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Bezeichnung der Erfindung: Mounting device for rotary-cutter tools
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B23B 31/04

ENTSCHEIDUNG / DECISION

vom / of / du 5 December 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Sandvik Aktiebolag

Einsprechender / Opponent / Opposant : Friedr. Krupp GmbH

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (yes)"
"Amendment of Claim 1 during the opposition procedure - Rule 29(1) EPC"

Leitsatz / Headnote / Sommaire

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Case Number : T 65/89 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 5 December 1990

Appellant : (Opponent)
Fried. Krupp GmbH
Altendorfer Str. 103
D-4300 Essen 1 (DE)

Representative :
Patentanwalt Vomberg
Schulstraße 8
D-5650 Solingen 1 (DE)

Respondent : (Proprietor of the patent)
SANDVIK AKTIEBOLAG
S-81181 Sandviken 1 (SE)

Representative :
Weber, Dieter, Dr.
Dr. Dieter Weber und Dipl.-Phys. Klaus Seiffert
Patentanwälte
Gustav-Freytag-Strasse 25
Postfach 6145
D-6200 Wiesbaden 1 (DE)

Decision under appeal :
Interlocutory decision of the Opposition Division of the European patent Office dispatched to the parties on 28 November 1988 concerning maintenance of European patent No. 15248 in amended form.

Composition of the Board :

Chairman : C. Andries
Members : H. Seidenschwarz
M. Schar

Summary of Facts and Submissions

I. European patent No. 15248 concerning a mounting device for rotary-cutter tools and comprising nine claims was granted on 27 July 1983 in response to European patent application 80 850 012.8 filed on 25 January 1980.

II. An opposition was filed against the European patent requesting it be revoked on the ground of lack of inventive step.

The following documents were referred to:

D1: DE-C-1 552 556
D2: DE-B-1 300 774
D3: Katalog "EWF Schneid- und Spannzeuge", 7570 Baden-Baden (DE); Ausgabe 75
D4: DE-U-7 827 203
D5: US-A-3 443 819
D6: DE-A-2 541 123.

III. By interlocutory decision dispatched to the parties on 28 November 1988, the Opposition Division maintained the patent as amended on the basis of the documents specified in the communication pursuant to Rule 58(4) EPC dated 6 September 1988.

IV. The Appellant (Opponent) lodged an appeal against the decision on 17 January 1989, paying the appeal fee simultaneously. The Statement of Grounds was filed on 13 March 1989.

The Appellant's objections can be summarised as follows: The subject-matter of amended Claim 1 lacks inventive step because, starting from document D6 which discloses the

mounting device according to the precharacterising portion of Claim 1, the solution as claimed consists in two distinctive measures, each of which achieves a particular purpose. Each of these measures is obvious in view of the document D6 in combination with document D1 or document D4 as well as document D6 in combination with document D2 or document D5. The combination of the features of Claim 1 does not result in surprising interactive effects. Furthermore, it is doubtful that the invention is sufficiently clearly and completely disclosed. The subject-matter of the present version of amended Claim 1 represents only a collocation of features.

V. Oral proceedings took place on 5 December 1990.

(i) The Appellant, who had been duly summoned according to Rule 71(1) EPC, informed the Board of Appeal in his letter dated 29 October 1990 that he would not attend the oral proceedings. He requested the Board of Appeal to take its decision on the basis of the documents on file, which request implicitly involves to set aside the decision under appeal and to revoke the patent. The oral proceedings, therefore, were continued without him (Rule 71(2) EPC).

(ii) The Respondent (Patentee) requested that the appeal be dismissed and that the patent be maintained as granted by the Examining Division.

VI. The independent Claims 1, 8 and 9 as granted read as follows:

"1. A mounting device for the connection of a rotary cutting tool (18) to a machine spindle, comprising an arbor (10) for connection to the spindle, an adapter (11) for connecting the cutting tool (18) to the arbor (10) and having a cylindrical extension (16) extending from its main

portion, a clamping bolt (13) for clamping the adapter (11) to the arbor (10) and having an exterior threaded portion (14) at its tool oriented end portion for threadable engagement with a corresponding internal thread portion (15) located at least partially within said cylindrical extension (16), characterized in that the cylindrical extension (16) has two cylindrical surface portions (27, 28) of different diameters, the distal surface portion (27) having a smaller diameter than the other surface portion (28), the bore (12) of the arbor (10) having two guide surfaces (29, 30) which fit closely against the two cylindrical surface portions (27, 28), and in that the clamping bolt (13) has an axial central bore (26) for the transmission of coolant medium therethrough and serves to clamp the adapter (11) directly to the arbor (10) so as to form a unit separable from the spindle."

"8. Adapter to be used in a mounting device according to Claim 1, characterized in that the adapter (11) is provided with a cylindrical extension (16) adapted to be received in an arbor connected between a spindle and the adapter, said cylindrical extension having an internal thread portion (15) and two cylindrical surface portions (27, 28) of different diameters on the outside of said cylindrical extension, the upper surface having a smaller diameter than the lower surface, said surfaces being adapted to engage said arbor."

"9. Arbor to be used in a mounting device according to Claim 1, characterized in that the arbor (10) has an axial bore (12) and comprises a clamping bolt (13) arranged within said bore and having an exterior thread portion (14) at its tool oriented end adapted for threadable engagement with an adapter (11) which holds the cutter tool, said clamping bolt having an axial central bore (26) for the transmission of coolant medium therethrough, and further comprises two guide surfaces (29, 30) of different

diameters within the bore of said arbor, the upper surface having a smaller diameter than the lower surface, said surfaces being adapted to engage said adapter."

Reasons for the Decision

1. The appeal is admissible.

2. Closest state of the art

A mounting device for the connection of a rotary cutting tool to a machine spindle as disclosed by document D6 is actually the closest prior art with respect to the subject-matter of the independent claims. Said mounting device comprises an arbor, an adapter and a clamping bolt as specified in the precharacterising portion of Claim 1. Furthermore, Figure 1 of document D6 also shows that the clamping bolt serves to clamp the adapter directly to the arbor so as to form a unit separable from the spindle. The surrounding inner cylindrical surface of the arbor and the corresponding cylindrical extension extending from the main portion of the adapter comprise a constant diameter along a considerable length thereof, thus providing a single cylindrical centering surface. Such a connection between the arbor and the adapter tends to cant or jam during mounting of the adapter into the arbor. Therefore, this connection requires considerable clearances between the abutting cylindrical surfaces of said arbor and adapter respectively. These disadvantages are well known in the state of the art of mounting devices having only one cylindrical centering surface: cf. document D4: page 2, lines 16 to 29; page 3, lines 1 to 9 and 17 to 21.

3. Problem and solution

3.1 It follows from the submissions of the Respondent during the oral proceedings on the prior art known from the above-mentioned document D6 that the technical problem to be solved by the invention is to provide a mounting device having a press-fit of the adapter in the arbor which results in a tool without any clearances and with a minimised radial offsetting of the cutting tool (column 2, lines 36 to 42; column 2, line 59 to column 3, line 8).

3.2 This problem is solved by the features of the independent claims, particularly by those which are present in the characterising portions of these claims, namely by providing

- the cylindrical extension of the adapter with two cylindrical surface portions of different diameters on the outside of said cylindrical extension, the distal or upper surface portion having a smaller diameter than the other or lower surface portion;

- the bore of the arbor with two guide surfaces which are adapted to fit closely against the two cylindrical surface portions of the adapter, and

- the clamping bolt with an axial central bore for the transmission of coolant medium therethrough.

The provision of an upper surface portion having a diameter smaller than the lower part results in cylindrical extension of the adapter with an upper part whose wall is thinner and, therefore, more elastic than the wall of the lower part. This property permits the two cylindrical surface portions of the adapter to slide with small clearances between the surface portions and the corresponding guide surfaces in the bore of the arbor, thus

avoiding almost entirely any canting or jamming during mounting of the adapter into the arbor. Furthermore, as a result of the small clearances the cylindrical surface portions of the cylindrical extension have only slightly been expanded in diameter by the wedging action of the clamping bolt to engage tightly the abutting surfaces in the bore of the arbor. Thus, an engagement of the abutting surfaces without any clearances and, consequently, with a minimised radial offsetting of the cutting tool is obtained.

In operation, the whole mounting device is heated via the adapter with heat coming from the rotary cutting tool. An overheating of said device may lead to an additional thermal radial expansion of the cylindrical extension of the adapter, which expansion causes tensions between the engaging surfaces of the adapter, the clamping bolt and the arbor, or jamming of the cylindrical extension inside the arbor. The coolant medium flowing through the central bore of the clamping bolt gives rise to smaller temperature gradients and smaller differences of the mean temperatures in the adapter, arbor and clamping bolt, thus reducing the overall temperature of the mounting device which avoids the overheating of the cylindrical extension.

The cooling of the mounting device is, therefore, a further prerequisite permitting the reduction of the clearances between the abutting surfaces of the connected parts of said device.

Thus, a two-piece structure occupying a minimum of space laterally is obtained.

From the above follows that all the features of Claim 1 are functionally interrelated (mutually supporting each other in such a way as to produce a new working inter-relationship) and solve the technical problem. It is,

therefore, incorrect to refer to solutions of part problems, since in the present case there is a true combination of features and not merely a juxtaposition of functionally independent features.

4. As can be seen from the above-mentioned paragraph 3., the patent in suit discloses the invention in a manner sufficiently clear and complete that a person skilled in the art can understand the underlying problem and can carry out said invention. It does not matter that no more information is mentioned in the description or in the independent claims having regard to clearances between the abutting cylindrical surfaces of the adapter and the arbor and the permissible variations of said clearances. The person skilled in the art does not need more information because it is well within the scope of his knowledge to choose the adequate conditions (clearances) dependent on the specific situation. Therefore, the objection of the Appellant concerning insufficient disclosure of the invention (pursuant to Article 83 EPC or, respectively, Article 100(b) EPC) cannot be followed by the Board.

5. Novelty

Neither document D6 nor any one of the other available documents discloses the subject-matter as specified in the independent claims. Therefore, said subject-matter is to be considered novel within the meaning of Article 54 EPC.

6. Inventive step

On the question of whether or not the state of the art present in the file could suggest the subject-matter according to the independent claims, the following is to be observed:

6.1 The idea of centering a cutting tool in a mounting device for connecting said cutting tool to a machine spindle by the use of two sections of different diameters for fitting with corresponding guide surfaces is already known from each of the documents D1 and D4. These sections of different diameters at the ends of the parts, which are fitted together, facilitate the change of the cutting tool, eliminate the danger of damaging the abutting surfaces by canting of the cutting tool or said parts and provide high accuracy of the connection due to small clearances between the abutting surfaces (cf. D1: column 2, line 29 to column 3, line 5; D4: page 1, first paragraph; page 4, lines 4 to 20).

Document D1 (cf. Figures 1 and 2) concerns a mounting device comprising an arbor (1) and an adapter (25). The arbor is formed with two cylindrical surface portions of different diameters (32, 33) for fitting with two corresponding guide surfaces (30, 31) in the bore of the adapter. The arbor is partly surrounded by the adapter, which is connected to the machine spindle (3) by means of an outer clamping device comprising a flange (11) and a coupling ring (18).

Such a mounting device is, however, comparatively expensive (cf. document D4: page 1, last paragraph to page 2, line 15).

Document D4 (cf. page 3, lines 17 to 28) mentions a chuck having one cylindrical centering surface for mounting a tool to a machine spindle, which chuck is secured to said spindle by a tensioning screw inside the spindle. Therefore, it must be possible to tension from the opposite side (machine spindle) and a corresponding bore, therefore, must be provided. Furthermore, it is stated that such a tensioning screw cannot safely absorb the load resulting from heavy cuts.

The technical problem to be solved by the subject-matter of document D4 is to improve not only the mounting device as known from document D1, but also the mounting device as mentioned in document D4 (page 3, lines 17 to 28), in such a manner as to allow manufacture at low cost, screwing or unscrewing without jamming and with high accuracy of the connection (cf. page 4, lines 4 to 25; page 9, lines 1 to 15 and Figure 2).

Document D4 teaches to use an adapter with a cone-shaped projection having two cylindrical surface portions of different diameters (15, 16) and, additionally, a steeply threaded portion (17) adjacent to said cylindrical surface portions for close fitting against corresponding guide surfaces in an arbor. The steeply threaded portions engage its corresponding guide surface only when the two cylindrical surface portions have centered the adapter in the arbor.

From the above, it is clear that document D4 refers to a mounting device for the connection of a rotary cutting tool to a spindle which connection does not need and even suggests to avoid any kind of tensioning screw or clamping bolt located inside the adapter and arbor for clamping the adapter to the arbor to obtain a close interfit of the engaging surfaces. In the Board's view the teaching of document D4 leads a person skilled in the art away from using two cylindrical surface portions of different diameters in combination with an internal clamping bolt. Therefore, the teaching of document D4 cannot give any suggestion to the person skilled in the art to combine two cylindrical surface portions of different diameters with the teaching of document D6.

6.2 The mounting device (1) for the connection of a rotary cutting tool (7) to a machine spindle according to document D5 has also a body member (2) and a collet (4) received in

a counterbore (5) in the arbor. The collet is connected to the arbor by means of a clamping device comprising a nosepiece (15) and a coupling ring (18). Concentric with the counterbore is a threaded bore (20) in the arbor in which is threadedly received an adjustable stop member (21) for properly locating the inner end of the tool shaft (6, 7) within the mounting device and taking up the axial thrust loads acting on the tool. The stop member and the cutting tool are provided with bores for supplying a coolant to the cutting edges (cf. column 1, lines 23 to 25; column 2, lines 1 to 6, 11 to 21, 37 to 43; column 3, lines 3 to 10; Figure 1).

According to the teaching of document D5, a cylindrical adapter member (30 or 37) is located between the tool shaft (6 or 7) and the stop member (21) in such a manner as to maintain the desired seating engagement between said adapter member and said tool despite axial misalignment between said tool and said stop member (cf. Claim 1).

Although disclosing the commonly known feature of supplying a coolant to the cutting edges of the tool through axial central bores in the shaft of the arbor and the cutting tool, there is no hint in document D5 towards the use of either two cylindrical surface portions or a clamping bolt having an axial central bore in order to solve the above-mentioned problem.

6.3 Document D2 concerns a mounting device which has a clamping bolt (3) for connecting a cutting tool (1) to a tool holder (2). Said clamping bolt has an exterior threaded portion at its tool holder oriented end portion for threadable engagement with the corresponding internal thread portion within said tool holder. Furthermore, the clamping bolt has a toothed head (4) for being inserted into a recess (20) in the tool holder oriented end portion of the cutting tool. The purpose of this device is to secure safely the cutting

tool to the tool holder (column 1, lines 1 to 5, 28 to 34, line 65 to column 2, line 2; Claim 1, Figure 3). This mounting device, however, does not have an arbor and an adapter as counterpart of the arbor.

Therefore, the teaching of document D2, namely to clamp a cutting tool directly to a tool holder and to provide the clamping bolt with an axial central bore if required, leads the person skilled in the art away from the invention in suit of using a mounting device of a two-piece structure according to the closest prior art as disclosed by document D6. The only suggestion the person skilled in the art receives with respect to the closest prior art is to use a clamping bolt with an axial bore if he thinks it necessary to cool the cutting tool through the arbor and the adapter.

6.4 The aforementioned documents, as well as the other available documents, give no hint to the subject-matter of the independent Claims 1, 8 and 9. Their teachings, therefore, could not, either alone or in combination with each other, lead the person skilled in the art to a device adapter and arbor according to the said claims.

6.5 Hence, the subject-matter of the independent claims involves an inventive step within the meaning of Article 56 EPC.

7. The subject-matter as set forth in the Claims 1, 8 and 9 is, therefore, patentable within the meaning of Article 52 EPC.

Claims 2 to 7 as granted concern particular embodiments of the subject-matter of claim 1 and thus are not open to objection.

8. The interlocutory decision of the Opposition Division is based on a modified Claim 1 and on modifications to the description filed by the Respondent during the opposition procedure.

The claim merely differed from Claim 1 as granted by the transfer of a feature from the characterising portion to the precharacterising portion. The purpose was to satisfy Rule 29(1) EPC, said transferred feature being known from the closest prior art according to document D6 (cf. above point 2). However, for the above reasons (cf. points 5, 6 and 7), the grounds for opposition laid down in Article 100(a) EPC do not prejudice the maintenance of the granted European patent. Furthermore, since Rule 29(1) is an implementing regulation, primarily relevant to the examination procedure and does not constitute a ground for opposition (T 99/85: "Diagnostic agent/BOEHRINGER-KODAK", OJ EPO 1987, 413), and since the opposition procedure is not designed to be an extension of examination procedure (G 001/84: "MOBIL OIL", OJ EPO 1985, 299), there is no reason for amending this Claim 1. With respect to the modifications in the description, which concerned the description of the relevant state of the art, the Board is of the opinion that such modifications, which are merely made to tidy up and improve the disclosure, and which are not necessitated by proper opposition grounds, should be avoided during the opposition procedure.

Therefore, the request of the Respondent at the beginning of the oral proceedings to maintain the patent on the basis of Claim 1 as granted by the Examining Division was admissible.

9. In view of the above, the patent can be maintained in the wording as granted.

Order

For these reasons, it is decided that:

1. The decision of the Opposition Division is set aside.

2. The patent is maintained as granted by the Examining Division.

The Registrar: The Chairman:

N. Maslin C. Andries

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