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**D E C I S I O N**  
**of 22 May 2003**

**Case Number:** T 0526/01 - 3.2.1

**Application Number:** 92202385.8

**Publication Number:** 0537807

**IPC:** F16B 23/00

**Language of the proceedings:** EN

**Title of invention:**

Fastener with multilobular internal recess and tool entry ramps

**Patentee:**

TEXTRON INC.

**Opponent:**

Kamax-Werke Rudolf Kellermann GmbH & Co. KG

**Headword:**

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**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty - yes (all requests)"  
"Inventive step - no (all requests)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0526/01 - 3.2.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.1**  
**of 22 May 2003**

**Appellant:** TEXTRON INC.  
(Proprietor of the patent) 40 Westminster Street  
Providence  
Rhode Island 02903 (US)

**Representative:** Webb, Andrew John  
J.A. Kemp & Co.  
14 South Square  
Gray's Inn  
London WC1R 5JJ (GB)

**Respondent:** Kamax-Werke Rudolf Kellermann GmbH & Co. KG  
(Opponent) Petershütter Allee 29  
D-37520 Osterode (DE)

**Representative:** Rehberg, Elmar, Dipl.-Ing.  
Patentanwälte  
Rehberg & Hüppe  
Postfach 3162  
D-37021 Göttingen (DE)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 16 March 2001  
revoking European patent No. 0 537 807 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** S. Crane  
**Members:** J. Osborne  
G. E. Weiss

## Summary of Facts and Submissions

- I. The appeal is directed against the decision of the Opposition Division to revoke European patent No. 0 537 807.
- II. The Opposition Division was of the opinion that the subject-matter of claim 1 according to the patent proprietor's main request lacked novelty and that the subject-matter of claim 1 according to each of the first and second auxiliary requests lacked inventive step.
- III. The following evidence cited during the opposition proceedings played a role in the appeal:
- D1: DE-A-38 08 534
- D4: US-A-3 584 667.
- IV. During oral proceedings held on 22 May 2003 the appellant 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 following documents: claim 1 according to the first auxiliary request, as submitted with a letter dated 25 May 2000, or claims 1 to 4 according to the second auxiliary request, as submitted with a letter dated 13 December 2000. The respondent requested that the appeal be dismissed as unfounded.
- V. Claim 1 according to the respective requests reads as follows:

Main request:

"A fastener having a recessed drive socket (20) for receiving a mating, rotational drive tool (22) therein, comprising a socket cavity (20) having a multilobular cross-section defined by an alternating, annular series of adjacent socket flutes (24) and socket lobes (26) extending parallel along a generally central axis (28) from an opening (21) in to the cavity circumscribed by a peripheral support collar, characterised in that each socket lobe (26) is truncated by a guide surface (27) thereof inclined relative to said opening (21) and said guide surface (27) beginning at a radially outer surface of an adjacent one of said flutes (24) and said guide surface (27) extending into said cavity (20) to form a tool clearance recess portion (29) of said guide surface (27), said tool clearance portion (29) extending from said radially outer surface of said adjacent flute (24), and said guide surface (27) extending therefrom to a termination location (31) within said cavity (20) axially recessed from said opening (21) in order to provide cammed guidance of drive lobes (23) on said tool (22) against said inclined guide surface (27) into said socket flutes (24) and to prevent driving engagement of said drive lobes (23) with said socket lobes (26) until said cammed guidance results in axially extended depth (D) of said drive lobes (23) into said socket flutes (24)."

First auxiliary request, after correction of three obvious errors and wherein the essential amendments in comparison with the main request are indicated in italics:

"A fastener having a recessed drive socket (20) for receiving a mating, rotational drive tool (22) *which continuously rotates in the drive direction*, the socket

(20) having a multilobular cross-section defined by an alternating, annular series of adjacent socket flutes (24) and socket lobes (26) extending parallel along a generally central axis (28) from an opening (21) into the socket (20) circumscribed by a peripheral support collar, each socket lobe (26) being truncated by a guide surface (27) thereof inclined *in the circumferentially extending direction, downwardly into said socket (20) at an angle relative to said opening (21) and in the direction of tightening rotation of the drive tool (22), said guide surface (27) being a planar surface forming an angle of approximately 15° relative to a line (T, Fig. 7) in a plane (P) at said opening (21) perpendicular to said central axis (28), and tangent to a circumference of said opening (21) at a radially outer edge of said adjacent socket flute, and said guide surface (27) beginning at a radially outer surface of an adjacent one of said flutes (24), extending into said socket (20) to form a tool clearance recess portion (29) of said guide surface (27), said tool clearance portion extending from said radially outer surface of said adjacent flute (24), and said guide surface (27) extending therefrom to a termination location (31) within said socket (20) axially recessed from said opening (21) in order to provide cammed guidance of drive lobes (23) on said tool (22) against said inclined guide surface (27) into said socket flutes (24) and to prevent driving engagement of said drive lobes (23) with said socket lobes (26) until said cammed guidance results in axially extended depth (D) of said drive lobes (23) into said socket flutes (24) characterized in that said multilobular cross-section has six lobes (26) and said guide surface (27) also forms an angle of approximately*

*15° relative to a line (R, Fig. 8) in said plane (P) at said cavity opening (21) perpendicular to said central axis (28), along a radius (R) of said cavity opening (21, Fig. 8)."*

Second auxiliary request, after correction of an obvious error and wherein the essential amendments in comparison with the main request are indicated in italics:

*"Use of a fastener having a recessed drive socket (20) for receiving a mating, rotational drive tool (22) therein in a method of engaging and driving said fastener with said mating rotational drive tool (22) wherein said fastener is stationary prior to engagement by said rotational drive tool and said mating rotational drive tool (20) is a continually rotating drive tool rotating in a drive direction, wherein the fastener, comprises a socket cavity (20) having a multilobular cross-section defined by an alternating, annular series of adjacent socket flutes (24) and socket lobes (26) extending parallel along a generally central axis (28) from an opening (21) in to the cavity circumscribed by a peripheral support collar, characterised in that each socket lobe (26) is truncated by a guide surface (27) thereof inclined relative to said opening (21) wherein said guide surface (27) is defined by a surface forming an angle relative to a line (T, Fig. 7) substantially in a plane (P) at said cavity opening (21) and extending substantially perpendicular to said central axis (28) and said guide surface (27) also forming an angle (e.g. of 15°) relative to a line (R; Fig. 8), in said plane also at said cavity opening (21) said guide surface*

(27) beginning at a radially outer surface of an adjacent one of said flutes (24) and said guide surface (27) extending into said cavity (20) to form a tool clearance recess portion (29) of said guide surface (27), said tool clearance portion (29) extending from said radially outer surface of said adjacent flute (24), and said guide surface (27) extending therefrom to a termination location (31) within said cavity (20) axially recessed from said opening (21) in order to provide cammed guidance of drive lobes (23) on said tool (22) against said inclined guide surface (27) into said socket flutes (24) and to prevent driving engagement of said drive lobes (23) with said socket lobes (26) until said cammed guidance results in axially extended depth (D) of said drive lobes (23) into said socket flutes (24) *whereby if said drive lobes (23) of the drive tool are initially aligned with said socket flutes (24) at the initial entry of the rotating drive tool through the socket opening (21) the clearance recess portion (29) of the guide surfaces (27) of the fastener provides rotational clearance to the drive lobes (23) preventing torque transmission from said drive lobes (23) to said socket lobes (26).*"

VI. The arguments of the appellant (patent proprietor) can be summarised as follows:

Claim 1 according to the main request is novel with respect to the disclosure of D1 because that document discloses neither that the socket has lobes nor the feature of a tool clearance recess portion. The disclosure of D1 is that the connecting faces between the flutes are flattened and closer to the central axis in comparison with the flutes. Whilst this general disclosure would encompass the lobes according to

claim 1 that specific feature is not disclosed. The disclosure of D1 is ambiguous as regards the guide surfaces. Although Figure 1 shows that the surface is not parallel to a radial line in the plane of the cavity opening there is no such disclosure in the text. Moreover, the disclosure contains no reference to the need to achieve axial alignment. As a result, there is no disclosure in D1 of a compound angle on the guide surfaces which would provide a tool clearance recess portion.

The subject-matter of claim 1 according to the main request also involves an inventive step. The problem to be solved when beginning from the closest prior art disclosed in D4 is to provide a fastener which regardless of relative angular and to some degree also axial offset position can receive and guide the continuously rotating and axially forward moving drive tool for transferring torque with less risk of the tool bouncing off at initial contact with the socket head and to prevent premature engagement at a shallow location of the rotating tool adjacent the opening. D1 does not present itself as being a solution to this problem and no tool clearance recess portion is disclosed.

The subject-matter of claim 1 according to the first auxiliary request additionally requires that the guide surface subtends a compound angle having components of a particular value, neither of which is disclosed in D1.

D1 also gives no suggestion to the skilled person to use the fastener of D4 in the way set out in claim 1 according to the second auxiliary request since it is



envisaged in D1 that the tool is stationary when it is offered up to the fastener.

VII. The respondent (opponent) essentially countered as follows:

As regards the feature of "lobes", this is clearly disclosed in D1 in as far as it describes portions between the flutes of the socket which are closer than the flutes to the central axis. The skilled person understands that these portions can be inwardly convex. Moreover, Figure 1 of D1 clearly shows that the guide surface has a compound angle. Since all other features of claim 1 according to the main request are also clearly disclosed in D1 the subject-matter of the claim lacks novelty.

Even if the subject-matter of claim 1 according to the main request were to be considered as being novel it would be obvious for the skilled person to put the teaching of D1 into effect in a fastener according to D4, thereby arriving at the subject-matter of the claim. D4 discloses a fastener having a multi-lobular recessed drive socket and in which a radially inwardly tapering face is provided at the top of each lobe to provide for centring the tool in the recess.

The hex-lobular construction defined in claim 1 according to the first auxiliary request results from the combination of D1 and D4. The 15° values of the respective components of the compound angle according to claim 1 of this request fail to add an inventive feature since these are consistent with the teaching of D1 Figure 1 and are merely the result of trial and error work by the skilled person in accordance with the

relative speeds of rotation and axial movement of the driving tool.

The amendment of claim 1 according to the second auxiliary request concerns the use of the fastener in a method in which a rotating tool is brought into contact with the head of the fastener. This is also disclosed in D1 in column 1, line 24 and so adds nothing new to the subject-matter of the main request.

## **Reasons for the Decision**

### *Main request*

#### 1. *Novelty*

- 1.1 D1 relates to the form of a recessed drive socket in a screw head and to the corresponding form of a driver tool for insertion therein. The disclosure begins from a prior art in which the socket comprises an alternating annular series of adjacent flutes and flat connecting portions ("Abflachungen") which reach closer than the flutes to the central axis. It is explained that with this prior art it was difficult to insert a machine driven drive tool into the recess because of the necessity that the tool and recess be not only concentrically but also rotationally aligned. In order to avoid the need for exact rotational alignment it was already known to rotate the drive tool when it was offered up to the fastener but this led to the problem that either the tool would not always enter the recess when they first become rotationally aligned or it would not enter to the correct depth. The solution proposed according to D1 involves extending the flutes counter

to the turning direction. In the preferred embodiment of the invention according to D1 the socket and tool have a cross-section in the form of a regular triangle with rounded corners. The sides of the triangle, which are the particular embodiment of the general feature of the connecting portions between the flutes, are described as being flat ("eben") and are represented in the figures by a straight line. The extensions of the flutes according to the preferred embodiment are in the form of inclined guide surfaces which truncate the connecting portions and which begin at a radially outer surface of an adjacent flute and extend into the cavity of the socket.

1.2 Claim 1 of the contested patent relates to a multi-lobular fastener in which the socket comprises "lobes" between the flutes. This type of fastener is well known in the art (see for example D4) and the inwardly convex surfaces of the lobes act together with the corresponding faces on the drive tool to direct the force between the drive tool and fastener closer to the tangential direction than is the case with a socket having planar faces arranged in a regular polygon, thereby improving the efficiency of torque transmission. Such a multi-lobular arrangement falls within the broad disclosure by D1 of connecting portions which reach closer to the central axis than do the flutes. However, the only specific disclosure of D1 is of the connecting portions having planar sides and D1 therefore fails to disclose the feature of lobes.

1.3 The guide surfaces in D1, which are described as conical side surfaces, are shown twice in Figure 1, in a lateral elevation and in cross-section. The elevational view represents the surface as a single

straight line beginning at the upper surface of the fastener head and extending down into the socket cavity. However, it is clear that this straight line is a simplified representation of the true elevational view of the surface which would involve complex curves formed by the intersection of an inclined surface with both flat and curved walls and the skilled person gains no teaching either from this view in the drawing or from the description as regards any inclination of the surface in the radial plane. The sectional view, on the other hand, which can more simply show the correct form of the guide surface, shows the surface as being angled downwardly towards the central axis relative to the plane of the head of the fastener. Although there is no mention in the text of this inclination, in the Board's view the skilled person would derive from the drawing that the surface should be inclined inwardly and downwardly in the radial plane. This is particularly so since it would be fully consistent with the general knowledge of the skilled person that a radially inclined surface is provided at the top surface of the lobes in recessed drive sockets to aid the axial alignment of a drive tool in the socket, see the sentence bridging columns 6 and 7 of D4. As a result of the radial inclination the guide surfaces would necessarily form a tool clearance recess portion in the same way as described in the patent specification column 4, lines 32 to 46. The Board therefore concludes that this feature fails to distinguish the subject-matter of contested claim 1 from the disclosure of D1.

- 1.4 The subject-matter of contested claim 1 is therefore novel with respect to the disclosure of D1 by virtue of the feature of lobes (Article 54 EPC).

2. *Inventive step*

2.1 As determined above, the subject-matter of claim 1 differs from the disclosure of D1 only by the feature of the lobes. The teaching of D1 in its most general sense relates to the head of a fastener in which the socket has the form of a plurality of flutes connected by flattened surfaces which reach closer to the central axis of the socket. This broad definition includes a hex-lobular form such as is known from D4, Figure 12. Although the preferred embodiment in D1 concerns an arrangement in which there are three such flutes and the connecting surfaces are flat, in the light of the known benefits of the hex-lobular form it would be obvious for the skilled person to apply the teaching of D1 to the hex-lobular form and thereby arrive at the subject-matter of contested claim 1.

2.2 The Board therefore concludes that the subject-matter of claim 1 does not involve an inventive step (Article 56 EPC).

3. *Auxiliary requests*

3.1 The subject-matter of claim 1 according to the first auxiliary request essentially differs from that according to the main request by the following features:

- the fastener is suitable for receiving a drive tool which continuously rotates;
- the multi-lobular cross-section has six lobes; and
- the guide surface extends in both circumferential

and radial directions at an angle of 15° relative to the plane of the surface of the head of the fastener.

It is explained in D1 column 1, lines 21 to 38 that the problem which was to be solved arose because, in order to avoid the need for rotational alignment when driving the tool with a machine, it was desirable that the tool be rotated when it is pressed against the fastener so that they can move into engagement. By adding the inclined guide surfaces D1 renders it possible to use the fastener together with a tool which is rotating before it enters the socket. In the light of that teaching it follows that a hex-lobular fastener as in D4 Figure 12 when modified according to D1 would be suitable for use with a continuously rotating drive tool. It would be necessary for the skilled person when putting into effect the teaching of D1 to complete it by choosing optimum values for the respective components of the compound angle of the guide surfaces. Such optimisation of the angles according to required rotational and approach speeds of the drive tool falls within the normal activity of the skilled person. Moreover, the 15° angles claimed are consistent with the orientation of the respective lines shown in D1 Figure 1. It follows that the additional differentiating features of contested claim 1 according to the first auxiliary request also follow in an obvious way from the application of the teaching of D1 to the disclosure of D4.

3.2 The subject-matter of claim 1 according to the second auxiliary request differs from that of the first essentially in that it defines the use of the fastener in a method in which a drive tool is continually

rotating prior to engaging the fastener and in that the effect of the tool clearance recess portion is defined. It is acknowledged in the patent specification that it was already known to bring a continually rotating drive tool into engagement with the head of a fastener having a multi-lobular recessed socket and indeed that the problem to be solved, to ensure satisfactory engagement between the tool and fastener, derived from performing that method. According to D1 essentially the same problem arose during machine driven rotation of the tool relative to the fastener. Particularly in the light of the discussion of that problem in D1 it would require no inventive activity on the part of the skilled person to choose to use the fastener resulting from a combination of D1 and D4 in the way which was already known. The action of the tool clearance recess portion in preventing drive between the tool and the fastener is an automatic consequence of the presence of that feature.

- 3.3 The Board concludes that the subject-matter of each of the auxiliary requests fails to involve an inventive step (Article 56 EPC).

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

S. Crane