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D E C I S I O N
of 11 March 2003

Case Number: T 0198/01 - 3.2.1

Application Number: 95200206.1

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Language of the proceedings: EN

Title of invention:
Screw and wrench for snugly-fitted tightenings

Patentee:
AS.TEC. Assistenza Tecnica s.r.l

Opponent:
Kamax-Werke Rudolf Kellermann GmbH & Co. KG
Richard Bergner Verbindungstechnik GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84
EPC R. 29(1)

Keyword:
"Novelty (yes)"
"Inventive step - *ex post facto* analysis"

Decisions cited:
T 0072/95

Catchword:
-

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Case Number: T 0198/01 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 11 March 2003

Appellant: (Proprietor of the patent)
AS.TEC Assistenza Tecnica s.r.l.
Via C. Alberto, 11
I-20052 Monza (IT)

Representative:
Faraggiana, Vittorio, Dr.-Ing.
Ingg. Guzzi & Ravizza S.r.l.
Via Vincenzo Monti 8
I-20123 Milano (IT)

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

Representative:
Patentanwälte Rehberg + Hüppe
Postfach 31 62
D-37021 Göttingen (DE)

(Opponent)
Richard Bergner Verbindungstechnik GmbH & Co. KG
Bahnhofstrasse 8-16
D-91124 Schwabach (DE)

Representative:
Tergau & Pohl Patentanwälte
Mögeldorfer Hauptstrasse 51
D-90482 Nürnberg (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 5 December 2000 revoking European patent No. 0 670 431 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. 0 670 431.

II. The opponents had cited *inter alia* the following evidence:

D1 DE-C-966 464

D2 US-A-2 046 837

D7 US-A-5 174 704.

III. The Opposition Division was of the opinion that the subject-matter of claim 1 as amended during the opposition procedure, although novel in comparison with the respective disclosures of D1 and D2, lacked an inventive step in the light of the closest prior art as disclosed in the patent specification in respect of Figure 2 when considered together with the disclosure of D7.

IV. In oral proceedings held 11 March 2003 the appellant (patent proprietor) requested that the contested decision be set aside and that the patent be maintained as granted (main request) and in amended form on the basis of claims as set out in Enclosures A and B submitted with a letter dated 7 February 2003 (first and second auxiliary requests respectively). The respondents requested that the appeal be dismissed.

V. The patent as granted contains two independent claims.

Claim 1 reads:

"A screw (30) for snugly-fitted tightening pairs, of the type having a lobate-socket head (31), in which each lobe (37) is formed with a first face (37') directed in a substantially circumferential manner with respect to the axis of the screw and two other substantially parallel faces (35, 36) directed inwardly with respect to the axis of the screw, said screw having a reaction surface (33) for a tightening wrench (32) which is made of the faces forming the lobes and of portions included between each pair of adjacent lobes, each portion of the reaction surface (33) included between two adjacent lobes comprising a pair of intersecting faces (38, 39) inclined to each other to form an angle concave towards the outside of the screw so that in the lobate-socket head (31) one face (38) of each intersecting pair thereof forms part of the side of a first regular polygon and the other face (39) of each intersecting pair thereof forms part of the side of a second similar, regular polygon, said polygons being angularly rotated with respect to each other about the axis of the screw and being operative to constitute two different sets of reaction surfaces for a wrench (40) of the same polygonal profile."

Claim 6 reads:

"A lobate wrench conforming to the shape of a screw according to claim 1, characterized in that it comprises a reaction surface (34) matching the corresponding reaction surface (33) of the screw, portions of said reaction surface (34) included between

two adjacent lobes (37c) comprising a pair of intersecting faces (38c, 39c) inclined to each other to form an angle concave towards the outside of the screw."

In addition to claims 1 and 6 the patent as granted contains dependent claims 2 to 5 and 7 and 8.

VI. The arguments of the respondents (opponents) can be summarised as follows:

As regards novelty of claim 1 with respect to the disclosures of D1 and D2 the matters at issue concern the features that the two inwardly directed faces are "substantially parallel" and that the regular polygons formed by the intersecting pairs of faces are "operative to constitute ... reaction surfaces for a wrench having the same polygonal profile". The term "substantially" renders the subject-matter of the claim unclear because it cannot be determined whether the deviation of the faces from parallel is only within manufacturing tolerances or may include larger angles. According to the Guidelines for Examination at the EPO C-III, 4.5a this unclear feature cannot be used to distinguish the subject-matter of the claim from the prior art with respect to novelty and inventive step. D1 and D2 relate to Phillips type screw heads in which the diverging faces in the slots are substantially parallel within the meaning of present claim 1, particularly as D1 discloses that the angles are not restricted to those disclosed in respect of the preferred embodiments. The requirement of present claim 1 that the intersecting pairs of faces constitute reaction surfaces "for a wrench ... " is not a structural but merely a functional limitation. In view of the fact that the claim includes no indication of the torque transmission requirement the functional requirement is met also by a Phillips type screw.

The closest prior art for consideration of inventive step is that disclosed in Figure 2 and column 1, lines 49 to 56 of the patent specification and which is a lobate screw head having, in addition to the lobate sockets, a hexagonal cavity to accommodate a correspondingly shaped wrench. Compared to this prior art the novel features of present claim 1 are those of and relating to the intersecting faces and the objective problem concerns only the interaction of two polygons and the avoidance of damage caused thereby. The remaining features relating to the lobate form have no influence on the problem. However, that problem will be solved only when a particular combination of tolerances occurs. The novel features *per se* do not solve the problem and so, in accordance with T 72/95 (not published in OJ EPO), should not be considered for assessment of inventive step. As regards the particular tolerance combination which would solve the problem, the skilled person would be aware of D7 which contains a general teaching that it is beneficial to angle the sides of a socket for use with a hexagonal bolt head in order to avoid damage to corners and so renders the subject-matter of claim 1 obvious. There is nothing which would prevent the skilled person from applying the teaching of D7 to the closest prior art. The skilled person would be aware that the inferior material of the screw head would render it susceptible to damage by the wrench and would apply the teaching of D7 accordingly.

VII. The appellant (patent proprietor) essentially argued as follows:

The expression "substantially parallel" defines that the faces are as parallel as is possible in view of the fact that screw heads of the type defined in present claim 1 are produced by a punching operation. D1 and D2 both relate to Phillips type screws in which the faces

in question are deliberately inclined to achieve a wedging effect. Lobate screw heads of the type defined in claim 1 when considered in the light of the description are used in applications requiring a high torque. The parts of the socket of the Phillips screw heads which form a polygonal aperture have converging sides and are not suitable for use with a conventional polygonal wrench for the application of torque of the level for which lobate-socket screws are suitable.

The closest prior art is indeed that to which Figure 2 of the patent specification relates and which is intended to be used to apply high torque to the screw. The problem is that such high torques cannot be applied when using a polygonal wrench because the necessary clearance to allow its insertion results in contact only at the corners which then become damaged and prevent the subsequent use of a lobate wrench. D7 concerns the problem of preventing damage to the external corners of a hexagonal bolt head in order to prevent rusting. Although in one embodiment the sides of the wrench socket are angled to improve the alignment of respective surfaces of the wrench and the head, the purpose of this is still to protect the corners of the bolt head and not the sides of the wrench socket. Any similarity with the form of the socket in the presently claimed screw is therefore purely superficial.

Reasons for the Decision

Main request

1. *Novelty*

1.1 The subject-matter of claim 1 is a screw having a lobate-socket head in which each lobe comprises two faces directed inwardly with respect to the axis of the screw. According to the claim these faces are "substantially parallel".

1.1.1 As set out in Article 84, first sentence in conjunction with Rule 29(1) EPC the purpose of patent claims is to define the matter for which protection is sought. In order to avoid an excessively restrictive interpretation of a claimed property when determining matter to be protected it is common practice when drafting the claims to qualify absolute properties by terms such as "substantially" such as not to exclude variations due to manufacturing tolerances. This does not change the basic teaching as regards the desired value of the property as disclosed in the description. In the present case the text in the description of the patent specification relating to the orientation of the two inwardly directed faces of the lobes defines the faces as "parallel" and this is consistent with further statements indicating that the faces are not radially orientated (column 5, lines 14 to 21). There is nothing in the patent specification which would lend support for the idea that the wording "substantially parallel" was ever intended to mean that the faces are intentionally not parallel. The Board therefore accepts the view of the appellant that the wording in question has the meaning of parallel within manufacturing tolerance.

1.1.2 Both D1 and D2 relate to cross-point screw heads having a lobate socket. According to D1 each lobe comprises side faces 18 which converge in both the outward (plan view Figure 2) and downward (elevational view Figure 9) directions at angles of 2° to 4°and 8° to 10° respectively. Although it is stated in page 4, lines 100, 101 that the latter angle may be varied according to requirements there is no teaching to remove the convergence. Similarly, whilst D2 contains no quantitative indication of the angular orientation of the faces 14 it is clearly stated in page 3, line 14 and shown in Figure 4 that they are mutually inclined.

1.1.3 According to the respondents the designation "substantially parallel" is unclear and so cannot be used to distinguish the subject-matter of the claim from the prior art. They refer in this respect to the Guidelines for examination at the EPO in which at C-III, 4.5a it is stated that "particular attention is required whenever the word "about" or similar terms such as "approximately" are used ... the word can only be permitted if its presence does not prevent the invention from being unambiguously distinguished from the prior art with respect to novelty and inventive step." However, as set out above, the Board considers that the meaning in the present case of "substantially parallel" is clear and leads to no ambiguity when comparing the subject-matter of claim 1 with that of the prior art.

1.2 The Board therefore concludes that the feature of present claim 1 that the inwardly directed faces of the lobes are "substantially parallel" renders the subject-matter of the claim novel with respect to the disclosures of both D1 and D2. The same conclusion

applies to claims 2 to 5. Since neither of D1 and D2 is relevant for assessment of inventive step it is not necessary to consider whether any further features of claim 1 are novel in comparison with these documents.

1.3 Claim 6 concerns a lobate wrench which has a form corresponding to that of the socket according to claim 1. D1 and D2 both disclose screwdrivers which conform to the respective screw heads and which comprise side faces which are angled in a manner corresponding to the sockets. The subject-matter of claim 6 and therefore also claims 7 and 8 thus is novel with respect to the disclosures of D1 and D2.

2. *Inventive step*

2.1 The Board agrees with all parties that the closest prior art is that which is acknowledged with reference to Figure 2 in the patent specification. Lobate sockets were developed in order to increase the efficiency of applying torque from the wrench to the screw by virtue of the arrangement of the inwardly directed side faces of the lobes close to the radial direction whereby the applied force is closely aligned to the tangential direction. The prior art shown in Figure 2 is such a hexalobate socket having also intermediate faces between the lobes arranged as a regular hexagon. According to the description of the patent specification this prior art socket can if required be operated by a hexagonal wrench in engagement with the intermediate faces. However, two disadvantages arise in such a case. Firstly, the applied force is directed at an angle well removed from the tangential direction and so higher forces are required than with a hexalobate

wrench in order to achieve a given torque. Secondly, the necessary clearance between the wrench and the intermediate faces permits a certain rotation of the wrench relative to the socket, leading to high stress and consequent deformation of the corner between a side face of a lobe and the adjacent intermediate face. This deformation may result in the movement of material of the socket wall into the lobe space and thereby prevent the subsequent insertion of a lobate wrench.

2.2 The subject-matter of present claim 1 differs from that of the prior art by the following features:

- each portion of the reaction surface included between two adjacent lobes comprises a pair of intersecting faces inclined to each other to form an angle concave towards the outside of the screw so that in the lobate-socket head one face of each intersecting pair thereof forms part of the side of a first regular polygon and the other face of each intersecting pair thereof forms part of the side of a second similar, regular polygon, said polygons being angularly rotated with respect to each other about the axis of the screw and being operative to constitute two different sets of reaction surfaces for a wrench of the same polygonal profile.

These features have the effect that the portion of the reaction surface engaged by the wrench is more closely aligned with the respective surface of the wrench whereby the surface stress is reduced, resulting in a lower risk of damage to the socket. Furthermore, the force transmitted from the wrench to the hexagonal

faces of the socket is applied at an angle closer to the tangential direction, thereby achieving higher efficiency. The corresponding problem to be solved was to reduce the risk of damage to the lobate form whilst improving efficiency when using a polygonal wrench.

2.3 D7 relates to hexagonal bolt heads and correspondingly shaped socket wrenches. According to D7 there exists the problem that the use of a socket mounted on an impact wrench can lead to rusting of the bolt head as the result of damage to its corners caused by rotation of the head within the socket due to the clearance between them (see D7 Figure 4). D7 relates to a technical field close to that of lobate headed fasteners and the skilled person faced with the problem set out in 2.2 above would be aware of it. However, in the Board's view he would not consider D7 as offering a solution to his problem. The solution to the problem posed in D7 is to form the sides of the hexagon on the bolt head or in the wrench socket as two inclined portions. In the case where the modification is made to the wrench, the two inclined portions are arranged to subtend an obtuse angle directed away from the bolt axis (Figure 3). However, this modification serves to protect the external corners of the bolt head. If this teaching were notionally transposed to the closest prior art in the present case the corresponding external corners would be on the wrench. These corners are, however, not subject to damage, firstly because they are located within the space defined by the lobes and secondly because they would be of a material which would be less prone to damage than that of the screw head. It follows that D7 sets out to solve a problem different from that to be solved in the present case. Moreover, D7 relates only to a conventional hexagonal bolt head which in comparison with a lobate socket head is relatively inefficient at applying torque and does not concern itself with this aspect of the problem in

the present case. The respondents argue that the problem to which present claim 1 relates merely concerns the interaction of two hexagonal shapes and that D7 teaches a solution to it. However, in the Board's view this oversimplifies the situation. The prior art socket of Figure 2 of the patent specification includes by virtue of its lobate form a particular design of hexagon which comprises inwardly directed corners on the walls of the socket which are prone to damage but which do not exist either in D7 or in a hexagonal socket in general and which, moreover, are employed on a screw head for use in high torque applications. Furthermore, contrary to the respondents' assertion, the teaching of D7 is restricted to the avoidance of damage to the external corners of a hexagonal bolt head. In the Board's view the skilled person would need to exercise inventive imagination to apply the specific teaching of D7 in respect of a conventional hexagonal bolt head to solve the problem posed in respect of the prior art in the present case which concerns a particular design of socket for use in high torque applications. Any other conclusion relies on an *ex-post* analysis.

2.4 The respondents essentially argue that only one of various possible combinations of dimensional tolerances of the socket defined in present claim 1 and a wrench for use therewith will result in the working surfaces becoming parallel, thereby reducing the stress level sufficiently to avoid damage. They conclude that the features of present claim 1 which are novel with respect to the closest prior art fail to solve the problem set and so, following T 72/95, are to be disregarded for assessment of inventive step. The Board

cannot accept these arguments. Firstly, in comparison with the prior art arrangement, the modifications of the socket according to present claim 1 reduce misalignment between the respective faces of a hexagonal wrench and the socket and so lead to a reduction in stress on the corner of the lobe irrespective of the tolerance combination. Secondly, deformation of the corners between the respective pairs of inclined faces which, according to the respondents, would occur at the tolerance extreme when the wrench is the largest dimension which can enter the socket, would not be detrimental to the subsequent insertion of a lobate wrench because the damage would increase the space available for insertion of the lobate wrench. Finally, T 72/95 concerns itself not with failure to solve the problem set but technically non-functional or disadvantageous modifications (reasons 5.4) and so fails to support the respondents' case.

2.5 The Board therefore concludes that the subject-matter of present claim 1 is not rendered obvious by the cited prior art.

2.6 Claim 6 concerns a lobate wrench which has a form corresponding to that of the socket according to claim 1. The subject-matter of this claim is not rendered obvious by the cited prior art for the same reasons as for claim 1.

2.7 It follows that both claims 1 and 6 involve an inventive step (Article 56 EPC). The same conclusion applies to claims 2 to 5, 7 and 8.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

S. Fabiani S. Crane