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D E C I S I O N
of 24 October 1995

Case Number: T 0518/93 - 3.2.1

Application Number: 84200798.1

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IPC: B21C 23/00, B21C 25/02

Language of the proceedings: EN

Title of invention:
An apparatus for continuous extrusion of metals

Patentee:
Backus, Henricus Peter Marie

Opponent:
Aluteam Management and Service GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0518/93 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 24 October 1995

Appellant: Backus, Henricus Peter Marie
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Representative: -

Respondent: Aluteam Management and Service GmbH
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 24 March 1993
revoking European patent No. 0 127 924 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
B. Schachenmann

Summary of Facts and Submissions

- I. European patent No. 0 127 924 was granted on 10 October 1990 on the basis of European patent application No. 84 200 798.1.

Claim 1 of the granted patent reads as follows:

"An apparatus for continuous extrusion of metals, with a channel (2) with substantially parallel walls, one wall being continuously movable with respect to another wall of the channel to feed the metal (4) supplied to the channel along it by friction under generation of heat, said channel (2) being substantially closed at the end (6) opposite the feed end with the exception of an extrusion opening (22) giving access for the metal to a wider space (14) in an extrusion chamber adjoining and supplying the metal to a throughflow shaping die (10,11), characterized in that between the extrusion opening (22) in the channel and said wider space (14) there is an extrusion passage (12) with substantially parallel walls of a length at least equal to its transverse dimensions and merging without sudden change of said transverse dimensions gradually into said wider space (14), which has a central flow axis for the metal substantially in line with the central flow axes of said passage (12) and said shaping die (10,11)."

Dependent Claims 2 to 4 relate to preferred embodiments of the apparatus according to Claim 1.

Independent Claim 5 has the following wording:

"An extrusion body for insertion in an apparatus according to any of the preceding claims, characterized in that said body (7) comprises a through-going passage

for metal therethrough, comprising in sequence of through-flow an extrusion passage (12) with substantially parallel walls of a length at least equal to its transverse dimensions, a passage (13) widening from said extrusion passage (12) towards a wider space (14) and connecting them for metal flow therethrough gradually without sudden change of transverse dimensions of the passage, and a shaping die (10,11), the central flow axes of said extrusion passage (12), said passage (13), said wider space (14) and said shaping die (10, 11) being substantially in line."

- II. The granted patent was opposed by the respondents on the grounds that its subject-matter lacked novelty and/or inventive step.

In particular, they alleged that they had for some time before the priority date of the contested patent been involved in the development of continuous extrusion apparatus of the type defined in the preamble of Claim 1 and in the course of this work had proposed a modification of the original extrusion body to improve the flow of metal through it. This modification had been discussed by one of their employees at a meeting in February 1983 with the employee of another manufacturing company of extrusion apparatus and had been entered by hand in the original works drawing of the relevant apparatus which was in the possession of that other company. The discussion had in no way been subject to any agreement of confidentiality and the other company had been free to do what they pleased with the information. The relevant employees of the respondents and the other company were offered as witnesses. It

could be seen from the modified copy of the original works drawing (henceforth referred to as "drawing 2") that the proposed form of the extrusion body had all the features set out in the characterising clause of Claim 1.

These features were in any case well known in the extrusion art as could be seen from page 2460 of "Enzyklopädie der Naturwissenschaft und Technik" (henceforth document D4). It was obvious to apply them to a continuous extrusion apparatus of the type defined in the preamble of the claim.

Subsequently to filing the notice of opposition the respondent referred, in a letter dated 4 February 1992, to two further prior art documents, namely "Strangpressen, Verfahren-Maschinen-Werkzeuge", Laue/Stenger, Aluminium Verlag, Düsseldorf, 1976 pages 197 and 261, (document D5) and Wire Journal, July 1978, pages 82 to 87, "Update: the conform continuous extrusion process", J. A. Pardoe (document D6). In this letter they also made reference to the alleged prior use of an extrusion die having the relevant features of Claim 1.

III. The appellant (proprietor of the patent) strongly contested that the circumstances portrayed by the respondents concerning the modifications shown in drawing 2 were accurate and developed various lines of argument which in his view showed that the drawing could only have been modified after the priority date of the contested patent, and was therefore a forgery. He argued that the use of a forged document as the basis of the opposition made it inadmissible and refrained from commenting in any detail on the substantive issues involved.

IV. In a communication of the Opposition Division dated 7 July 1992 reference was made to two prior art documents which were mentioned in the description of the patent specification, namely JP-A-57/159213 (document D1) and Technical Paper MF 76-407 of the Society of Manufacturing Engineers, Dearborn, Michigan, 1976, "Continuous extrusion by the Conform process", E. Hunter (document D2).

The Opposition Division expressed its opinion that the subject-matter of the granted claims lacked inventive step with respect to the state of the art according to documents D1 and D2, and the general knowledge of the skilled person.

V. With its decision dated 24 March 1993 the Opposition Division revoked the patent for the reasons given in its communication of 7 July 1992.

VI. An appeal against this decision was filed on 21 May 1993 and the appeal fee paid on 24 May 1993. The Statement of Grounds of Appeal was filed on 22 July 1993.

The appellant requested that the contested decision be set aside and the patent maintained unamended.

The statement of grounds directed itself essentially to the reasons for which in the opinion of the appellant the opposition should be considered as inadmissible.

VII. With a reply dated 14 September 1993 the respondent requested that the appeal be dismissed. With a further letter dated 20 July 1994 the respondents requested apportionment of costs on the grounds that the extensive

submissions of the appellant did not go to the substance of the contested decision and that the significant time required to deal with them was disproportionate to their value to the issues at hand.

VIII. In his turn, with a letter dated 15 August 1994, the appellant also requested apportionment of costs, essentially on the basis that these arose as the result of the filing of an inadmissible opposition.

IX. In a communication dated 15 March 1995 the Board gave, with reasons, its preliminary view on various matters, including:

(a) that the opposition was admissible;

(b) that the appeal was admissible;

(c) that drawing 2 was not significantly more relevant to the patentability of the claimed subject-matter than the published state of the art, in particular certain documents mentioned in the description of the patent specification itself (documents D1, D2, and US-A-4 277 968 (D3)); and

(d) that pursuant to Article 114(2) EPC it was intended to disregard the late filed evidence contained in the respondents letter of 4 February 1992 concerning an alleged prior use.

X. Oral proceedings before the Board were held on 24 October 1995.

- XI. At the oral proceedings the appellant put forward essentially the following substantive arguments:

At the time the invention was made much effort had already gone into trying to make the "Conform" continuous extrusion process workable on a commercial scale. These had however only been partially successful and it was still not possible to produce complex sections with the required high degree of surface finish. He had realised that this was due to temperature and pressure variations in the metal being delivered to the extrusion die by the frictional feed and had designed the path of the metal from the end of the feed channel to the die in such a way that these variations were substantially eliminated. There was nothing in the state of the art which could suggest to the skilled person the particular combination of special form of extrusion passage and extrusion chamber as claimed.

- XII. In reply the respondents argued essentially as follows:

The characterising clause of Claim 1 contained nothing which was not well known in the art. In particular, the choice of length of the extrusion passage was dependent on a number of factors and it was conventional for this to be longer than it was wide, as could be seen from document D4 and drawing D2 (before amendment). As for the requirement that there was a smooth transition from the extrusion passage to the wider space in the extrusion chamber this followed from the need to avoid dead spaces and achieve smooth flow, and was again wholly conventional as witnessed by documents D1 and D5, and drawing 2.

Reasons for the Decision

1. The appeal complies with the formal requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. Although the statement of grounds did not deal with the substantive reasons given in the appealed decision for revocation of the patent, the argument that the opposition was inadmissible, if it had been successful, would indeed have led to the appealed decision being set aside. The appeal is therefore admissible.

2. *Admissibility of the opposition*

In its communication of 15 March 1995 the Board set out in detail its reasons for concluding that the opposition was admissible. Since this question was not addressed again at the oral proceedings, and since the Board, for the reasons set out below, has come to the conclusion that the appeal should succeed on the basis of substantive issues involved, it is not necessary to repeat the relevant parts of the Board's communication here.

3. *State of the art*

3.1 The development of the "Conform" continuous extrusion process in the 1970s is described in some detail in documents D2 and D6, which are of similar content. The basic concept involved is the advancement of feedstock along a channel towards an extrusion die by frictional engagement with a moving member which forms at least one wall of the channel. In practice the moving member is a rotating grooved wheel, the channel-forming groove being closed over part of its length by a shoe with a corresponding arcuate surface and a stop which enters the groove to close it. The heat generated by the

frictional engagement of the wheel with the feedstock brings this into a plastic state enabling it to pass through a passage in the shoe to the extrusion die.

- 3.2 Documents D1 and D3 both relate to continuous extrusion apparatus of the basic configuration described above.

The apparatus of document D1 is set up to extrude a sheathing on to a wire rod. To this end the rod is passed through an extrusion chamber in a direction perpendicular to that of the extrusion passage. The length of the extrusion passage, as shown in the drawings, is considerably less than its width. The extrusion passage is joined to the wider space of the extrusion chamber by a frusto-conical wall.

Document D3 is essentially concerned with the problems involved in producing a variety of different sized products from a single size or limited number of sizes of feedstock. Various arrangements are disclosed in which the rotating wheel of the apparatus has a plurality of grooves, a respective extrusion passage leading from each groove to a common extrusion chamber in a wall of which there is arranged an extrusion die. The extruded product may be tubular or may be a sheathed rod as in document D1. Figure 5 shows an embodiment with a single groove and single extrusion passage. It is stated that this arrangement is suitable where the speed of the product is not required to be high. The extrusion passage opens directly into the flat base of the extrusion chamber. As shown in the drawing, the extrusion passage is longer than it is wide.

- 3.3 The cited pages of document D4 is concerned with a screw extruder for producing blown plastics foils. Between the screw and the extrusion die there is shown an extrusion passage of considerable length.

3.4 The cited passages of document D5 show an extrusion press for aluminum and details of die and die holder therefor. Between the end of the press cylinder and the die there is arranged an expansion disc with an internal wall of constantly increasing cross-section.

3.5 Drawing 2 shows (in its unamended form) an extrusion body for use with a "Conform" continuous extrusion apparatus wherein a cylindrical extrusion passage opens directly into the flat base portion of the extrusion chamber. This base portion is of smaller diameter than the full diameter of the extrusion chamber and is connected thereto via a stepped portion. The length of the extrusion passage is greater than its diameter. The handwritten amendments concern a frusto-conical section between the extrusion passage and the base portion of the extrusion chamber. As a consequence of incorporating this frusto-conical section the cylindrical extrusion passage is shortened to an extent that its length is less than its diameter. The diameter of the wider end of the frusto-conical section is less than that of the base portion of the extrusion chamber.

As will become clear from what is said below the Board has come to the conclusion that drawing 2 is prejudicial to neither the novelty nor the inventive step of the claimed subject-matter. For this reason the Board decided that it would not be procedurally economic to embark on an investigation, which would necessarily have entailed hearing several witnesses, as to how the drawing came into being and whether its content was made available to the public. Instead, it has proceeded on the basis that drawing 2 belongs to the state of the art according to Article 54(2) EPC.

4. *The claimed invention*

In the preamble of Claim 1 there are set out, in very general terms, the essential features of a continuous extrusion apparatus of the "Conform" type.

The characterising clause of the claim comprises effectively three features. The first of these is that between the extrusion opening in the channel and the wider space of the extrusion chamber there is an extrusion passage "with substantially parallel walls of a length at least equal to its transverse dimensions". Having regard to the description, see column 4, lines 47 to 52 and lines 54 to 57, it is clear that what is meant by this is that the cross-section of the extrusion passage is constant along its length, i.e. it is cylindrical in the broad mathematical sense of the term, and that its length is at least equal to its largest transverse dimension. The second characterising feature is that the extrusion passage merges without sudden change of its transverse dimensions gradually into the wider space of the extrusion chamber. Again with reference to the relevant part of the description, in particular column 4, lines 58 to 63, the Board understands this feature as meaning that between the end of the cylindrical extrusion passage and the wall defining the wider space of the extrusion chamber there is an unstepped transition section of substantially constantly increasing cross-section. The third feature stated in the characterising clause of Claim 1 is that the central flow axes for the metal in the extrusion passage, the wider space of the extrusion chamber and the shaping die are substantially in line. This feature is clear and does not require any interpretation. However, it is apparent from the prior art cited in the

patent specification itself, in particular documents D1 and D3, that this configuration is conventional when the extruded product is a rod or the like, and not a sheathed wire as in the case in document D1.

In the light of what is said above it is evident that the third feature of the characterising clause of Claim 1 was in fact known in combination with the features of the continuous extrusion apparatus set out in the preamble of the claim. The object of the claimed invention was to develop this known apparatus in such a way that products having more complicated cross-sections than simple rods or wires could be reliably produced. The solution to this technical problem lies in the first and second features specified in the characterising clause of Claim 1. The cylindrical form of the extrusion passage and the fact that its length is at least equal to its maximum transverse dimension enable temperature and pressure inhomogeneities in the flowing metal to be substantially eliminated as it moves through the passage. This homogeneous flow is then retained up to the shaping die by virtue of the smooth change in cross-section from the end of the extrusion passage into the wider space of the extrusion chamber.

The above analysis of the terms used, the distinctions over the prior art, and the technical effects resulting from these distinguishing features also applies *mutatis mutandis* to Claim 5, which is directed to an extrusion body for insertion in a continuous extrusion apparatus and comprising the extrusion passage, extrusion chamber and shaping die defined in the same manner as in Claim 1.

5. *Novelty and inventive step*

In the course of the opposition proceedings the respondents alleged that the subject-matter of Claim 1 was not novel with respect to the contents of drawing 2. Although this objection was not explicitly pursued in the course of the appeal proceedings it is necessary to deal with it here, especially as the establishment of the differences between the subject-matter of Claim 1 and what is shown in drawing 2 will be of use when subsequently considering inventive step. It is not in dispute that drawing 2 relates in particular to that part of a "Conform" continuous extrusion apparatus through which the heated metal flows from the channel in the rotating wheel towards the shaping die, and that this part comprises a cylindrical extrusion passage and a cylindrical extrusion chamber of wider diameter than the passage. In the unamended drawing the length of passage is greater than its diameter, corresponding to the first characterising feature of Claim 1, but the transition from the end of the passage to the wider diameter of the extrusion passage is by way of two steps at right-angles to the flow axis, so that it is clear that the second characterising feature of Claim 1, which requires a smooth transition, is not met. According to the modifications entered into drawing 2 by hand the cylindrical extrusion passage has been reduced in length such that it is significantly shorter (12mm) than its diameter (18mm). Although the transition to the full diameter of the extrusion chamber now includes a frusto-conical section extending from the end of the passage the maximum diameter of this section is indicated as being only half (40mm instead of 80mm) of that full diameter, and the subsequent part of the transition remains stepped as before. Thus the amended version of drawing 2 does not disclose either of the first or second features of the characterising clause of Claim 1.

The subject-matter of Claim 1 is therefore novel with respect to drawing 2 in both its original and amended forms.

Since the novelty of this subject-matter with respect to the published state of the art is not in dispute it is not necessary to go into this issue in detail here. It is evident from the analysis of the state of the art made in point 3 above that this does not disclose continuous extrusion apparatus having all the features set out in Claim 1.

As for inventive step it has to be noted first of all that none of the cited prior art documents address the problem of homogenising the conditions of the metal flow on its path from the feeding channel to the shaping die in a "Conform" continuous extrusion apparatus. As shown in the drawings of document D3 the extrusion passage has a length greater than its width. This relationship is however nowhere mentioned in the description and since the drawings of document D3 are in any case somewhat schematic in nature the skilled person does not derive from this state of the art any technical teaching which might lead him to the conclusion that it could be of significance, in order to be able to extrude complex cross-sections with a good surface finish, to have the length of the extrusion passage at least equal to maximum transverse dimension. The respondent also relied on drawing 2 in its unamended form as showing that it was conventional to have an extrusion passage which was longer than it was wide. However, according to that drawing the longer extrusion passage is not associated with a smooth transition to the full diameter of the extrusion chamber and when measures were proposed, corresponding to the hand-written modifications, to make this transition smoother then this was at the expense of the length of the extrusion passage. Thus the skilled

person does not derive from drawing 2 any indication that the length of the extrusion passage was a significant factor affecting the quality of the product, in fact the opposite is true.

The last document relied upon by the respondents with respect to the required length of the extrusion passage is document D4. The skilled person cannot however derive from the screw extruder for plastics shown there any generalised teaching concerning the optimum length of the extrusion passage of a "Conform" continuous extrusion apparatus, which operates on a wholly different feeding principle and on a different material.

Lastly, the respondents have pointed to documents D1 and D5 as showing that it was conventional in the extrusion art to avoid dead spaces by arranging for a smooth transition between passages of different cross-section in the metal flow path. This may well indeed be the case. However, the claimed invention does not reside in this feature alone but in its combination with an extrusion passage of a particular length. This combination cannot be derived in an obvious manner from the state of the art.

The Board therefore comes to the conclusion that the subject-matter of Claim 1 involves an inventive step (Article 56 EPC).

The above considerations with respect to novelty and inventive step also apply in equal measure to the subject-matter of Claim 5.

6. *Costs*

According to Article 104 EPC each party to the proceedings shall normally meet its own costs. In the present case both parties have requested apportionment of costs in their favour. The request of the appellant is based essentially on his contention that the opposition as filed was inadmissible. For the reasons given in the Board's communication of 15 March 1995 and not challenged by the appellant thereafter, this was however not the case. The request of the respondents derives from the nature of the extensive submissions made by the appellant, which in their opinion had nothing to do with the subject of the appealed decision and which, they alleged, forced them into an inordinate amount of wasted work. However the Board notes that the bulk of the submissions made by the appellant had already been advanced in the opposition proceedings, so that the amount of work involved in reviewing them should not have been excessive. Thus there is no justification to depart from the norm set out in Article 104 EPC.

Order

For these reasons it is decided that:

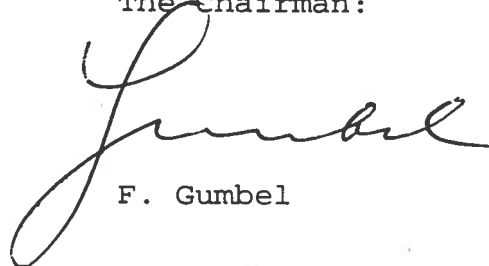
1. The contested decision is set aside.
2. The patent is maintained unamended.
3. The requests for apportionment of costs are rejected.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel