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**D E C I S I O N**  
of 21 February 1994

**Case Number:** T 0807/92 - 3.2.1

**Application Number:** 84112446.4

**Publication Number:** 0152531

**IPC:** F16B 19/10

**Language of the proceedings:** EN

**Title of invention:**  
Blind fastener

**Patentee:**  
Monogram Industries, Inc.

**Opponent:**  
01) Hi-Shear Corporation, Inc.  
02) Avdel Systems Ltd.

**Headword:**  
-

**Relevant legal norms:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0807/92 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 21 February 1994

**Appellant:** Monogram Industries, Inc.  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office given on 25 May 1992 and  
issued in writing on 8 July 1992 revoking European  
patent No. 0 152 531 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. 0 152 531 was granted on 18 July 1990 on the basis of European patent application No. 84 112 446.4.
- II. The patent was opposed by the Respondents (Opponents 01 and 02) on the basis that its subject-matter was not novel and/or did not involve an inventive step (Article 100(a) EPC), insufficiency of disclosure (Article 100(b) EPC) and the addition of subject-matter (Article 100(c) EPC).

In the course of the opposition proceedings a total of 36 pre-published documents were relied upon as showing the relevant state of the art. Of these documents only the following played any significant role in the appeal proceedings:

D12: Voi-Shan Brochure PLT 1040  
D19: US-A-2 765 699  
D30: US-A-3 357 094.

In support of their arguments the Respondents also referred to a subsequent patent document issued to the Appellants (Proprietors of the patent), viz.:

D35: US-A-4 747 202.

- III. By its decision given at oral proceedings on 25 May 1992, and issued in written form on 8 July 1992, the Opposition Division upheld the objection of addition of subject-matter under Article 100(c) EPC against the granted patent, held that the objection of insufficiency of disclosure under Article 100(b) EPC was not justified and found that the subject-matter of the claims

according to the auxiliary request, which had been amended to overcome the objection under Article 100(c) EPC, did not involve an inventive step having regard to the state of the art according to documents D12 and D30.

- IV. An appeal against this decision was filed on 26 August 1992 and the appeal fee paid at the same time. The Statement of Grounds of Appeal was filed on 6 November 1992.

The Appellants requested maintenance of the patent in amended form on the basis of the documents according to the auxiliary request considered by the Opposition Division.

- V. In replies of the Respondents dated 16 April 1993 and 21 April 1993 respectively both referred *inter alia* to a further state of the art document, US-A-2 776 681 (D40), which in their view either destroyed the novelty of the subject-matter of the then Claim 1 or at least would be of great significance when evaluating its inventive step.

- VI. The Board issued a communication pursuant to Article 11(2) RPBA on 9 November 1993.

In this communication the Board indicated that as the ground of opposition under Article 100(b) EPC had not been mentioned in the counterstatements of the Respondents it was assumed they no longer wished to pursue it. Furthermore it was stated that there was no objective basis for the interpretation of document D40 made by the Respondents and that since the late-filed document added nothing of significance to the state of the art already in the proceedings the Board intended to disregard it pursuant to Article 114(2) EPC.

VII. Oral proceedings before the Board were held on 21 February 1994.

At the oral proceedings the Appellants submitted a new set of Claims 1 to 17 and a revised description on the basis of which, together with the drawings as granted, maintenance of the patent in amended form was requested (Main request). The auxiliary request of the Appellants was for maintenance of the patent in amended form on the basis of Claims 1 to 17 filed with their letter dated 9 February 1994.

The Respondents requested that the appeal be dismissed and revocation of the patent confirmed.

VIII. Claim 1 according to the main request of the Appellants reads as follows:

"A blind fastener (10; 110; 210; 310; 410) for mounting in aligned openings (20, 22) through workpieces (12, 16) to connect them together in overlapping outer and inner relation and adapted to be set by wrench means for applying torque, the fastener (10; 110; 210; 310; 410) comprising:

- a generally tubular fastener body (26; 176; 276; 376) extending axially within said openings (20, 22) in said workpieces (12, 16), said fastener body (26; 176; 276; 376) having
  - a bore extending axially through said fastener body (26; 176; 276; 376) and
  - an enlarged body head (54; 254; 354; 454) for engaging said outer workpiece (12);

- an externally threaded cylindrical stem (24; 124; 224; 324; 424) passing through said fastener body (26; 176; 276; 376), said stem (24; 124; 224; 324; 424) having
  - an enlarged stem head (36) spaced inwardly from the inner end of said fastener body (26; 176; 276; 376) and
  - a holding region spaced outwardly from said body head (54; 254; 354; 454), said holding region being provided with a wrench engaging region (34);
- a deformable sleeve (58; 178; 278; 378; 426) around said stem (24; 124; 224; 324; 424) in contact with said stem head (36), said stem being movable (24; 124; 224; 324; 424) outwardly through said fastener body (26; 176; 276; 376) to deform said sleeve (58; 178; 278; 378; 426) to a fully set condition in overlying contact with the inner surface (18) of said inner workpiece (16);
- a break groove (52) in said stem (24; 124; 224; 324; 424) at an axial location positioned substantially flush with an outer surface (14) of said body head (54; 254; 354; 454) when said sleeve (58; 178; 278; 378; 426) is fully set, an outer portion (53A) of said stem (24; 124; 224; 324; 424) being separable from remaining inner portions (53B, 53C) of said stem (24; 124; 224; 324; 424) at said break groove (52) by continued application of turning force to said fastener (10; 110; 210; 310; 410) after said sleeve (58; 178; 278; 378; 426) is fully set, said outer portion (53A) of said stem (24; 124; 224; 324; 424) extending outwardly of said break groove (52);

characterized by

- a drive nut (28) threadedly mounted on said stem (24; 124; 224; 324; 424) adjacent said body head (54; 254; 354; 454), said nut having external wrench engaging surfaces and being separate from said fastener body (26; 176; 276; 376) and being able to frictionally contact said body head (54; 254; 354; 454) to restrain said fastener body (26; 176; 276; 376) from rotating in said openings (20, 22) in said workpieces (12, 16) when said stem (24; 124; 224; 324; 424) is rotated, said drive nut (28) and said wrench engaging region (34) being adapted for concurrent engagement by said wrench means for holding said drive nut (28) against rotation and for turning said stem (24; 124; 224; 324; 424) relative to said drive nut (28) in one direction, wherein turning motion of said stem (24; 124; 224; 324; 424) relative to said drive nut (28) in said one direction moves said stem (24; 124; 224; 324; 424) in an axially outward direction through said fastener body (26; 176; 276; 376);
- said outer portion (53A) of said stem (24; 124; 224; 324; 424), extending through said nut (28), and being separable from said inner portions (53B, 53C) with said nut entirely attached."

Dependent Claims 2 to 15 relate to preferred embodiments of the blind fastener according to Claim 1.

Independent Claim 16 reads as follows:

"A method of fastening overlapped outer and inner workpieces (12, 16) using a fastener (10; 110; 210; 310; 410) of the type having a generally tubular fastener body (26; 176; 276; 376) having an enlarged body head (54; 254; 354; 454), a deformable sleeve (58; 178; 278;

378; 426) at an end of said fastener body (26; 176; 276; 376) opposite from said body head (54; 254; 354; 454), and an externally threaded stem (24; 124; 224; 324; 424) extending through aligned bores in said sleeve (58; 178; 278; 378; 426) and said fastener body (26; 176; 276; 376), said stem (24; 124; 224; 324; 424) being provided with a break groove (52) between inner and outer regions of said stem (24; 124; 224; 324; 424), the method comprising the steps of:

- inserting said fastener (10; 110; 210; 310; 410) through aligned openings (20, 22) in said workpieces (12, 16) to be fastened together until said body head (54; 254; 354; 454) engages an outer surface (14) of said outer workpiece (12) with said sleeve (58, 178; 276; 378; 426) positioned beyond an inner surface (18) of said inner workpiece (16);
- applying torque to an outer portion (53A) of said stem (24; 124; 224; 324; 424) to turn said stem (24; 124; 224; 324; 424) in said one direction until said sleeve (58; 178; 278; 378; 426) has been bulged laterally to a fully set condition overlying said inner surface (18) of said inner workpiece (16), and said break groove (52) has moved outwardly to a position in substantially flush relation with an outer surface (62) of said body head (54; 254; 354; 454) as said sleeve (58; 178; 278; 378; 426) has become fully set;
- continuing to apply torque to said stem (24; 124; 224; 324; 424) to shear off said outer portion (53A) of said stem (24; 124; 224; 324; 424) at said break groove (52),

characterized by the further steps of:

- screwing a drive nut (28) on said outer portion (53A) of said stem (24; 124; 224; 324; 424) prior to inserting said fastener (10; 110; 210; 310; 410) through said aligned openings (20, 22);
- gripping said drive nut (28) to hold it against rotation, while applying torque to said outer portion (53A) to shear off said outer portion (53A) with said drive nut (28) still attached to said outer portion (53A) of said stem (24; 124; 224; 324; 424)."

Dependent Claim 17 relates to a preferred embodiment of the method according to Claim 16.

IX. The arguments presented by the Appellants in support of their main request can be summarised as follows:

The basic form of blind fastener to which the invention related, known universally as a "Jo-Bolt", had been in existence for a long time and used in very large numbers in the aerospace industry. The drive nut concept for setting such fasteners as proposed by the invention, although superficially simple, represented a radical departure from accepted techniques and was associated with a number of considerable advantages which had led to exceptional commercial success. It was however established jurisprudence that the simplicity of a solution did not speak against inventive step but instead for it.

Document D30 related to a tool for setting blind fasteners which were essentially of the Jo-Bolt type, except that the body head did not have driving recesses. Instead, the body head was supposed to be held against rotation during setting by frictional engagement with collet-like jaws of the tool. The skilled man would however immediately recognise that the proposals of

document D30 were unworkable, particularly as the tool shown could not be assembled, and accordingly would disregard it when investigating improved ways of setting Jo-Bolts. Furthermore, even if such a tool could in some way be built then it was evident that the advantages associated with the invention of improved tool alignment, reduced operator fatigue and improved pin tail recovery would not in any case be achieved, since these were dependent on the use of the drive nut.

Document D12 did indeed show a blind fastener with a drive nut but that fastener was of a very specialised type for use with weak honeycomb materials where the stem was accordingly not provided with a break groove. Consequently, the skilled man could derive no general teaching from this document as to the advantages of using a drive nut with a fastener of the Jo-Bolt type.

X. In reply the Respondents argued substantially as follows:

The best starting point for evaluation of inventive step was the blind fastener disclosed in document D12. This fastener possessed all of the features of present Claim 1 with the sole exception of the provision of a break groove in the stem. The use of break grooves in the given context was however generally known in the art. As soon as the skilled man decided to use a fastener with a drive nut as shown in document D12 in normal rigid materials where sufficient torque would be generated to shear the stem at a break groove, then the provision of such a break groove would follow as a matter of course.

An alternative approach was to start from document D30. The arguments presented by the Appellants with respect to the technical deficiencies in the teachings of this document were incorrect and there was nothing to prevent

the skilled man from assembling the tool disclosed therein. It therefore clearly belonged to the state of the art of which the skilled man would take account when considering how to improve the setting operation of fasteners of the Jo-Bolt type. The skilled man would also recognise the functional equivalence of the drive nut proposed in document D12 and the collet-like jaws of the tool of D30 and it would not have required an inventive step to have replaced these jaws by a drive nut in order to simplify the tool.

The bulk of the very substantial submissions made by the Appellants had been concerned with the so-called "secondary indications" of inventive step, in particular the alleged commercial success achieved with the claimed invention. It had, however, to be pointed out that the vast majority of the sales to which the Appellants referred had been of a blind fastener according to document D35 incorporating a feature which took those fasteners outside the scope of present Claim 1. The arguments of the Appellants in this respect were therefore misleading.

### **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. *Admissibility of the amended documents*

Apart from various editorial amendments the claims according to the main request differ from the granted claims in that the terms "localized weakened region" or "weakened zone" as used in the latter have been replaced

throughout by the term "break groove". This amendment, which clearly does not extend the protection conferred by the granted claims, was necessary to meet the objection under Article 100(c) EPC that there was no basis in the original disclosure for the use of such generalised terms in the granted claims, the original disclosure having been limited in this respect solely to break grooves.

The amendments made to the description do not go beyond those necessary to adapt this to the terms of the amended claims.

There are therefore no objections to the amended documents under Articles 123(2) and 123(3) EPC.

3. *Sufficiency of disclosure*

The objections raised in this respect in the opposition proceedings have been dealt with thoroughly in the decision under appeal. The Board concurs with what is said there and particularly as this matter has not been pursued on appeal (see Section VI above) has nothing to add to it.

4. *State of the art*

- 4.1 The basic configuration of blind fastener with which the invention is concerned is known as a "Jo-Bolt", this name deriving from that of its inventor, cf. document D19. As shown there the fastener comprises a tubular, internally threaded, body with an enlarged head for engaging the outer workpiece, an externally threaded stem engaging the body threads and having an enlarged head at its inner end, and a deformable sleeve arranged between the enlarged stem head and the inner end of the fastener body. On relative rotation of the stem and the

fastener body to set the fastener the sleeve is deformed into engagement with the inner workpiece. Further relative rotation shears off the outer end (pin tail) of the stem at a break groove therein, this being designed to occur when the break groove is substantially flush with the outer surface of the enlarged head of fastener body. Two alternatives are shown, one in which the enlarged head of the fastener body is arranged in a countersink in the outer workpiece (a flush head Jo-Bolt) and is provided with crossed grooves in the manner of a Phillips-type screw for engagement with a driving tool, and the other (a projecting head Jo-Bolt) in which the enlarged head of the fastener body takes the form of a conventional six-sided bolt head for engagement by a driving tool.

4.2 Document D12 is a product information sheet relating to a blind fastener for use in attaching a honeycomb structure to a rigid backing plate. This fastener also comprises a fastener body, stem and deformable sleeve arranged in the manner described above with respect to the Jo-Bolt, the stem, however, not having a break groove. To set this fastener a drive nut is provided on the outer end of the stem, this drive nut being screwed down onto and frictionally engaging the enlarged head of the fastener body. Relative rotation of the drive nut and the stem is continued until the drive nut is flush with the surface of the outer workpiece. Thereafter the drive nut is unscrewed from the stem and the stem milled flush with the fastener body head.

4.3 Document D30 relates to a blind fastener essentially of the Jo-Bolt type, differing from the flush head Jo-Bolt described in point 4.1 above only by the absence of driving grooves in the fastener body head, and a tool for setting such fasteners.

The tool has a tubular forward nose portion in which are slidably arranged three jaw members of a collet chuck the leading ends of which project from the nose portion of the tool and have outwardly flaring surfaces co-operating with similarly flaring surfaces on the end inside surface of the nose portion. The projecting ends of the jaws have threaded flanges for engaging the threads of the stem of the fastener as the jaw assembly is contracted by means of the co-operating tapering surfaces when the jaws are pressed against the fastener head. The tool also includes pneumatically driven means for engaging and rotating the stem of the fastener. Rotation of the stem with respect to the threaded flanges of the jaws draws the ends of the jaws into firm frictional engagement with the fastener body head which is thereby prevented from rotation.

5. *Novelty*

It is apparent from the above description of the state of the art, according to documents D19, D12 and D30 that none of these discloses either a blind fastener as set out in Claim 1 or a method of fastening as set out in Claim 16. In particular, in those documents (D19 and D30) where a break groove is provided in the stem of the fastener no drive nut is used to set it, and where according to document D12 a drive nut is used to set the fastener the stem of the fastener does not have a break groove. The subject-matter of these claims is therefore novel.

6. *Inventive step*

In practice a number of difficulties were experienced in the use of Jo-Bolts, especially those of the flush-head type. In particular, during the setting operation the drive tool tended to "cam out" of the drive grooves in

the fastener body head, especially when the tool was not properly aligned with the axis of the fastener, thereby seriously weakening the strength of the fastener and sometimes preventing completion of the setting operation. Correct setting of the fasteners was therefore a time-consuming procedure requiring a high degree of skill on behalf of the operator. Furthermore, the need to force the tool against the fastener body head to secure an adequate drive connection led to operator fatigue. Another disadvantage was that a large number of different drive tools had to be used to accommodate the size range of the fasteners, since otherwise proper form locking of the drive tool with the drive grooves in the fastener body head could not be guaranteed. A further disadvantage derived from the fact that in aerospace applications it was imperative to retrieve the pin tails which had been sheared off the stem. Because of their small size this was not easy, especially, as was often the case in the aerospace industry, if they were made of non-magnetic stainless steel, thus preventing the use of a magnetic sweep.

The technical problem with which the invention is concerned is therefore to provide a blind fastener and a method of fastening workpieces, with which highly reliable connections can be established with a minimum of setting time and a minimum number of drive tools for various dimensions of fastener and whereby effective and economic methods of recovering the sheared-off pin tails may be used.

This problem is solved by the blind fastener according to Claim 1 and the method according to Claim 16 respectively. The provision of a drive nut on the stem which frictionally engages the fastener body head eliminates the camming out problem associated with the prior art, facilitates proper alignment of the drive

tool with the fastener axis, and dispenses with the need for the operator to exert pressure on the drive tool to establish the required driving connection. Furthermore, only a small number of differently sized drive nuts are necessary to cover the whole range of fastener sizes so that the number of differently sized drive tools can be correspondingly reduced. Lastly, as the drive nut stays on the sheared-off pin tail this can be more readily recovered since firstly the drive nut/pin tail combination is considerably larger than the pin tail alone and secondly it is possible to make the drive nut of a material that can be located by a magnetic sweep.

In this context it is convenient to consider the allegations of the Respondents that the technical advantages put forward by the Appellants, and the commercial success deriving therefrom, were dependent on the subsequent incorporation of the feature disclosed in document D35. The Board is however satisfied that the technical advantages described in the preceding paragraph flow inherently from the use of a drive nut as described in the contested patent. It is supported in this view by a brochure issued in 1987 by one of the Respondents relating to the "Beta-Lok II Blind Fastening System" which shows a blind fastener incorporating a drive nut without the additional feature of document D35 which is said to provide "a dramatic reduction of time and effort for the installer", the fastener being praised in terms - among others - of "reduced tooling inventory", "cam out from flush head fasteners eliminated" and "steel drive nut affords easy magnetic pick up". Thus it is unnecessary, and indeed would not be proper, for the Board to address the question whether, as put forward by the Appellants, the blind fasteners disclosed in document D35 in any case fell within the ambit of the claims of the contested patent.

It had already been proposed in document D30 to dispense with form-locking between the drive tool and the fastener body head of a flush-head blind fastener. To this end the drive tool is provided with collet-like jaws which frictionally engage the fastener body head. The arguments put forward by the Appellants that the teachings of this document are so defective that the skilled man would ignore it are not convincing. The Board can recognise no reason why the skilled man could not, with the application of his basic engineering knowledge, put these teachings into practical effect. Thus it can be seen that document D30 proposes at least a partial solution to the technical problem identified above since camming out between the drive tool and the fastener body head will be eliminated and the number of drive tools for covering the size range of fasteners can be reduced. Furthermore, at least with hindsight, the collet-like jaws, which have threaded flanges for engaging the stem of the fastener, can be seen to be functionally equivalent during the setting operation to a drive nut. However, the Board can recognise nothing in document D30 itself or in the rest of the state of the art which could have encouraged the skilled man to dispense with the collet-like jaws, which are of course permanent elements of the drive tool, by equipping the blind fastener itself with a drive nut, which drive nut remains attached to the pin tail of the stem after this is sheared off. In this respect the Respondents have relied upon document D12 as showing that the use of a drive nut which frictionally engaged the fastener body head of a blind fastener was known *per se*. That is indeed true. It must however be noted that document D12 relates to a blind fastener which is set by the application of low torque, certainly not sufficient to shear off the stem at a break groove, and in the view of the Board the skilled man would not turn to such a document when specifically concerned with problems

arising through the need to apply consistently and reliably high torque to a fastener body head. Furthermore, according to document D12 the drive nut is screwed off the stem after setting the fastener so that this document can give no indication of the advantage associated with leaving the drive nut attached to the pin tail of the stem.

It is more or less implicit from what is said above that the alternative attack of the Respondents on the claimed subject-matter, which takes document D12 as its starting point, must also fail. This attack is based on the assumption that the skilled man would recognise from document D12 that the teaching to use a drive nut was applicable not just in the specific circumstances disclosed there of a relatively soft honeycomb workpiece but also to the normal case of rigid workpieces and that once having recognised this he would as a matter of course provide a break groove in the stem of the fastener, this being generally known *per se*. However, that assumption overlooks the fact that document D12 relates to a very specific product to be used in a particular way in particular circumstances and contains no indication whatsoever that the provision of a drive nut could in any way be associated with advantages when used outside that one context.

Accordingly, the Board comes to the conclusion that the subject-matter of independent Claims 1 and 16 according to the main request of the Appellants cannot be derived in an obvious manner from the state of the art. These claims together with their dependent Claims 2 to 15 and 17 and the revised description are therefore a suitable basis for maintenance of the patent in amended form.

7. In view of the above finding it is unnecessary to consider the auxiliary request of the Appellants.

8. In their counterstatement to the appeal dated 21 April 1993 the second Respondents (Opponents 02) asked for "such costs as the Board of Appeal may find it appropriate to award". At the oral proceedings the Chairman of the Board explained the principles relating to costs before the EPO (Article 104 EPC) after which this request was not maintained.

**Order**

**For these reasons, it is decided that:**

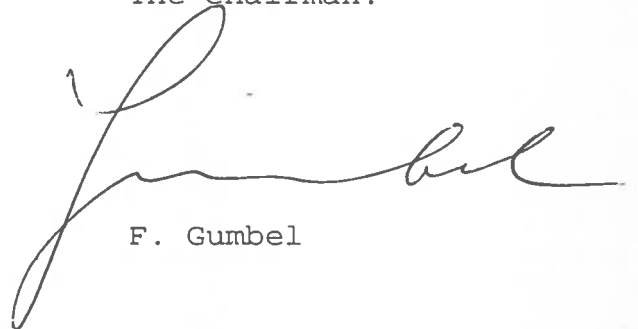
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the documents submitted at the oral proceedings (Claims 1 to 17 and description) and the drawings as granted.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel

