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File Number: T 531/90 - 3.2.5

Application No.: 83 850 134.4

Publication No.: 0 096 669

Title of invention: Milling cutter

Classification: B23C 5/22

D E C I S I O N
of 13 January 1993

Proprietor of the patent: Santrade Ltd

Opponent: Fried. Krupp GmbH

Headword:

EPC Article 56

Keyword: Inventive step (yes)



Case Number : T 531/90 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal
of 13 January 1993

Appellant :
(Opponent)

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Respondent :
(Proprietor of the patent)

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Decision under appeal :

Decision of the Opposition Division of the
European Patent Office dated 23 April 1990
rejecting the opposition filed against European
patent No. 0 096 669 pursuant to Article 102(2)
EPC.

Composition of the Board :

Chairman : C. Payraudeau
Members : H. Seidenschwarz
H. Ostertag

Summary of facts and submissions

- I. By the decision under appeal, the Opposition Division rejected the opposition filed against the European patent No. 0 096 669.

- II. The Appellant appealed against the decision, requesting the cancellation of said decision and the revocation of said European patent on the grounds that the subject-matter of Claim 1 of the patent as granted does not involve an inventive step.

- III. Claim 1 reads as follows:

"A milling cutter comprising a cutter body (1) rotatable about an axis and containing a plurality of circumferentially spaced recesses (3), each said recess (3) including a reaction surface (14), a support surface (3a) and a locating surface (28A), said locating surface having axial and radial directional components relative to said axis, a plurality of cutting inserts (5) supported in respective ones of said recesses (3), each of said inserts (5) comprising a pair of opposing side faces (5A) interconnected by a plurality of edge faces (5B), a plurality of clamp means (7-11) for yieldably pressing said inserts against said support surfaces, each clamp means comprising a wedge member (7) engaging one of said side faces (5A) of associated insert (5) and spring means (9) arranged to yieldably urge said wedge member (7) against said one side face (5A) to push one of the edge faces (5B) toward said reaction surface (14) and to push the other of said side faces against said support surface (3a) in a direction oriented generally tangentially with respect to said axis, characterized in that a plurality of adjusting means (6, 23) are arranged in the cutter body (1) for adjustably moving respective ones of said inserts

(5) in a direction of adjustment having radial and axial components, each said adjusting means comprising an adjusting element (6) having a tapered portion wedgingly disposed in a respective recess (3) and bearing against said reaction surface (14) and said one of said edge faces (5B) of an associated insert (5), with another of said edge faces slidably engaging said locating surface (28A), said adjusting element (6) being movable linearly along a path oriented parallel to said reaction surface and said support surface (3a) and at an inclination relative to the location surface (28A), and having radial and axial components, said adjusting element (6) being held against rotation about said path as an axis, said adjusting element including a transversely extending projection (16) which includes a threaded bore (17) extending substantially parallel to said path, a threaded screw (23) threadedly connected in said bore (17) and accessible to a tool from the outside to be rotated, means restraining said screw (23) against movement along its longitudinal axis such that in response to rotation of said threaded screw in one direction of rotation said adjusting element (6) is moved inwardly along said path to adjustably displace said insert outwardly along said locating surface (28A) in said direction of adjustment by means of the engagement between said adjusting element and said one edge face, said insert (5) sliding frictionally relative to said wedge member (7) of said clamping means during displacement in said direction, with said wedge member (7) retaining said insert in its adjusted position simultaneously with termination of said displacement."

IV. Oral proceedings were held.

(i) The following documents were referred to in the appeal proceedings:

K5: DE-B-1 934 836,

K8: DD-A- 136 223, and

K9: DE-U-8 118 680.

- (ii) The parties agreed that document K5 represents the prior art which comes closest to the subject-matter of Claim 1.
- (iii) The Appellant's and the Respondent's submissions can be summarised as follows:

Appellant

Document K5 concerns a milling cutter comprising triangular shaped inserts which are moved into the recess by a resultant force resulting from the axial and radial components of the cutting forces acting on triangular shaped inserts.

The person skilled in the art knows that the precision of the milling of the surface of a workpiece by a milling cutter depends mainly on the force component in the axial direction. Also, an incorrectly positioned insert wears rapidly which necessitates its early replacement. Therefore, the problem to be solved by the subject-matter of the patent in suit is to provide the known milling cutter with an adjusting means which permits a precise positioning of the insert in the recess of the cutter body in the axial direction.

The person skilled in the art however finds a solution for the axial adjustment of an insert in document K8, in which document K5 is referred to as

the closest prior art. Furthermore, document K9 teaches the person skilled in the art to provide a wedge for the adjustment of an insert in the axial direction with a projection which includes a threaded bore for a threaded screw being accessible to a tool from the outside of the cutter body to be rotated.

Therefore, the subject-matter of Claim 1 of the patent as granted does not involve an inventive step having regard to the teachings according to the cited three documents in combination with the common practice of the person skilled in the art.

Respondent

The problem to be solved by the subject-matter of Claim 1 of the patent as granted is to provide means which permits an exact positioning of the insert in the recess and which does not demand more space than the locating device according to document K5. The documents K8 and K9 concern milling cutters which differ in their constructions from the construction of the milling cutter according to the closest prior art (document K5) in that they have special members (document K8: Kasette 4; document K9: Schneidplattenträger 5) for supporting the inserts on the cutter bodies. Therefore, the solutions for precisely adjusting the inserts in the axial direction as disclosed by said documents go in directions which are different from that specified in Claim 1. Furthermore, the adjusting means known from each of document K8 and K9 requires more space than the corresponding means according to the invention.

Consequently, these documents do not give any hint to the person skilled in the art for solving the aforementioned problem in the sense of Claim 1.

- (iv) The Appellant requested that the decision under appeal be set aside and the European patent No. 0 096 669 be revoked.

The Respondent requested that the appeal be dismissed.

Reasons for the decision

1. Document K5 which corresponds to document US-A-3 616 507 cited in the description of the patent as granted discloses the prior art which comes closest to the subject-matter of Claim 1. The content of the precharacterising portion of this Claim 1 reflects said closest prior art within the meaning of Rule 29(1)(a) EPC.

In this prior art device the spring means of the clamp means urges yieldably the wedge-member of the clamp means against one of the side faces of an insert to push one of the edge faces of this insert toward the reaction surface and to push the other of the side faces of this insert against the support surface. Furthermore, another of the edge faces is supported by the locating surface in the recess (Fig. 2 and 3). According to document US-A-3 616 507 (column 3, lines 26 to 29) the reaction surface and the locating surface are arranged in two main directions which permits only two positions of the insert in the recess which means a limitation of the positioning of the insert in the recess (cf. patent specification EP-B-0 096 669: column 1, lines 50 to 55).

2. Therefore, the problem to be solved by the subject-matter of Claim 1 of the patent as granted is to provide means for a time-saving, precise and simple positioning, while permitting a simple changing and indexing of the insert in the recess of milling cutter body, which means demands no more space than the known clamp means.

3. This problem is solved according to the teaching of Claim 1 of the patent as granted essentially by an adjusting means comprising an adjusting element which has a tapered portion wedgingly disposed between the reaction surface of the recess and the corresponding edge face of the insert. The movement of the adjusting element in response to the rotation of a screw threadedly connected to the adjusting element displaces the insert inwardly or outwardly along the locating surface in the recess thus resulting in a direction of movement of the insert having axial and radial components.

With this movement, the position of the insert in the recess is continuously adjustable. The positioning of the insert is easy and quick since the axial movement of the adjusting element follows upon a rotation of the screw while said insert is retained in the recess by the constant pressure resulting from the spring means of the clamp.

The adjusting element is positioned between the reaction surface of the recess and an edge face of the insert, thus replacing the parts of balls (33, 34) which constitute a supporting surface in the recess of the milling cutter as disclosed by document K5. Therefore, the dimensions of the arrangement for clamping the insert are not increased compared to the known arrangement.

4. The question to be considered is whether the subject-matter of Claim 1 involves an inventive step with respect to the combined teachings of the documents K5, K8 and K9.

4.1 Document K8 describes a milling cutter comprising a cutter body (2) which is rotatable about an axis (2) and which contains a special member (Kassette 4) mounted on the body. On this special member an insert (11) is adjustably mounted by means of spring-biassed clamp means (18, 19, 20, 21, 26) and adjusting means (6, 7, 8, 9) arranged in the special member.

The special member comprises a guide surface (5) on which is formed a first wedge (7) coacting with another wedge (6) formed on a separate part movable relative to the special member. The rotation of a screw (9) with a head which engages a recess (8) in the movable wedge displaces this movable wedge together with the insert in a direction of adjustment having an axial component only.

The clamp means contains a spring biassed lever (20) which engages with one end the insert for yieldably urging this insert against a surface (10) of the movable wedge and a bolt (19) which is mounted on the guide surface of the special member.

Apart from the constructional features of the known arrangement for clamping an insert in a cutter body, in which this arrangement differs from the subject-matter as specified in Claim 1 of the patent as granted, document K8 is silent concerning the adjustment of the insert in a direction having an axial and a radial component.

Therefore, the person skilled in the art cannot receive any suggestion from document K8 with respect to an adjustment means movable in a direction having both radial

and axial components which, in combination with a locating surface having also axial and radial directional components for slidably engaging one of the edge faces of the insert in a recess, permits simultaneously the adjustment of this insert in both the axial and radial directions of the rotational axis of the cutter body.

4.2 Document K9 concerns a milling cutter which comprises a cutter body (2) which is rotatable about an axis and which contains a plurality of cutting inserts (3). Each of these inserts is fixed on a special member (5) which is secured to the cutter body by a screw (7) screwed in a blind hole (6). For a precise adjustment of the insert the member carrying the insert has to be axially and radially adjusted using two different adjusting means: firstly, a wedge-shaped means (8) comprising a wedge (18) and a threaded screw (19, 20) for the radial adjustment, and secondly, a wedge-shaped means (9) comprising a guiding means (25) and a threaded screw for the axial adjustment.

These radial and axial adjustments, however, can only be carried out when the screw in the blind hole has been unscrewed. Therefore, the teaching of document K8 cannot give any hint to the person skilled in the art to replace the locating member on the reaction surface of the recess in the device according to document K5 by a single adjusting means as specified in Claim 1 of the patent in suit, which adjusting means permits the movement of the insert itself in a direction of adjustment having simultaneously axial and radial components as well as being under the constant pressure from the spring-biassed clamping means.

4.3 Having regard to the submission of the Appellant that document K9 teaches the person skilled in the art to

replace the movable wedge and its separate screw in the arrangement for adjusting the insert in a milling cutter according to Figure 1 of document K8 by the wedge with the projection including the threaded bore and the threaded screw, thus leading the person skilled in the art to an adjusting means as specified in Claim 1 of the patent as granted, it is held that such a replacement does not provide the arrangement known from document K9 with those means which are necessary for an adjustment of the insert in this arrangement in a radial direction. The adjustment of the insert in both axial and radial directions, however, by a single means is essential for the solution of the problem as defined above (cf. point 2).

Therefore, also the combination of the teachings disclosed by the documents K8 and K9 does not reveal the features according to the wording of Claim 1 of the patent as granted, in particular the features concerning the recesses, clamp means and adjusting means.

4.4 Therefore, the subject-matter of Claim 1 involves an inventive step within the meaning of Article 56 EPC.

5. Consequently, the patent can be maintained as granted.

Order

For these reasons, it is decided that:

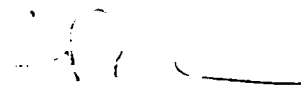
The appeal is dismissed.

The Registrar



A. Townend

The Chairman



C. Payraudeau