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DECISION
of 17 July 2003

Case Number: T 0632/02 - 3.2.1

Application Number: 95908321.3

Publication Number: 0745011

IPC: B21H 3/02, B21J 5/08

Language of the proceedings: EN

Title of invention:
Thread formation

Patentee:
Ancon CCL Limited

Opponent:
Dextra Asia

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Relevant content of a patent publication, when assessing
inventive step"
"Inventive step (no)"
"Prejudice in the art (no)"
"Obvious to try with a reasonable expectation of success"

Decisions cited:
T 0024/81, T 0004/83

Catchword:

When considering inventive step, the relevant content of a patent publication must be assessed from the point of view of the skilled person seeking to solve the technical problem as defined vis-à-vis the closest prior art, at the filing date of the European patent in suit, irrespective of the point of view of the author or drafter of that patent publication. Consequently, what is within the main claim of that patent publication does not take precedence over the disclosure in the description thereof (point 2.2 of the reasons).



Case Number: T 0632/02 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 17 July 2003

Appellant:
(Proprietor of the patent) Ancon CCL Limited
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 25 March 2002
revoking European patent No. 0745011 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: S. Crane
Members: M. Ceyte
G. Weiss

Summary of Facts and Submissions

- I. The appellant is proprietor of European patent No. 0 745 011 (application No. 95 908 321.3)

Claim 1 as granted reads as follows

"1 A connection method for deformed steel reinforcing rods, whereby a connection between adjoining rods has strength characteristics which are greater than or at least equal to the strength characteristics of un-threaded regions of the rods, the method comprising:

cold upsetting an end, connection, region of the deformed steel reinforcing rods (1) having a nominal diameter (D) so as to increase the diameter of the end regions to a new, upset, diameter greater than the nominal diameter (D);

skimming the upset end regions to remove ovalities (2) from the end region;

rolling a thread onto the end regions so as to produce threaded regions (W) having a thread major diameter (D2) which is greater than the nominal diameter (D) and a thread minor diameter (D3) which is less than the nominal diameter (D); and

coupling said threaded regions (W) together with a threaded coupler (8)."

II. The patent was opposed by the respondent (opponent) on the grounds of lack of patentability.

The following state of the art was *inter alia* cited:

D2: EP-B-0 327 770,

D3: FR-A-2 689 156,

D10: Institut für Bautechnik, Zulassungsbescheid für Bewehrungsanschluß "System Couplerbox" für Betonstabstahl, 09-07-1990,

D12: Fachkunde Metall, Verlag Europa-Lehrmittel 1987, pages 2, 3, 222, 344 to 347.

III. By its decision of revocation posted on 25 march 2002 the opposition division held that the subject-matter of granted claim 1 was not inventive having regard to prior art documents D3, D10 or D12.

IV. On 23 May 2002 the appellant (patent proprietor) lodged an appeal against this decision and paid the prescribed appeal fee.

The statement of grounds of appeal was filed at the same time.

By letter dated 10 June 2003 the appellant submitted four auxiliary requests and an expert report from Professor G. Kehm.

V. Oral proceedings before the Board were held on 17 July 2003.

The appellant (patentee) requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or in the alternative in amended form on the basis of the sets of claims according to the second to fourth auxiliary requests submitted with letter dated 10 June 2003.

It withdrew its first auxiliary request.

Claim 1 according to the second auxiliary request reads as follows:

"1. A connection method for deformed steel reinforcing rods, whereby a connection between adjoining rods has strength characteristics which are greater than or at least equal to the strength characteristics of un-threaded regions of the rods, the method comprising:

 cold upsetting an end, connection, region of the deformed steel reinforcing rods (1) having a nominal diameter (D) so as to increase the diameter of the end regions to a new, upset, diameter greater than the nominal diameter (D);

 skimming the upset end regions to remove ovalities (2) from the end region;

 rolling a thread onto the end regions so as to produce threaded regions (W) having a thread major diameter (D2) which is greater than the nominal diameter (D) and a thread minor diameter (D3) which is

less than the nominal diameter (D) and not greater than 90% of the nominal diameter (D) of the rod; and

coupling said threaded regions (W) together with a threaded coupler (8)."

Claim 1 according to the third auxiliary request reads as follows:

"1. A connection method for deformed steel reinforcing rods, whereby a connection between adjoining rods has strength characteristics which are greater than or at least equal to the strength characteristics of unthreaded regions of the rods, the method comprising;

cold upsetting an end, connection, region of the deformed steel reinforcing rods (1) having a nominal diameter (D) so as to increase the diameter of the end regions to a new, upset, diameter greater than the nominal diameter (D);

skimming the upset end regions to remove ovalities (2) from the end region;

rolling a thread onto the end regions so as to produce threaded regions (W) having a thread major diameter (D₂) which is greater than the nominal diameter (D) and a thread minor diameter (D₃) which is less than the nominal diameter (D) and an effective diameter larger than the normal diameter (D) and

coupling said threaded regions (W) together with a threaded coupler (8)."

Claim 1 according to the fourth auxiliary request reads as follows:

"1. A connection method for deformed steel reinforcing rods, whereby a connection between adjoining rods has strength characteristics which are greater than or at least equal to the strength characteristics of un-threaded regions of the rods, the method comprising:

cold upsetting an end, connection, region of the deformed steel reinforcing rods (1) having a nominal diameter (D) so as to increase the diameter of the end regions to a new, upset, diameter greater than the nominal diameter (D) but not greater than 110% of the nominal diameter (D);

skimming the upset end regions to remove ovalities (2) from the end region;

rolling a thread onto the end regions so as to produce threaded regions (W) having a thread major diameter (D2) which is greater than the nominal diameter (D) and a thread minor diameter (D3) which is less than the nominal diameter (D); and

coupling said threaded regions (W) together with a threaded coupler (8)."

VI. In support of its requests, the appellant submitted i.a. the following:

(i) The claimed invention aims to provide a full strength joint, that is a joint which is at least as strong as the un-threaded part of the adjoining

rod and whose size is substantially smaller than that of the joint disclosed in D3. The teaching of the present invention that the thread minor diameter is less than the nominal diameter (D) of the bar does away with the long held myth considered by engineers working in this field, that undercutting of the nominal diameter of the bar will inevitably lead to a joint which is less than full strength.

All the prior art documents cited during the opposition proceedings demonstrate this technical prejudice. For example D2, which represents the starting point of the invention disclosed in the closest prior art document D3, teaches that the diameter of the smallest thread (i.e. the diameter of the bottom of the helical) should not be smaller than the nominal diameter of the bar, "thus the formation of a male thread at the rebar end does not reduce the strength of that end portion".

One object of the invention disclosed in D3 (page 2, lines 29 to 36) is to provide a method of producing a mechanical bonding of reinforced concrete rods which makes it possible to realise, at the end of the reinforcement rod a reinforced zone such that the thread minor diameter is equal to or greater than nominal diameter of the reinforced concrete rod (emphasis added), but which necessitates less cold upsetting and consequently implementing less significant upsetting forces. That is accomplished by the connection method claimed in claim 1 which

requires the thread minor diameter to be equal or greater than the nominal diameter. A skilled person reading D3 would have realised that this requirement is essential to achieve a full strength joint. The closest prior art document D3 thus also points away from realising a full strength joint in which the thread minor diameter is less than the nominal diameter. Therefore it would not have been obvious to the skilled reader to proceed from such closest prior art to the invention claimed in the European patent in suit, even taking the other citations, in particular D10, into consideration.

Contrary to the opponent's view D10 does not relate to a full strength joint as is evidenced by the expert report from Prof G. Rehm. The expert emphasized that even if there is an increase in strength in the thread region due to cold forming this increase is not as a rule sufficient to compensate for the stress peaks in the thread core. Therefore in the system "coupler box" dealt with in D10, rupture will occur in the threaded part near to the end of the sleeve, at a breaking load which is usually less than that of the unmachined part of the bar. In other words the examples given in D10 having a thread minor diameter less than the nominal diameter are not full strength joints. The under-strength nature of these joints results from the fact that the production of the threaded region of the rods does not involve the prior step of "cold upsetting" as is a prerequisite for the claimed invention. It also follows that the technical prejudice referred to above cannot be

denied solely on the basis of D10, because this citation does not disclose a full strength joint in combination with a thread minor diameter which is less than the nominal diameter.

Accordingly neither D3 nor D10 contain any pointer towards having a full strength joint in combination with a thread minor diameter which is less than the nominal diameter. Therefore the claimed method is not rendered obvious by the combination of these two citations.

- (ii) Claim 1 according to the second auxiliary request corresponds to claim 4 as granted. Limiting the thread minor diameter to 90% of the nominal diameter of the rod provides a most efficient utilisation of materials and has in practice been found to be a good achievable target.

Claim 1 according to the third auxiliary request corresponds to claim 5 as granted. Such claim includes a further limitation to the claimed rolling step which is effectively: rolling a thread onto the end regions so as to produce threaded regions (W) having a thread major diameter (D2) which is greater than the nominal diameter (D), a thread minor diameter (D3) which is less than the nominal diameter (D) and an effective diameter which is larger than the nominal diameters D. This represents an optimisation of the method of realising a full strength joint which is not rendered obvious by the available prior art.

Claim 1 according to the fourth auxiliary request corresponds to granted claim 6. Limiting the upset diameter of the end regions to 110% of the nominal diameter is no mere dimensional requirement but instead is a specification of a particular dimensional limit within which the invention has been found to be most effective and thereby of greatest utility.

VII. The respondent (opponent) rejected the arguments brought forward by the appellant. It submitted in detail the reasons for which the subject-matter of claim 1 according to the main request and that according to the second to fourth auxiliary request were not inventive over the available prior art.

It requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. *Claim 1 as granted (main request)*
 - 2.1 It is not disputed that the method of forming a thread on at least one end region of a deformed steel reinforcing rod disclosed in D3 represents the closest prior art. This known method comprises:
 - cold upsetting an end region of the rod having a nominal diameter, so as to increase the diameter of the end region to a new, upset diameter greater than the nominal diameter,

- skimming the upset end region to remove ovalities therefrom,
- rolling a thread onto the end region, so as to produce a threaded region having a thread major diameter which is greater than the nominal diameter of the upset end region.

The fact that the thread minor diameter is equal to or greater than the nominal diameter of the rod is regarded as a disadvantage in this known method, since the connecting sleeve or coupler is not as small as desired.

In the search of a solution to this problem the appellant set himself the dual task of providing a full performance joint i.e. a joint which is at least as strong as the un-threaded part of the bar and whose size is substantially smaller than that of the joint disclosed in D3 (see column 1, paragraph [0005] of the European patent specification).

This problem is in essence solved by the method claimed in claim 1 which comprises cold upsetting an end region and subsequent rolling a thread onto the upset end region, and which requires the thread minor diameter to be less than the nominal diameter.

2.2 The essential requisites of the claimed invention, that is

- (a) cold upsetting an end region of the steel reinforcing rod, and

(b) rolling a thread onto that upset end region

are both described and claimed in claim 1 of the prior published specification D3. It is however also true that the claim in question requires in its pre-characterising portion the thread minor diameter to be equal to or greater than the nominal diameter.

According to Article 54(2) EPC, "everything" that has been made available to the public in any way before the date of filing - anywhere in the description, the claims or the drawings, if any, of a published patent specification regarded as prior art - is no longer considered as new. Consequently, as is well established by the jurisprudence of the Boards of Appeal, the whole content of a published patent specification forms part of the state of the art.

Furthermore, contrary to the appellant's submissions, the disclosure in the description of a patent publication is to be assessed at the same level as that of the claims, or expressed differently, what is within the main claim of a patent publication does not take precedence over the disclosure in the description of that patent publication. When examining for inventive step, the relevant disclosure in a published patent specification must indeed be assessed from the point of view of a skilled person seeking to solve the technical defined vis-à-vis the closest prior art, at the filing date, that is the priority date, if any, of the European patent in suit, irrespective of the point view of the author or drafter of that published patent specification.

More specifically, the author of the published patent specification D3 sought to improve the method of the kind disclosed in D2 comprising in essence cold upsetting an end region of the deformed steel reinforcing rod and cutting a thread onto the upset end region. One object of the invention disclosed therein is said to provide a male thread on the end region which does not have a weakening effect, see paragraph bridging pages 2 and 3 of D3. This is accomplished by cold rolling the thread onto the upset region. It follows that the starting point for the determination of the problem is in D3 different from that of the European patent in suit. This also implies that features which were considered as essential by the author of the published patent specification D3 for solving his problem may be considered as unessential by the skilled person faced with a substantially different problem, namely the problem underlying the European patent in suit. It is therefore irrelevant whether the pertinent disclosure in the published patent specification D3 is among the claims or the description.

This conclusion is also in line with the jurisprudence of the Boards of Appeal: in decision T 4/83 (OJ EPO 83, 498, point 4 of the reasons) the Board 3.3.1 held that any information in a patent specification which conveys to the skilled person a technical teaching belongs to the content of the disclosure irrespective of whether or not it falls within the scope of the claims or what purpose it serves. Similarly, all the embodiments in a published patent specification must be taken into consideration which offered a suggestion to the skilled person for solving the problem he was confronted with,

even where these embodiments were not particularly emphasised (T 24/81 OJ EPO 83, 133, point 14).

The skilled person who is thus not bound by the teaching of the main claim of the published patent specification D3 would not take into consideration the dimensional requirement claimed therein that the thread minor diameter should be equal or greater than the nominal diameter, because this requirement would also not help him in solving the dual problem he was confronted with, i.e. that of substantially reducing the size of the coupler device disclosed in D3 while maintaining its full strength characteristics.

- 2.3 The Board is unable to follow the appellant's allegation as to the existence of a long held myth or technical prejudice considered by engineers working in this field that undercutting of the nominal diameter of the bar will inevitably lead to a joint which is less than full strength. Clearly a technical prejudice in a particular field requires a relatively long period of time in order to be recognised and generally accepted by the experts in that field. Thus this long period is a prerequisite for the existence of such prejudice. This is not the case here: The closest prior art which is represented by the published patent specification D3, that is the sole citation which undeniably discloses a full strength joint, was published on October 1993, that is 4 months before the priority date of the European patent in suit (February 1994). This period of time is obviously too short for the establishment of a general trend or a generally accepted technical prejudice against the possibility of realising a full

strength joint in which the nominal diameter is "undercut".

In the present case it is apparent that the skilled person would indeed have reservations against reducing the thread minor diameter below the nominal rod diameter, but only insofar as the prior art does not put means at his disposal to counteract the reduction in cross-sectional area of the threaded region with respect to the rest of the rod. However, D3, as already explained above, proposes a two-stage cold-working treatment of the end region (upsetting followed by thread rolling), which is taught as being an improvement on the method of D2, where upsetting is followed by thread cutting, this improvement enabling a reduction in the diameter of the threaded region. For the reasons given above this information is available in general terms to the reader of D3, irrespective of the fact that the author of the document was only concerned with the situation where the thread minor diameter was at least equal to the nominal rod diameter. On the basis of this information the skilled person would have at least have a reasonable expectation that the proposed two-stage cold working treatment could adequately compensate for a reduction in the thread minor diameter below the nominal rod diameter.

- 2.4 Furthermore, the skilled person was already aware from document D10 of a reinforcing rod connecting method where the threaded region of the rod had a diameter less than the nominal rod diameter

Document D10 is an official certificate of approval which is a prerequisite for applying coupler systems in

civil engineering in Germany. This citation discloses a method for connecting deformed steel reinforcing rods and therefore belongs to the same specialised technical field.

D10 teaches that a thread is rolled onto the end regions of deformed steel reinforcing rods so as to produce threaded regions having a thread major diameter which is greater than the nominal diameter and a thread minor diameter which is less than the nominal diameter. Effective values for the nominal (d_s) and for the corresponding thread major ($Ext\phi$) and minor ($Kern\phi$) diameters are disclosed in Table 2 of Annex 1 of D10. At the oral proceedings before the Board, both parties made lengthy submissions as to whether the coupler system of D10 provides a full strength joint or not. According to the expert report, the coupler system disclosed in this citation is not a full strength joint given that "apart from rare exceptions, rupture will occur in the threaded part of the bar near the end of the sleeve, at a breaking load usually less - or mostly less - than that of the unmachined bar." In any case this citation provides the skilled person, i.e. the manufacturer of coupler systems, with such information that a system in which a thread is rolled onto the end region and the thread minor diameter is less than the nominal diameter is suitable for use as coupler system for deformed steel reinforcing rods. D10 thus teaches that a satisfactory coupler system in which the nominal diameter is "undercut" may be realised even if the joint is not guaranteed to be completely "full strength".

The knowledge from D3 of the benefits of a two-stage cold working treatment in the formation of the threaded end region, coupled with the knowledge from D10 that a coupler system with threaded end regions of minor diameter less than the nominal rod diameter formed by a one-stage cold working treatment had already met regulatory approval - which at the least means that the strength of the joint is equal to the nominal strength of the rod - would encourage the person skilled in the art in search of a solution to the problem at hand to believe there was a reasonable prospect of success in investigating whether a joint having a minor thread diameter less than the nominal rod diameter and formed using the known two-stage technique could be made to meet the requirement of being full strength

2.5 Therefore, in the Board's judgement, the subject-matter of claim 1 according to the main request is rendered obvious by the combination of D3 and D10 and thus lacks an inventive step (Article 56 EPC).

3. *Auxiliary requests:*

3.1 Claim 1 according to the second auxiliary request contains the additional requirement that the threaded minor diameter is not greater than 90% of the nominal diameter of the rod.

Once the development of a method for manufacturing a coupler system of a smaller size having the mechanical properties of a full strength joint becomes obvious, determination of other dimensional parameters such as the upper limit of the thread minor diameter is purely a matter of routine experimentation.

Furthermore, Table 2 of D10 discloses that the thread minor diameter ("Kern Φ ") is not greater than 90% of the nominal diameter. The additional feature of the second auxiliary request cannot therefore make an inventive contribution to the claimed method.

- 3.2 Claim 1 according to the third auxiliary request contains the additional requirement that the threaded region has an effective diameter larger than the nominal diameter.

D3 shows clearly in Figure 3 that the threaded region made by cold rolling has an effective diameter which is in essence equal to the nominal diameter of the upset end region and thus necessarily greater than the nominal diameter of the unmachined bar. Thus this additional dimensional requirement of the third auxiliary request can also not be seen as involving an inventive step.

- 3.3 Claim 1 according to the fourth auxiliary request contains the additional requirement that the diameter of the upset region is not greater than 110% of the nominal diameter D.

As has already been stated, the method claimed in claim 1 of the main request and requiring that the thread minor diameter is less than the nominal diameter of the rod has been rendered obvious by the combination of the prior art documents D3 and D10. This necessarily implies in the case of a thread of standard size a reduction of the diameter of the upset region of D3 which according to the example given on page 7,

lines 18 to 21 amounts to 115% of the nominal diameter. The skilled manufacturer being aware that the diameter of this upset region should be reduced, would be able to determine by routine experimentation the upper limit of this reduced diameter. Such dimensional requirement cannot therefore make an inventive contribution to the claimed method.

The method defined in claim 1 of the fourth auxiliary request accordingly lacks an inventive step (Article 56 EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



S. Crane

