BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 41/90 - 3.2.1

Application No.: 81 200 111.3

Publication No.: 0 036 674

Title of invention: Method of making plastics tubing

Classification: F16L 11/08, B29C 47/02

D E C I S I O N
of 2 July 1991

Proprietor of the patent: Copely Developments Ltd et al

Opponent: Solvay et Cie

Headword:

EPC Article 56

Keyword: "Inventive step (yes)"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 41/90 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 2 July 1991

Appellant : (Proprietor of the patent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 9 October 1989, and posted on 13 November 1989, revoking European patent No. 0 036 674 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : F. Gumbel
Members : S. Crane
M. Schar

Summary of Facts and Submissions

I. European patent No. 0 036 674 was granted with effect from 4 June 1986 on the basis of European patent application No. 81 200 111.3 filed on 30 January 1981, priority being claimed from United Kingdom application No. 8 009 780 dated 22 March 1980.

II. Claim 1 of the granted patent reads as follows:

"A method of forming a plastics tube (1) comprising extruding a plastics material through a die to form a first tube (2) having a plurality of ridges (3) or ribs which are disposed longitudinally of the tube (2) and which define V-shaped valleys therebetween, applying reinforcing thread (4) on the outer surface of the first tube (2), and extruding a second tube (5) over the first tube (2) and the reinforcing thread (4), characterised in that the reinforcing thread is applied so that the ridges (3) or ribs space the reinforcing thread (4) from the valleys, and the second tube (5) is extruded over the first tube (2) and the reinforcing thread (4) so as to flow into the valleys to bond the first and second tubes (2, 5) together between adjacent portions of the reinforcing thread (4)."

Dependent Claims 2 to 7 relate to preferred embodiments of the method according to Claim 1.

III. The patent was opposed by the Respondents on the grounds that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC) and of insufficient disclosure (Article 100(b) EPC).

In the course of the opposition proceedings the following documents were referred to by the Respondents:

(D1) BE-A-817 110
(D2) US-A-3 460 578
(D3) US-A-3 860 040
(D4) US-A-3 814 138
(D5) AT-B-335 240.

IV. By its decision taken at the oral proceedings on 9 October 1989 and issued in written form on 13 November 1989 the Opposition Division revoked the patent on the ground that its subject-matter lacked inventive step particularly having regard to the teachings of document D4.

V. The Appellants (Proprietors of the patents) appealed against this decision on 11 January 1989 and paid the appeal fee on the same day. The Statement of Grounds of Appeal was received on 20 March 1990.

VI. In a communication pursuant to Article 11(2) RPBA, issued on 7 January 1991, in preparation for the oral proceedings requested by both parties, the Board indicated that it considered document D3, on which the preamble of granted Claim 1 is based, as being the most relevant with regard to the question of novelty and inventive step.

VII. Oral proceedings were held on 2 July 1991.

VIII. In the course of the oral and written proceedings essentially the following arguments were put forward by the Appellants:

The technical problem with which the claimed invention was concerned was the production of plastics tubing which had the same strength as equivalent prior art tubing but required the use of less material.

This problem was clearly stated in the introductory description of the patent. The problem was solved by the development of a production method which led to a good bond between the first (inner) and second (outer) tubes and the reinforcing thread of the tubing, which thus for a given thickness of these tubes increased the overall strength of the tubing. For any required strength the thickness of these tubes could therefore be reduced in comparison with the prior art. The creation of a good bond was not itself the technical problem to be solved but rather the first step towards the solution of the problem as stated above. In this respect reference should be had to document D4 where a bond between the inner and outer tubes was held to be disadvantageous. This showed that there was no recognised automatic correlation between the quality of this bond and the overall strength of the tubing.

According to the proposal of the contested patent the good bond between the inner and outer tubes was achieved by a combination of features which were prima facie known per se from a variety of documents but which in those documents had a different function to that proposed in the patent. Furthermore, when considering the contribution of these features to the solution of the problem it was irrelevant whether these features appeared in the preamble or the characterising clause of the claim, since the subject-matter of the claim had to be judged as a whole.

Thus the V-shaped valleys provided in the outer surface of the inner tube according to document D3 were provided to retain adhesive and not to increase the area of bonding as proposed in the patent and there was nothing in this document to suggest that an increase in this area was of any significance. Granted Claim 1 had indeed during

examination proceedings been delimited with respect to document D3 such that the feature of the V-shaped valleys appeared in the preamble of the claim, this did not however mean that this feature should not be considered as contributing to the solution of the problem as stated above.

Furthermore, there was nothing in document D3 to suggest that the threads were spaced from the valleys. This feature was indeed known from document D4, as was the feature that the second tube flows into the valleys between adjacent thread portions, but there the express purpose of the described arrangement was to embed the thread in the outer tube without there being any bond between inner and outer tube.

With regard to the objection of the Respondents that the patent specification did not indicate how the bond between the inner and outer tubes was to be obtained without the use of adhesive the man skilled in the art would readily be able to select materials and parameters such that bonding reliably occurred, for example by extruding the outer tube while the inner tube was still sufficiently warm. If the inner tube had cooled it could be necessary to apply a solvent to soften its surface, such a solvent was however not to be considered as an adhesive.

Accordingly, the Appellants requested that the appealed decision be set aside and the patent maintained in the granted form.

Alternatively the Appellants requested the maintenance of the patent on the basis of the claims filed with their letter of 26 April 1991 in which it was stated in Claim 1 that the outer tube was bonded directly to the inner tube.

IX. In contesting the views of the Appellants and in support of their request that the appeal be dismissed the Respondents have put forward essentially the following counter-arguments:

More important than the question of whether the problem to be solved was the reduction of the material required to make tubing of a specific strength or the improvement of the bond between the layers of the tubing was an analysis of the features actually specified in Claim 1 of the patent.

The closest prior art was that disclosed in document D3 where the inner tube was provided with ridges defining V-shaped valleys therebetween as stated in the preamble of granted Claim 1. It was self-evident that these ridges increased the area available for bonding and could therefore improve the bond. Furthermore, when the reinforcing thread was wound around the inner tube it would slightly flatten the ridges but the ridges would still space the thread from the valleys, in correspondence with the first feature of the characterising part of the claim. Although document D3 proposed the use of an adhesive to bond the inner and outer tubes it was well known in the art, as stated in the introductory description of the contested patent itself, to bond the inner and outer tubes of plastics tubing directly by extruding the outer tube onto the inner tube. Examples of this technique were shown in documents D1 and D5. It was also clear from this part of the description of the patent that the skilled man had already recognised the necessity for a good bond between the inner and outer tubes. If the skilled man, in other respects following the teachings of document D3, dispensed with the adhesive and adopted this

well-known technique of direct bonding he would arrive at a method as defined in granted Claim 1.

In document D4 the arrangement of the reinforcing thread between the inner and outer tubes was essentially equivalent to that proposed by the patent; that is the thread was applied over the ridges of the inner tube and was spaced from the valleys defined between those ridges, and the material of the outer tube on extrusion onto the inner tube flowed into the valleys thereby securing the thread in the outer tube. The outer tube did not however bond to the inner tube. Since the technical means employed here were equivalent to those proposed in the patent it was not apparent how according to the patent, in contrast to document D4, a good bond was obtained between the inner and outer tube.

The disclosure of the claimed invention was therefore insufficient in this respect.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.

2. Granted Claim 1 is a combination of the features of original Claims 1 to 4 and 8 and features relating to the spacing of the reinforcing thread from the valleys and the flow of the second tube into the valleys, these features being derived from the description of the embodiment of original Figure 3 (now the only Figure of the patent specification). The amendments to the description do not go beyond the necessary adaptation to the terms of Claim 1 and an evaluation of the relevant state of the

art. There is therefore no objection to the patent specification under Article 123(2) EPC.

3. Sufficiency of disclosure

The Board is satisfied that the man skilled in the art would have no difficulty in performing the method defined in granted Claim 1 such that a satisfactory bond is obtained between the inner and outer tubes. The ability of an extruded material to bond to a substrate material, provided that these materials are compatible and the surface of the substrate is in a suitable condition, for example still warm after being extruded itself or softened by a solvent, is so well known that there was no requirement to mention this specifically in the original disclosure. The fact that according to document D4 no bond is obtained when the outer tube is extruded onto the inner tube merely indicates that in this case the appropriate conditions for obtaining bonding, such as those mentioned above, did not exist or that active measures were taken to prevent bonding, such as the application to the inner tube of a separation film.

Accordingly, the ground of opposition under Article 100(b) EPC is no bar to maintenance of the patent.

4. State of the art

The most relevant state of the art is in the opinion of the Board that shown in document D3, on which the preamble of granted Claim 1 is based. This document discloses a method for forming plastics tubing in which a first inner tube is extruded with a plurality of longitudinal ridges defining V-shaped valleys therebetween, this tube is passed through a bath of adhesive, reinforcing thread is applied to the outer surface of the inner tube, and an

outer tube is extruded over the reinforcing threads and is bonded thereto by means of the adhesive.

Documents D1 and D2 both relate to plastics tubing comprising extruded inner and outer tubes with a reinforcing thread disposed therebetween. In order to prevent the reinforcing thread being displaced axially on the inner tube before the outer tube is extruded thereon the inner tube is provided with a number of ridges into which the reinforcing thread cuts as it is wound on the inner tube. Between the ridges the reinforcing thread lies on the surface of the inner tube.

In document D4 it is proposed to improve the flexibility of this same basic configuration of plastics tubing by avoiding any bond between the inner and outer tubes and embedding the reinforcing thread in the outer tube such that this can move longitudinally with the outer tube by sliding on the inner tube. To achieve this effect the surface of the inner tube is formed with a series of rounded ridges and valleys. The reinforcing thread is wound over the ridges and is spaced from the valleys and on extrusion of the outer tube this flows into the valleys to embed the reinforcing thread in the outer tube.

Document D5 related to a method of forming plastics tubing in which once the reinforcing threads have been applied to the inner tube the latter is expanded under pressure and heat so that it flows partially through the gaps between the reinforcing threads and is then allowed to cool with the pressure maintained. In this way the reinforcement is pre-tensioned. Subsequently the outer tube is extruded over the inner tube and bonds directly to the portions thereof which have flowed past the reinforcing threads.

5. **Novelty**

5.1 The method of granted Claim 1 is distinguished from the closest state 1 the art according to document D3 by the features of the characterising part of the claim, that is in that the reinforcing thread is applied so that the ridges space the thread from the valleys between the ridges and that the outer tube is extruded so as to flow into the valleys to bond the inner and outer tubes together.

In this respect the Board is not able to interpret the references in document D3 to the reinforcing threads "slightly" flattening the ridges as meaning in effect that the threads will be necessarily spaced from the valleys. According to Claim 1 of document D3 the reinforcing threads are required to "fill" the valleys, and in the cross-sections of Figures 2 and 6 are indeed shown as doing so. A spacing of the threads from the valleys would therefore be inconsistent with both the claims and the figures of the document.

Furthermore, although the outer tube is also provided with internal ridges and valleys complementary to those of the inner tube it is apparent that the bonding between the tubes is solely by way of the adhesive applied to the inner tube. The outer tube does not flow into the valleys to bond the tubes together as required by granted Claim 1. In this respect the Board interprets this requirement of Claim 1, having regard to the whole of the patent specification and the statements made by the Appellants in the course of the procedure, as meaning that bonding occurs by virtue of direct contact between the inner and outer tubes without the interposition of an adhesive layer.

5.2 It is apparent from the description under point 4 above of the state of the art according to documents D1, D2, D4 and D5, that these are more remote from the method of granted Claim 1 than the state of the art according to document D3. A detailed comparison of the claimed method with each of these state of the art documents is therefore unnecessary for establishing the novelty of that method.

6. **Inventive step**

6.1 It belongs to the well-established jurisprudence of the Boards of Appeal that inventive step is to be evaluated by means of the problem and solution approach whereby the problem is to be objectively determined by comparison with the closest state of the art.

6.2 The Board is of the opinion, as indicated above, that in the present case the closest state of the art is represented by document D3. It is true that according to this document the longitudinal ridges and valleys are provided to maintain a uniform coating of adhesive on the inner tube after this is passed through the adhesive bath. By ensuring such a uniform coating of adhesive the bond between the inner and the outer tube will be improved. However, although there is no specific mention of this in document D3, it is self-evident for the skilled man that the increased surface area resulting from the provision of the ridges and valleys will necessarily also lead to an improvement in the bond. The Board cannot therefore accept the argument of the Appellants that the provision of such ridges and valleys should be considered as part of their solution of the technical problem to be solved, which in their view is the development of a method for producing plastics tube which enables tubes to be produced which for a given strength require less material than in the prior art.

6.3 In this respect the Board remarks that in the original application documents, which were drafted without the knowledge of document D3, the problem to be solved was correctly stated in the above terms and in that context it is correct to view the provision of a better bond between the inner and outer tube as being part of the solution of this problem. However, the Appellants have not convinced the Board, either by way of argument or evidence, that the measures taken in the method of documents D3 to ensure that a good bond is achieved between the inner and outer tubes and the reinforcing thread do not achieve this goal, that the strength of the bond achieved according to the invention is enhanced over that achieved according to document D3, or that as a result it is possible to produce tubing according to the invention that requires less material than tubing of the same strength produced according to document D3. It is however without doubt that the application of an adhesive as required by document D3 is a measure which involves extra costs and equipment and which can be associated with environmental problems. Accordingly, the Board sees the technical problem to be solved, objectively determined by comparison with the state of the art disclosed in document D3, as being the development of a method in which the above mentioned disadvantages associated with the use of an adhesive can be avoided while at the same time maintaining a good bond between the inner and outer tubes and the reinforcing thread.

6.4 For the skilled man seeking to adapt the method of document D3 such that an adhesive layer was no longer required it would be evident that direct bonding between the inner and outer tubes was the alternative and that then the reinforcing thread must be arranged so that on extrusion of the outer tube there will be direct contact between the outer tube and the inner tube to allow bonding

therebetween. This can be achieved by ensuring that the spacing between adjacent portions of the reinforcing thread is sufficiently large as shown in documents D1 and D2. However, there is nothing in the whole of the cited prior art which could suggest to the skilled man that to improve the bond further the reinforcing thread should be so wound around the ridges and these ridges should be of such form that the reinforcing thread is spaced from the valleys. Indeed, both documents D1 and D2, where the reinforcing threads cut into the ridges provided there so as positively to locate the threads with respect to the inner tube without the need for adhesive, tend to point away from the spacing of the thread from the valleys as stipulated in granted Claim 1. By the adoption of this measure the method of the invention allows the outer tube to contact the inner tube along the whole length of the valleys and the reinforcing thread is effectively immovably embedded in the outer tube instead of merely being entrapped between the inner and outer tubes as proposed in documents D1 and D2.

It is indeed true that according to document D4 the reinforcing thread is similarly arranged as required by Claim 1 of the granted patent and that there also the thread is embedded in the outer tube. That document is however specifically and exclusively concerned with plastics tubing where there is no bond between the inner and outer tubes. The skilled man would therefore have no reason to take any account of the teachings of this document when he is considering ways of providing as good a bond as possible between these tubes. For this reason also it would be inappropriate, as was done in the decision under appeal, to consider document D4 as the closest state of the art starting from which the inventive step of the claimed invention should be judged even though, on a purely quantitive basis, it possibly

discloses more of the features of granted Claim 1 than does document D3.

6.5 Accordingly, the Board comes to the conclusion that the subject-matter of granted Claim 1 cannot be derived in an obvious manner from the state of the art and must therefore be seen as involving an inventive step (Articles 52(1) and 56 EPC) and as being patentable.

Dependent Claims 2 to 7 concerning particular embodiments of the invention according to Claim 1 can likewise be maintained.

The ground of opposition under Article 100(a) EPC therefore also fails.

7. Since the Appellants' main request was allowed, their auxiliary request did not need to be considered.

Order

For these reasons, it is decided that:

1. The appealed decision is set aside.

2. The patent is maintained in the granted form.

The Registrar: The Chairman:

S. Fabiani F. Gumbel