, D3, D4, D10 and D13.

For these reasons the teachings of D2 cannot possibly be compatible with any of these citations, let alone the fact that they all are predominantly relying on heat shrinkage to bring out the length differential necessary for obtaining the bulk. On the strength of these facts, the arguments in support of obviousness submitted by the Appellants in the context of citation D2 are not sufficiently persuasive to rebut the conclusions of non-obviousness reached above.

4.10 The scientific papers D5 to D9, D11 and D12 present the influence of the melt spinning parameters on the drawing of polyester filament yarn and deal in particular with the analysis of continuous drawing process in terms of basic load/extension/temperature properties. they also do not lead the skilled person to the principle of the invention. To the extent that representations have been made concerning hot drawing polyester filaments they are basically confined to the mapping of different stress elongation curves established at a variety of process parameters. However no recipe can be extracted how the phenomena established can be put to use to obtain considerably higher elastic recovery of one component of a yarn compared with another in order to generate sufficient bulk. Hence, the Board is in agreement with the views expressed in the impugned decision that these papers could be considered somewhat suggestive to the skilled person merely with the benefit of ex post facto analysis.

4.11 From the foregoing considerations the Board holds that none of the teachings of any of the documents discussed above nor the consideration of them as combined by the Appellants would direct the skilled person in the slightest to solution of the problem set forth in section 4.3 and to the salient features recited in Claim 1.

5. Hence, the subject-matter of this claim is both non-obvious and involves an inventive step thus fulfilling the requirements of Art. 56 EPC. None of the grounds for opposition mentioned in Art. 100 EPC prejudices the maintenance of Claim 1 as granted.

6. Claims 2-17 concern particular embodiments of the method according to Claim 1. The Board is satisfied that their maintenance likewise is not prejudiced by any one of the grounds for opposition raised.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani P. Delbecque

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