Tool (10) with diamonds (35, 35', 36) for dressing grinders (90) having a roller (11) rotating on a supporting shank (20) round an axis that intersects the axis of the shank (20) at an angle of 45°, with operative areas (30, 31) having one or more diamonds (35, 35', 36) placed at equal angular distances or continuously over a conical geometrical surface (16) with a taper of 90° so as to be intersected by the geometrical plane passing along the axis of rotation and the axis of the shank according to a straight line orthogonal to the latter.
FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<table>
<thead>
<tr>
<th>Code</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Austria</td>
</tr>
<tr>
<td>AU</td>
<td>Australia</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
</tr>
<tr>
<td>BF</td>
<td>Burkina Faso</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
</tr>
<tr>
<td>CA</td>
<td>Canada</td>
</tr>
<tr>
<td>CF</td>
<td>Central African Republic</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
</tr>
<tr>
<td>CI</td>
<td>Côte d'Ivoire</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
</tr>
<tr>
<td>CS</td>
<td>Czechoslovakia</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
</tr>
<tr>
<td>ES</td>
<td>Spain</td>
</tr>
<tr>
<td>FI</td>
<td>Finland</td>
</tr>
<tr>
<td>FR</td>
<td>France</td>
</tr>
<tr>
<td>GA</td>
<td>Gabon</td>
</tr>
<tr>
<td>GB</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>GN</td>
<td>Guinea</td>
</tr>
<tr>
<td>GR</td>
<td>Greece</td>
</tr>
<tr>
<td>HU</td>
<td>Hungary</td>
</tr>
<tr>
<td>IE</td>
<td>Ireland</td>
</tr>
<tr>
<td>IT</td>
<td>Italy</td>
</tr>
<tr>
<td>JP</td>
<td>Japan</td>
</tr>
<tr>
<td>KP</td>
<td>Democratic People's Republic of Korea</td>
</tr>
<tr>
<td>KR</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>LI</td>
<td>Liechtenstein</td>
</tr>
<tr>
<td>LK</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>LU</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>MC</td>
<td>Monaco</td>
</tr>
<tr>
<td>MG</td>
<td>Madagascar</td>
</tr>
<tr>
<td>ML</td>
<td>Mali</td>
</tr>
<tr>
<td>MN</td>
<td>Mongolia</td>
</tr>
<tr>
<td>MR</td>
<td>Mauritania</td>
</tr>
<tr>
<td>MW</td>
<td>Malawi</td>
</tr>
<tr>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>NO</td>
<td>Norway</td>
</tr>
<tr>
<td>PL</td>
<td>Poland</td>
</tr>
<tr>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>RU</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>SD</td>
<td>Sudan</td>
</tr>
<tr>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>SN</td>
<td>Senegal</td>
</tr>
<tr>
<td>SU</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>TD</td>
<td>Chad</td>
</tr>
<tr>
<td>TG</td>
<td>Togo</td>
</tr>
<tr>
<td>US</td>
<td>United States of America</td>
</tr>
</tbody>
</table>
DIAMOND-STUDDED TOOL FOR DRESSING GRINDERS, WITH A CONE-SHAPED ROLLING MEANS, ON AN OBLIQUE AXIS

The invention concerns diamond-studded tools, especially those for dressing grinders.

For this purpose use is generally made of tools with diamonds, especially tools having a shank on which a roller can rotate around an axis orthogonal to that of said shank, said roller having a certain number of diamonds lodged in its cylindrical surface at equidistant radial positions.

When a diamond becomes worn down it is replaced with another by rotating the roller after loosening a central screw which is tightened again afterwards. Figures 22 and 23 illustrate one of these tools, with diamonds 129 and 130.

It is known that the tool 120 is most effective when the ZZ axis of the operating diamond 130, coinciding with the XX axis of the shank 122, intersects the KK axis of rotation of the grinder 90.

But frequently this optimum set-up is interfered with by errors in angular set of the roller 121 which can lead to incorrect setting, at 130°, of the diamond 130 moving it to
D, distant from the XX axis of the shank that intersects
the KK axis of the grinder 90.

Further, since the roller's rotation axis YY is substan-
tially parallel to the grinder's rotation axis KK, due
5 to moments of force set up by the grinder itself, consid-
erable stresses are created on the diametrical edges 131
132, of the seat holding the operating diamond 130, aligned
on an arc of the cylindrical surface of said roller 121.

Since, due to curvature of the roller 121, said edges lie
10 farthest from the point of the diamond 130, said diamond
becomes easily loosened and dislodged.

As the axis of the roller is parallel to that of the grin-
der 90, the forces set up by the grinder are exerted tan-
gentially on said roller 121 and tend to make it rotate;

15 further, as the point of the diamond 130 lies at a consid-
erable distance from the roller's axis, there is much vi-
bration in the tool during its work which adversely affects
its stability and operational accuracy.

The above invention eliminates these drawbacks and also
offers other advantages as will be explained below.

Subject of the invention is a diamond-studded tool, for
dressing grinders, rotating on the shank of a support round
an axis that obliquely intersects the axis of the shank.
The operative areas with diamonds are spread over a geo-
20 metrical conical surface or over planes tangential to said
surface.

The best effects are achieved when the geometrical conical
surface so tapers that the plane, on which lie the axis
of rotation and that of the shank, intersects the opera-
25 tive areas according to a straight line practically ortho-
gonal to the axis of the shank.
It is an advantage if obliquity of the axis of rotation with respect to the axis of the shank is practically 45° and, similarly, if tapering of the geometrical conical surface is about 90°.

The flat operative areas may be arranged, as the case may be, on the conical surface at an equal angular distance, or be spread in a continuous manner over said conical surface. Said operative areas may be all equal or may be wholly or partially different, and may comprise one or more diamonds preferably on lines coinciding with the radius of the geometrical conical surface or on lines parallel to said radius.

The points of the diamonds are placed along geometrical flat surfaces at tangents to the geometrical conical surface or else are placed along said surface. Geometrical form of the operative areas may vary and may especially be rectangular, square, circular. In other executions the operative areas are made from a compound composed of a powder of diamonds and of sintered metal.

By means of special devices the tool may rotate freely and may be locked as desired either in any angular position or at intersection, according to a line orthogonal to the axis of the shank, of one or other operative areas with the plane on which lie the axes of rotation and of the shank.

In this way a worn area may be replaced with a fresh one or an area of one kind with another of a different kind. The advantages of the invention are clear. The diametrical edges of the seats holding the diamonds,
lying on the same plane as that of the axis of the shank and of tool rotation, since they lie on a straight line, ensure the maximum reaction of movements of force which, due to grinder rotation, tend to dislodge the diamond.

An error, even of some size, in angular setting of the tool round its own axis and therefore of the diamond becomes reduced, because of the obliquity of the tool's axis, to the value of its orthogonal projection on the geometrical plane passing through the axes of the tool and of its shank, thus becoming negligible.

Since the axis of rotation of the tool lies on a plane that is orthogonal to the axis of the grinder, and since the operative areas lie at a short distance from the axis of rotation, vibrations are greatly lessened.

Characteristics and purpose of the invention will become still clearer by the following examples of its execution illustrated by diagrammatic drawings.

Fig. 1 Side view of the invented tool with six flat rectangular operative areas each with three diamonds, in a working position.

Fig. 2 Plan view of the above.

Fig. 3 Detail of the tool, plan view.

Fig. 4 Cross section of the tool, in working position.

Fig. 5 The shank at the resting plane of the tool, plan view.

Fig. 6 Back of the tool, plan view.

Fig. 7 Enlarged detail of Figure 1.

Fig. 8 Tool with six flat rectangular areas each with eight diamonds, side view.

Fig. 9 Plan view of Figure 8

Fig. 10 Side view of tool with six flat rectangular areas each with twelve diamonds.
Fig.11 Plan view of Figure 10.

Fig.12 Side view of the tool with four flat circular areas, each with twelve diamonds.

Fig.13 Plan view of Figure 12.

Fig.14 Side view of the tool with six diamonds.

Fig.15 Plan view of Figure 14.

Fig.16 Side view of tool with diamond-studded conical surface.

Fig.17 Plan view of Figure 16.

Fig.18 Tool with six areas of a sintered paste of diamond granules, side view.

Fig.19 Plan view of Figure 18.

Fig.20 Side view of tool with six different operative areas.

Fig.21 Plan view of Figure 20.

Fig.22 Side view of a known type of this tool in a working position.

Fig.23 Plan view of Figure 22.

On the tool there is a conical roller 11 turning on the head 21 of the shaft 20 around an axis YY at an angle of 45° with respect to the axis of the shaft XX.

Said roller is mounted on the front plane 22 of said head, orthogonal to the axis YY, by means of a socket-head screw 40 which screws through the hole 12 in the roller by its threaded stem 41 into the threaded hole 23 in the head.

The countersunk head 42 of the screw lodges in the corresponding seat 13 of the roller on whose back 14 there is a pair of oblong diametrical projections 15 15' which fit closely into one or other of the pairs of diametrical seats 25 25', 26 26' placed at the same angular distance on the plane 22 of the shank's head 21.

The roller 11 can rotate round the screw 40 whose YY axis
is orthogonal to said plane 22 and intersects the XX axis of the shank.

On loosening the screw 40 the roller can be turned by moving the pair of diametrical projections 15 15' into one or other of the seats 25 25' or 26 26'.

On tightening the screw again the roller will be firmly fixed in the required position.

The conical surface 16 of the roller has a 90° taper and is therefore tangential to a plane orthogonal to said axis XX traced on the plane in Figures 1, 4 and 7 and marked A. Spaced equally on said conical surface are flat, tangential rectangular expansion areas 30 31. Their angular position in relation to the projections 15 15' on the back of the roller is such that a plane passing through the axis of the shank crosses at a right angle one of these expansions, 30 in Figures 1, 4 and 7, orthogonal to said axis. Three diamonds 35 35' and 36 are inserted in a radial row in the expansions, their points being virtually bounded by a plane orthogonal to the XX axis of the shank, traced and marked B in Figures 1 and 7.

Each diamond has an axis ZZ orthogonal to the plane tangential to the conical surface of the roller, and therefore at an angle of 45° with respect to the axis of rotation and lying on the plane on which said axis of rotation lies, or parallel to said axis ZZ.

When the expansion area reaches the plane on which lie the axis of the shank and that of rotation and is oriented towards the tip of the tool, axis ZZ of each diamond will be parallel to said axis XX and may therefore intersect with the axis KK of the grinder 90, namely in the position where efficiency will be greatest.
With reference to Fig. 1, it can be seen that the roller 11 opposes to the grinder 90, with axis KK for dressing, a flat area 30 orthogonal to the axis ZZ of each diamond 35 35' indicated by a traced line marked C parallel to the preceding traced lines marked A and B, and therefore the diamonds 35 35' benefit from being most securely fixed at point 36 and at the opposite point 37 at the contour where the maximum moments of reaction forces are generated by the grinder (Fig. 7).

When angular position of the roller is changed to replace the expansion area holding worn out diamonds by another, the position taken up by the fresh expansion is practically the same as that of the former one.

Any errors of angle there may be, bearing in mind that roller axis obliquity is 45°, cause only negligible movement of diamond axis in relation to the optimum position at its intersection with axis KK of the grinder 90.

Figs. 8 and 9 show the tool 10 with a roller 45 similar to the roller 11 but having six flat rectangular expansion areas 47 48 tangential to the conical surface 46 with two parallel rows of four conical diamonds 49 whose ends are virtually bounded by a plane (tracing marked B) orthogonal to the axis XX.

Each diamond has an axis ZZ orthogonal to the conical surface of the roller 45 and therefore parallel to the axis XX of the shank.

Figs. 10 and 11 illustrate the tool 10 with a roller 50 similar to roller 11 but having four flat rectangular expansions 52 53 tangential to the conical surface 51 with three parallel rows of four diamonds each 54.

Figs. 12 and 13 show the tool 10 having a roller 60 with
four flat circular expansion areas 62, 63 tangential to
the conical surface 61 with four parallel rows of dia-
monds 64.
The tool 10 in Figs. 14 and 15 has a roller 70 that carries
six diamonds 72, 73 at equal angular distances, with a ZZ
axis orthogonal to the conical surface 71 where it meets
said surface and where it thus intersects axis YY of the
roller and axis KK of the grinder 90 that is being dressed.
Clearly an angular irregularity E between the correct posi-
tion 72 of the diamond with axis ZZ intersecting the grin-
der axis KK and the incorrect angle 72' will, when projec-
ted onto the axis A (Fig. 4), become a small fraction, D,
of said axis with respect to axis ZZ.
Figs. 16 and 17 show a tool 10 and roller 80 with conical
surface 81 onto which numerous diamonds 82 are fixed, also
with a ZZ axis orthogonal to said conical surface.
Figs. 18 and 19 show a tool with roller 85 whose conical
surface 86 has six flat circular expansions 87, 88 tangent-
tial to said surface at equal angular distances, said ex-
pansions consisting of a compound 89 comprising a powder
of diamonds and of sintered metal.
The axis ZZ of said expansions is similarly orthogonal to
the conical surface 86.
In Figs. 20 and 21 a tool 10 with roller 100 has a conical
surface 101 with six expansions at equal angular distances,
consisting respectively of rectangular areas 102 with one
row of three diamonds, 103 with two rows of three diamonds,
104 with three rows of four diamonds, 105 circular with
twelve diamonds, 106 circular and made from a compound con-
sisting of a powder of diamonds and sintered metal, 107
with one diamond.
CLAIMS

1. Tool (10) with diamonds (35 35' 36 49 54 64 72 73 82) for dressing grinders (90) having a roller (11 45 50 60 70 80 85 100) turning round a supporting shank (20) characterized in that the axis of rotation of the roller (11 45 50 60 70 80 85 100) obliquely intersects the axis of the shaft (20) and in that the operative areas (30 31 47 48 52 53 62 63 87 88 102-107) are spread over a geometrical conical surface (16 46 51 61 71 81 86 101) or on planes tangential to said surface the purpose of this being to ensure maximum reaction against the moment of forces generated by the grinder (90) on the points of the diamonds (35 35' 36 49 54 64 72 73 82) by the edges (36 37) of the seats in which said diamonds are lodged, to limit the effects of errors in angular setting of the roller (11 45 50 60 70 80 85 100) and to reduce the distance between said operative areas and the roller's axis of rotation and thus to lessen vibrations.

2. Tool as in claim 1,

characterized in that the taper of the geometrical conical surface (16 46 51 61 71 81 86 101) is such that the plane on which lie the axes of rotation and of the shank (20) intersects the operative areas (30 31 47 48 52 53 62 63 87 88 102-107) according to a straight line practically orthogonal to the axis of the shank (20).

3. Tool as in claim 1, characterized in that obliquity of the axis of rotation of the roller (11 45 50 60 70 80 85 100) with respect to the axis of the shank (20) is practically 45° and in that taper of the geometrical conical surface (16 46 51 61 71 81 86 101) is practically 90°.
4. Tool as in claim 1, characterized in that the operative areas are disposed continuously round the conical surface (81).

5. Tool as in claim 1, characterized in that the flat operative areas (30 31 47 48 52 53 62 63 87 88 102-107) are placed at equal angular distances, are all equal or partially different.

6. Tool as in claim 1, characterized in that the operative areas (30 31 47 48 52 53 62 63 87 88 102-107) comprise one or more diamonds (35 35' 36 49 54 64 72 73 82) on lines coinciding with a radius of the geometrical conical surface (16 46 51 61 71 81 86 101) or on lines parallel to said radius.

7. Tool as in claim 1, characterized in that the operative areas (89 106) consist of a compound comprising powder of diamonds and of sintered metal.

8. Tool as in claim 1, characterized in that the points of the various diamonds (35 35' 36 49 54 64 72 73 82) are disposed along flat geometrical surfaces tangential to the conical geometrical surface (16 46 51 61 71 81 86 101) or along said surface.

9. Tool as in claim 1, characterized in that the geometrical form of the operative areas (30 31 47 48 52 53 62 63 87 88 102-107) is varied being especially rectangular (30 31 47 48 52 53 102-104), square, circular (62 63 87 88 105 106).

10. Tool as in claim 1, characterized in that by means of special devices (40 15 15' 25 25' 26 26') the roller (11 45 50 60 70 80 85 100) can rotate freely and be locked as desired both at any
angular setting and at intersection, according to a line practically orthogonal to the axis of the shank (20), of one or other operative area (30 31 47 48 52 53 62 63 87 88 102-107) with the plane on which lie the axis of rotation and the axis of the shank (20) for replacement either of a worn area or of one type of area with a different type of area.
## II. FIELDS SEARCHED

### Minimum Documentation Searched\(^7\)

<table>
<thead>
<tr>
<th>Classification System</th>
<th>Classification Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Int.Cl. 5</td>
<td>B24B</td>
</tr>
</tbody>
</table>

Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched\(^8\)

## III. DOCUMENTS CONSIDERED TO BE RELEVANT\(^9\)

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, (^11) with indication, where appropriate, of the relevant passages (^12)</th>
<th>Relevant to Claim No.(^13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>FR, A, 2 040 984 (ETABLISSEMENT J. K. SMIT &amp; FILS S.A.) 29 January 1971 see claim; figures</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>GB, A, 743 343 (PRECISION DIAMOND PRODUCTS LTD) 11 January 1956 see claims; figures</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>DE, A, 1 953 544 (FA. ERNST WINTER &amp; SOHN) 24 June 1971 see claims; figures</td>
<td>1</td>
</tr>
</tbody>
</table>

\(^*\) Special categories of cited documents : \(^10\)

- **A** document defining the general state of the art which is not considered to be of particular relevance
- **E** earlier document but published on or after the international filing date
- **L** document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- **O** document referring to an oral disclosure, use, exhibition or other means
- **P** document published prior to the international filing date but later than the priority date claimed
- **T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- **X** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- **Y** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- **&** document member of the same patent family

## IV. CERTIFICATION

**Date of the Actual Completion of the International Search**

17 JANUARY 1992

**Date of Mailing of this International Search Report**

24. 01. 92

**International Searching Authority**

EUROPEAN PATENT OFFICE

**Signature of Authorized Officer**

ESCHBACH D. P. M.
This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for those particulars which are merely given for the purpose of information. 17/01/92

<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB-A-743343</td>
<td></td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>DE-A-1953544</td>
<td>24-06-71</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

For more details about this annex: see Official Journal of the European Patent Office, No. 12/82