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D E C I S I O N
of 27 January 2004

Case Number: T 1296/01 - 3.2.1
Application Number: 92923611.5
Publication Number: 0614405
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Language of the proceedings: EN

Title of invention:
Improved panel clinching methods

Patentee:
HENROB LIMITED

Opponent:
Eckold GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 56, 123(2), 123(3)

Keyword:
"Inventive step (yes)"
"Extension of the scope of protection (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 1296/01 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 27 January 2004

Appellant: HENROB LIMITED
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 11 October 2001
revoking European patent No. 0614405 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: S. Crane
Members: M. Ceyte
A. Pignatelli

Summary of Facts and Submissions

- I. The appellant is proprietor of European Patent No. 0 614 405 (application No. 92 923 611.5).
- II. The patent was opposed by the respondent (opponent) on the grounds of lack of novelty and lack of inventive step.

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

B1: Stephen P. Sunday "Self-Piercing Rivets for Aluminium Components" SAE Technical Paper Series, Detroit, Michigan 1983

B2: EP-B-0 077 932

B4: Handbuch der Fertigungstechnik, Band 5 "Fügen, Handhaben und Montieren" Carl Hanser Verlag München Wien, 1986

B6: L. Budde, U. Klemens, W. Lappe "Qualitätssicherung in der Niettechnik" Tagungsunterlagen des DFB-Kolloquiums "Umformtechnisches Fügen von Blech" am 8/9 Oktober 1990 im Chemnitz

- III. In its decision of revocation posted on 11 October 2001 the opposition division held that the subject-matter of granted claims 1 and 13 lack novelty over prior art document B1.
- IV. On 12 December 2001 the appellant (opponent) lodged an appeal against that decision and paid the prescribed appeal fee.

The statement of grounds of appeal was filed on 13 February 2002.

V. Oral proceedings before the Board were held on 27 January 2004.

The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims 1 to 11 submitted at the oral proceedings.

The respondent (opponent) requested that the appeal be dismissed.

Claim 1 reads as follows:

"1. A panel clinching method for clinching together at least two panels (12, 13), wherein a tubular rivet or slug is driven or inserted by a punch assembly (20,21) into a clinched joint (11) between the panels (12,13) to deform the panels (12, 13) being joined into a supporting die (14) wherein the rivet or slug co-operates with the punch assembly to deform the panels (12, 13), characterised in that the punch assembly comprises a punch (20) and a sleeve (21) external to the punch (20) the punch (20) is driven through the rivet or slug (10) into engagement with the upper panel (12), the punch and rivet are advanced to deform the panels (12,13), and the sleeve is advanced relative to the punch (20) to deform at least an inner end of a shank of the rivet or slug (10) outwardly within

the clinched joint (11) and in that the rivet or slug (10) does not penetrate the panels (12, 13)."

Independent claim 7 reads as follows:

"7. A panel clinching method for clinching together at least two panels (312, 313), using a solid or semi-tubular rivet or slug (310), wherein a punch forms a conventional button-type clinched joint (311) in the panels (312, 313) to be joined, the panels being supported by a die (314) and the punch (320) is then retracted; characterised in that the rivet or slug (310) is interposed between the punch (320) and the clinched joint (311); and the punch (320) is advanced to drive the rivet or slug (310) into the clinched joint (311) to deform the panels (312, 313) being joined into a supporting die and to deform outwardly at least the inner end of the shank of the rivet or slug in the clinched joint (311), and in that the rivet or slug (310) does not penetrate the panels (312,313)."

Independent claim 10 reads as follows:

"10. A panel clinching method for clinching together at least two panels (112, 113), using a rivet (110) having a bore (122) with a tapered end (123) and including a shank having an inner end, the method comprising the steps of:

providing a punch (120) having a main body with an engaging shoulder and a reduced diameter lower end for fitting within the bore (122) of the rivet (110);

supporting the panels (112, 113) on a supporting die and clamping the panels with a pre-clamping head (119);

interposing the rivet (110) between the panels (112, 113) and the punch (120); characterised by:

advancing the punch (120) until the shoulder of the main body engages the top of the rivet (110);

further advancing the punch (120) downwardly to deform the panels (112, 113) into the die (114) and to form the clinched joint (111); and

thereafter again advancing the punch (120) downwardly to cause at least the inner end of the shank of the rivet (110) to be outwardly deformed, consequently deforming the panels (112, 113) to secure the clinched joint without penetration of the panels by the rivet (110)."

VI. In support of its request the appellant made essentially the following submissions:

- (i) Claim 1 as amended does not extend the protection conferred since it contains all the features of granted claim 1. It is essentially a combination of granted claims 1, 2 and 4.

- (ii) The invention claimed in claims 1, 7 and 10 is based on the idea of increasing the strength of a clinched joint in which the panels are mechanically interlocked. As proposed in the patent under appeal this idea is realised in that a rivet or slug is inserted into the depression formed by the clinched joint so as to outwardly

deform the inner end of the shank of the rivet or slug within the clinched joint, without penetration of the panels by the rivet.

The opposed prior art documents do not give the skilled person any indication that a clinched joint may be reinforced by inserting into it a rivet or slug whose inner end is outwardly deformed within the clinched joint.

VII. The respondent (opponent) did not object against the filing of new requests and submitted in essence the following:

- (i) Amended claim 1 is not a simple combination of the features of claims 1, 2 and 4 as granted. Granted claim 1 is limited to a method in which the rivet of slug is driven by the punch. The reference in granted claim 4 to "a sleeve (21) external to the punch is advanced relative to the punch" is clearly unambiguous and means what it says, that is the disposition of two different items, a punch and a sleeve external to the punch. The combined features of granted claims 1 and 4 do not therefore correspond to "a punch assembly [which] comprises a punch and a sleeve external to the punch" as stated in the characterising part of amended claim 1. Thus amended claim 1 extends the protection conferred in contravention of Article 123(3) EPC.
- (ii) As rightly stated in the decision appealed against the panel clinching method according to granted claim 1 lacks novelty over prior art document B1.

The two new measures of the clinching method according to amended claim 1 - (a) the use of a tubular rivet, (b) the provision of a sleeve to outwardly deform the inner end of the tubular rivet - are obvious to a skilled person having regard to the cited state of the art. In particular, replacing the semi-tubular rivet of B1 by a conventional tubular rivet is a routine measure for the skilled person. Furthermore, in B4, Figure 54(c) a sleeve is advanced to outwardly deform a tubular insert. As is apparent from Figure 1 of B1 the inner end of the semi-tubular rivet is outwardly deformed. This automatically follows from the particular shape of the anvil cavity which is designed to flare the inner end of the rivet.

(iii) The clinching method according to independent claim 7 lacks an inventive step on the basis of B1 in combination with B2. B2 suggests the solution of first forming a clinched joint in which the panels are mechanically interlocked before inserting and driving the rivet or slug into the clinched joint so as to deform the inner end of the rivet. As stated in the passage bridging columns 5 and 6 of B2, the joint may not be cut or incised and thus the joint area may remain fluid-tight.

(iv) Using a punch having an engaging shoulder and a reduced diameter lower end for fitting within the bore of the tubular rivet, as claimed in claim 10 is an obvious design for driving or inserting a tubular rivet.

Reasons for the Decision

1. The appeal is admissible.
2. *Formal matters*
- 2.1 Claim 1 - Article 123(3) EPC

Amended claim 1 requires the provision of a punch assembly which "comprises a punch (20) and a sleeve (21) external to the punch". The appellant submitted that in granted claim 4 there is a clear distinction between the punch (20) and the sleeve (21) external to the punch, so that the skilled reader would not consider the sleeve as a part of a punch assembly, as is claimed in amended claim 1. Thus, amended claim 1 contravenes Article 123(3) EPC.

The Board is unable to follow such reasoning.

First, claim 4 as granted goes on to state that the sleeve (21) "is advanced relative to the punch to deform the rivet or slug (10) within the clinched joint". Secondly, according to the embodiment of Figures 1 to 6, the sleeve which engages the rivet is responsible for the insertion of the tubular rivet and for the outward deformation of its inner end. Thus it is clear for the skilled person that in the embodiment of Figures 1 to 6 covered by granted claim 4 the sleeve functions as a "punch" and in fact constitutes the "punch" as required by granted claim 1. There can

therefore be no objection to referring to it as part of a "punch assembly" as in amended claim 1.

As already stated, amended claim 1 is restricted over granted claim 1 by the features of granted claims 2 and 4 which are dependent from granted claim 1. Amended claim 1 contains all the features of granted claim 1 and added features narrowing the claim further. This means that the subject-matter of claim 1 is more narrowly defined as a result of the amendments and thus meets the requirements of Article 123(3) EPC.

2.2 Claim 7 - Article 123 EPC

Amended claim 7 contains all the features of granted claim 1 and therefore meets the requirements of Article 123(3) EPC: According to the pre-characterising part of granted claim 1, "a rivet or slug is driven or inserted by a punch (20) into a clinched joint (11) between panels (12, 13) to deform the panels being joined into a supporting die". This feature is claimed in the characterising part of claim 7 where it is stated "the punch (320) is advanced to drive the rivet or slug (310) into the clinched joint to deform the panels being joined into a supporting die".

Amended claim 7 results from the combination of granted claims 1, 5 and 7, (corresponding in essence to the combination of claims 9 and 11 as filed) and from the further restriction that "the rivet or slug (10) does not the penetrate the panels" which has a basis in the application as filed. Thus amended claim 7 meets the requirements of Article 123(2) EPC.

2.3 Claim 10 - Article 123 EPC

This claim is directed to the embodiment of Figures 7 to 12, where the punch has a lower end of reduced diameter for passing through the bore of a tubular rivet and a shoulder for engaging the top of the rivet during insertion.

Amended claim 10 is in essence supported by paragraphs [0032] and [0033] and Figures 7 to 12 and thus complies with the requirements of Article 123(2) EPC.

According to the pre-characterising part of granted claim 1, "a rivet or slug is driven or inserted by a punch (20) into a clinched joint (11) between panels (12, 13) to deform the panels (12, 13) being joined into a supporting die". In amended claim 10, the rivet or slug is also driven by the plug into the clinched joint, as the clinched joint is formed, since it comprises the step of advancing the punch - whose shoulder engages the top of the rivet - downwardly to deform the panels (112, 113) into the supporting die (114) and to form the clinched joint. Claim 10 contains all the features of granted claim 1 as well as additional limiting features and thus complies with the requirements of Article 123(3) EPC.

3. *Novelty*

The Board is satisfied that the subject-matter of amended claim 1 and that of new independent claims 7 and 10 is novel over the opposed prior art.

Since novelty has not been disputed during the appeal proceedings, there is no need for further detailed substantiation of this matter.

4. *Inventive step*

4.1 The invention the subject of the patent under appeal is concerned with a panel clinching method.

In column 1, paragraph [0002] the specification refers to spot welding. It is said that spot welding is the most commonly used technique for joining vehicle body components in the automotive industries. After setting out the drawbacks of spot welding, the specification describes two alternatives to spot welding:

One alternative is the use of self-piercing rivets. A further alternative method is metal clinching where two sheets of metal are deformed into locking engagement using a punch-and-die combination.

According to the patent under appeal, the clinched joints suffer i.a. from the problem that they have relatively low shear and axial load strengths, see paragraph [0008].

Therefore the technical problem to be solved by the present invention is to provide a panel clinching method which overcomes this disadvantage, ie which increases the shear strength and the axial load strength of the clinched joint.

4.2 This problem is in essence solved in accordance with a first aspect of the present invention by a panel clinching method as defined in claim 1, in accordance with a second aspect, by a clinching method as defined in claim 7 and in accordance with a third aspect by a clinching method as defined in claim 10.

The invention claimed in independent claims 1, 7 and 10 is based on the idea of increasing the strength of a conventional clinched joint between two panels, ie made by placing two panels between a punch and a supporting die and advancing the punch downwardly so as to cause deformation of the material of the two panels into a double layer boss or bead, in which the panels are mechanically interlocked.

As proposed in the patent under appeal, the strength of such a joint is increased in that a rivet or slug is inserted into the depression formed by the clinched joint so as to outwardly deform the inner end of the shank of the rivet or slug within the clinched joint without penetration of the panels by the rivet. Present claim 1 is concerned with a method utilising a special punch assembly whereby the rivet is further deformed by advancing a sleeve of the assembly after it has been driven into the die to form the clinched joint. Claim 7 is directed to a two stage method for forming a reinforced clinched joint, in which a punch or punch assembly is used to form a conventional clinched joint and then causes the inner end of rivet shank to be outwardly deformed. Claim 10 is directed a single stage method in which a punch is advanced to first deform the panels into the die to form the clinched joint and

further advanced to cause the inner end of the shank of the rivet to be outwardly deformed.

- 4.3 The cited prior art documents do not give the skilled person any indication that a clinched joint may be reinforced by inserting into it a rivet or slug whose inner end is outwardly deformed within the clinched joint, without penetration of the panels by the rivet.

B1 describes the technique of self-piercing riveting whereby two panels of material are held together and a self-piercing rivet is then driven into the panel assembly so as to cut through the first of the two panels and deform into permanent engagement into the second panel. According to the decision appealed against the term "piercing" does not necessarily mean that the rivet goes through at least the first panel but has also the meaning of "going into". Document B1 was said to refer to this second meaning as can be seen in Figure 1.

The Board is unable to follow such reasoning: in B1 first page, first column third paragraph, it is stated "The self-piercing rivet joining technique requires that the rivets have sufficient strength to **pierce through** the material being joined." (emphasis added) The diagram of Figure 1 which serves only to give a schematic representation of a "typical joint cross-section" and not to represent it in detail, does not allow the conclusion that the first panel is not pierced. B1 was published in 1983. Document B6 published in 1990 enumerates in Figure 4 the four rivet joining techniques which are used "Vollniete, Blindniete, Paßniete und Stanzniete" (self-piercing

riveting technique). It is specified that in self-piercing riveting ("Stanzniete") the first of the two panels is perforated (page 4, first paragraph).

As rightly stated by the appellant, the self-piercing riveting technique is fundamentally different from that of clinching, in which the two panels being joined are deformed into a supporting die to form a double layer boss or bead, by means of which the panels are mechanically interlocked by deformation. In the present invention this clinched joint is supplemented by the insertion of a rivet or a slug to improve its strength. There is no piercing or penetration of either of the panels of material.

The skilled person confronted with the problem of reinforcing a clinched joint would not consider the teaching of B1 since this citation does not relate to a clinched joint, let alone to an improvement in strength of a clinched joint.

Document B2 describes a method for joining metal panels using mating dies in which the male die has cutting edges. The male and female dies are brought together with the panel material between them and deform the panel by shearing. This implies that there is a cutting or piercing action in contrast to the clinching operation of the present invention where the panels are pressed through but not cut. In the embodiment of Figures 9a and 9b, the depression formed by the joint is "capped" by a rivet. As is apparent from Figure 9b, the cuts through the panels enable the rivet to penetrate the panel material. There is also no suggestion of providing a clinched joint, that is a

double layer boss or bead, in the depression of which a rivet is inserted so as to outwardly deform the inner end of the shank of the rivet without penetration of the panels by the rivet.

It is true that in the passage bridging columns 5 and 6 of B2 it is said that the joint may not be cut or incised. However, this alternative concerns only the embodiment in which a joint is formed without insertion of a rivet into the panel material. In the embodiment of Figures 9a and 9b which shows a combination of a joint and a rivet, the panel material has been pierced and the rivet penetrates through both panels.

- 4.4 The respondent argues that the method of claim 1 lacks an inventive step having regard to the disclosure of B1 in combination with the disclosure of B4. In B4 Figure 54(c) a fastener is inserted into a pre-drilled hole and a separate claw is passed over the shank of the fastener before it is expanded in the hole by a sleeve. It is true that the expansion of the claw permits the fastener to be firmly secured into position. However, the problem solved by this arrangement is by no means comparable with the problem underlying the present invention, that is to improve in strength a clinched joint formed by deforming two panels into a die, without cutting or piercing the panel material. B4 does not suggest the solution claimed in claims 1, 7 and 10 that is the insertion of a rivet or a slug either to form the clinched joint (claims 1 and 10) or into the clinched joint subsequently to its formation (claim 7), with deformation of the inner end of the rivet outwardly within the clinched joint, without penetration of the panel material by the rivet.

From the foregoing considerations it follows that the essence of the invention contained in amended claims 1, 7 and 10 is neither disclosed nor suggested by the cited prior art documents taken alone or in combination.

- 4.5 Accordingly in the Board's judgement, the subject-matter of claim 1 and that of independent claims 7 and 10 involve an inventive step (Article 56 EPC).
5. Dependent claims 2 to 6, 8 and 11 concern particular embodiments of the invention claimed in claims 1, 7 and 10 respectively and are likewise allowable.

The opposition grounds thus do not prejudice the maintenance of the patent as amended.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:
 - claims 1 to 11 and a revised description submitted at the oral proceedings before the Board and drawings as granted.

The Registrar:

The Chairman:

S. Fabiani

S. Crane