



- (51) **International Patent Classification:**
B23D 77/02 (2006.01) **B23D 43/06** (2006.01)
- (21) **International Application Number:**
PCT/SE2010/050224
- (22) **International Filing Date:**
26 February 2010 (26.02.2010)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
0950110-7 3 March 2009 (03.03.2009) SE
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) **Title:** ROTATING TOOL

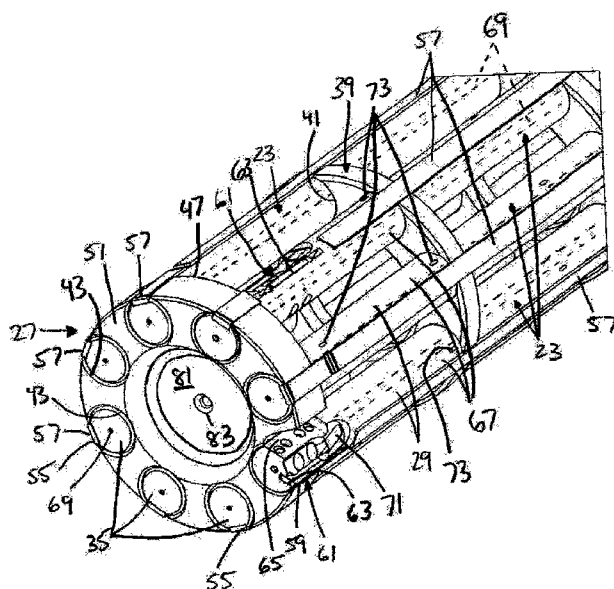


FIG. 3

(57) **Abstract:** A rotating tool includes a plurality of elongated members, and a support for holding the elongated members relative to an axis of rotation of the tool, wherein a guiding pad (57) extends from at least one of the elongated members (23).

ROTATING TOOL

BACKGROUND AND SUMMARY

The present invention relates to rotating tools for metal removing machining and, more particularly, to rotating tools comprising a plurality of elongated members.

In rotating tools such as reaming tools, it is often necessary to use tools having large diameters and/or lengths. Often, the tools have bodies made of cast iron or other heavy materials. Conventional tools can be too heavy for some machine spindles. While it is possible to make the tools out of material with relatively light weight, such as aluminum, aluminum can be difficult to machine.

It is desirable to provide a solution to the above-mentioned drawback.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the present invention are well understood by reading the following detailed description in conjunction with the drawings in which like numerals indicate similar elements and in which:

FIG. 1 is a perspective view of a rotating tool according to an embodiment of the present invention;

FIG. 2 is a view of a coupling attached to a rotating tool according to an embodiment of the present invention;

FIG. 3 is a view of a forward end of a rotating tool according to an embodiment of the present invention; and

FIG. 4 is a cross-sectional view of a rotating tool according to an embodiment of the present invention.

DETAILED DESCRIPTION

A tool 21 is shown in FIG. 1 and is particularly adapted for use as a reaming tool, although the basic concept is applicable to other types of rotating tools, such as drills, boring tools, milling tools and the like. The tool 21 comprises a plurality of elongated members 23 and a support 25 for holding the elongated members relative to an axis of rotation A of the tool. The elongated members 23 are typically steel or carbon fiber rods, usually generally circular in

cross-section, of sufficient stiffness to avoid problems with torsional deflection of the tool due to bending of the elongated members. The physical characteristics of the elongated members can be dependent upon the application for which the tool will be used. The quantity of elongated members can also vary depending upon the application for which the tool will be used.

5 The support 25 can comprise a first disk 27 to which first ends 29 of the plurality of elongated members 23 are attached and a second disk 31 to which second ends 33 of the plurality of elongated members are attached. While tips 35 and 37 of the first ends 29 and second ends 33, respectively, of the plurality of elongated members 23 can extend beyond outer surfaces of the first and second disks 27 and 31, ordinarily, the tips of the first ends and second ends of the
10 elongated members will be recessed relative to or flush with the outer surfaces.

 The second disk 31 can comprise a coupling member, such as a shank, for attachment to, e.g., a chuck (not shown) of a machine for rotating the tool and moving the tool axially. In FIG. 2, the second disk 31 is bolted to a discrete coupling member 38 that is attachable to a chuck.

 The support 25 can comprise one or more intermediate disks 39 between the first and
15 second disks 27 and 31. Each intermediate disk 39 can comprise openings 41 through which the plurality of elongated members 23 extend. The first disk 27 and the second disk 31 will ordinarily also comprise openings 43 and 45, respectively, that extend from first sides 47 and 49 of the first and second disks to second sides 51 and 53 of the first and second disks, with each elongated member 23 extending through a corresponding one of the openings.

20 Each disk 27, 31, and 39 may have one or more, ordinarily a plurality of, radial openings 55. Each of the radial openings 55 can be open to a radial edge of the respective disk 27, 31, and 39, and will ordinarily correspond to an opening 41, 43, or 45. Guiding pads 57 can extend outwardly from each radial opening 55 beyond a circumferential surface of the disk 27, 31, or 39 to facilitate guiding the tool in a hole being reamed. Often, guiding pads 57 will only be
25 provided to extend out from the first disk 25 as well as certain intermediate disks 39 close to the first disk and portions of the elongated members 23 near the first disk as these disks and portions of the elongated members are most likely to be disposed in a hole being reamed. The guiding pads 57 will typically be mounted on the elongated members 23, however, guiding pads can be mounted directly to the disks 27, 31, or 39. The guiding pads 57 can be mounted on the
30 elongated members 23 in recesses 58 in the elongated members and can be brazed to the elongated members.

A cutting edge 59 extends from at least one of the elongated members 23. Cutting edges can also or alternatively extend from a support 25. Typically, the cutting edge 59 is formed on a removable cutting insert 61 that is mounted to the at least one of the elongated members 23 in a pocket 63 formed in the elongated member. The position of the cutting edge 59 relative to the elongated members 23 can be adjustable, such as by mounting inserts 61 on the elongated members using mounting systems such as the BIFIX or PRECIFIX systems available from Seco Tools AB, Fagersta, Sweden.

Ordinarily, a cutting edge 59 extends axially from a tip 35 of at least one of the elongated members 23, as seen, for example, in FIGS. 1 and 3. The first disk 27 has a recess 65 in the disk in front of the cutting edge 59 in a direction of rotation of the tool. The recess 65 forms a chiproom in which chips can be formed and from which they can flow away from the front of the tool 21 to behind the first disk 27. A cutting edge 59 ordinarily also extends radially from a side 67 of at least one of the elongated members 23. The cutting edge 59 extending from the tip 35 of the elongated member 23 and the cutting edge extending from the side 67 of the elongated member may be formed on the same cutting insert 61 and extend from the same elongated member, however, ordinarily, different cutting edges on different elongated members will extend from the tip and the sides. A cutting edge 59 at the tip 35 of an elongated member 23 may also extend from the side of the elongated member, however, a cutting edge remote from the tip may merely extend from the side of the elongated member.

At least one of the elongated members 23 can comprise an internal passage 69. The internal passage 69 can be used for conveying cooling and/or lubricating fluid toward the forward end of the tool 21. A channel 71 can extend from the internal passage 69 to an exterior of the elongated member 23 proximate a cutting edge 59 and, in this way, facilitates cooling and/or lubricating of the cutting edge and the workpiece. Another channel 73 can extend from the internal passage 69 to an exterior of the at least one of the elongated members proximate a guiding pad 57 and, in this way, facilitates cooling and/or lubrication of the guiding pad and the workpiece contacted by the guiding pad.

The elongated members 23 and the support 25 will ordinarily have some form of arrangement for ensuring proper orientation of the elongated members relative to the support. For example, the elongated members 23 and the disks 27, 31, 39 can have recesses for receiving a key that ensures proper orientation of the elongated members relative to the disks. FIG. 4

shows an elongated member 23 and, for purposes of illustration, a first disk 27 with keyways 75 and 77, respectively, each of which receive part of a key 79. Other arrangements for properly orienting the elongated members 23 relative to the support 25 can be provided, such as by providing the elongated members with a non-circular external shape that matches an opening having a non-circular shape in the disks.

The first disk 27 can be provided with a central open or recessed area 81. The central open or recessed area can facilitate removal of chips from the forward end of the tool 21. Additionally, cooling and/or lubricating fluid that flows to the front of the tool 21 through the internal passages 69 in the elongated members 23 can be removed through an open area 81 or an opening 83 in a recessed area 81.

In the present application, the use of terms such as “including” is open-ended and is intended to have the same meaning as terms such as “comprising” and not preclude the presence of other structure, material, or acts. Similarly, though the use of terms such as “can” or “may” is intended to be open-ended and to reflect that structure, material, or acts are not necessary, the failure to use such terms is not intended to reflect that structure, material, or acts are essential. To the extent that structure, material, or acts are presently considered to be essential, they are identified as such.

It is desirable to provide a light weight rotating tool. In accordance with an aspect of the present invention, a rotating tool comprises a plurality of elongated members, and a support for holding the elongated members relative to an axis of rotation of the tool, wherein a guiding pad extends from at least one of the elongated members.

While this invention has been illustrated and described in accordance with a preferred embodiment, it is recognized that variations and changes may be made therein without departing from the invention as set forth in the claims.

The disclosures in Swedish patent application No. 0950110-7, from which this application claims priority, are incorporated herein by reference.

WHAT IS CLAIMED IS:

1. A rotating tool (21), **characterized in** that the tool comprises:

a plurality of elongated members (23); and

a support (25) for holding the elongated members (23) relative to an axis of rotation of the tool, wherein a guiding pad (57) extends from at least one of the elongated members (23).

2. The rotating tool (21) as set forth in claim 1, wherein the support (25) comprises a first disk (27) to which first ends (29) of the plurality of elongated members (23) are attached and a second disk (31) to which second ends (33) of the plurality of elongated members (23) are attached.

3. The rotating tool (21) as set forth in claim 2, wherein the support (25) comprises at least one intermediate disk (39) between the first and second disks (27 and 31), the at least one intermediate disk (39) comprising openings (41) through which the plurality of elongated members (23) extend.

4. The rotating tool (21) as set forth in any of claims 1-3, wherein the support (25) comprises a disk (27, 31, 39) having a plurality of radial openings (41, 43, 45), each of the radial openings being open to a radial edge of the disk, and wherein a pad (57) extends outwardly from each radial opening beyond a circumferential surface of the disk (27, 31, 39).

5. The rotating tool (21) as set forth in any of claims 1-4, wherein a cutting edge (59) extends from at least one of the elongated members (23).

6. The rotating tool (21) as set forth in claim 5, wherein the cutting edge (59) is formed on a removable cutting insert (61) that is mounted to the at least one of the elongated members (23).

7. The rotating tool (21) as set forth in claim 6, wherein the position of the cutting edge (59) relative to the at least one of the elongated members (23) is adjustable.

8. The rotating tool (21) as set forth in claim 5, wherein the cutting edge (59) extends axially from a forward end (35) of at least one of the elongated members (23).

9. The rotating tool (21) as set forth in claim 8, wherein the support (25) comprises a disk (27, 31, 39) having a plurality of openings (41, 43, 45) extending from a first side of the disk to a second side of the disk, each elongated member (23) extending through a corresponding one of the openings.

10. The rotating tool (21) as set forth in claim 9, comprising a recess (65) in the disk (27) in front of the cutting edge (57) in a direction of rotation of the rotating tool (21).

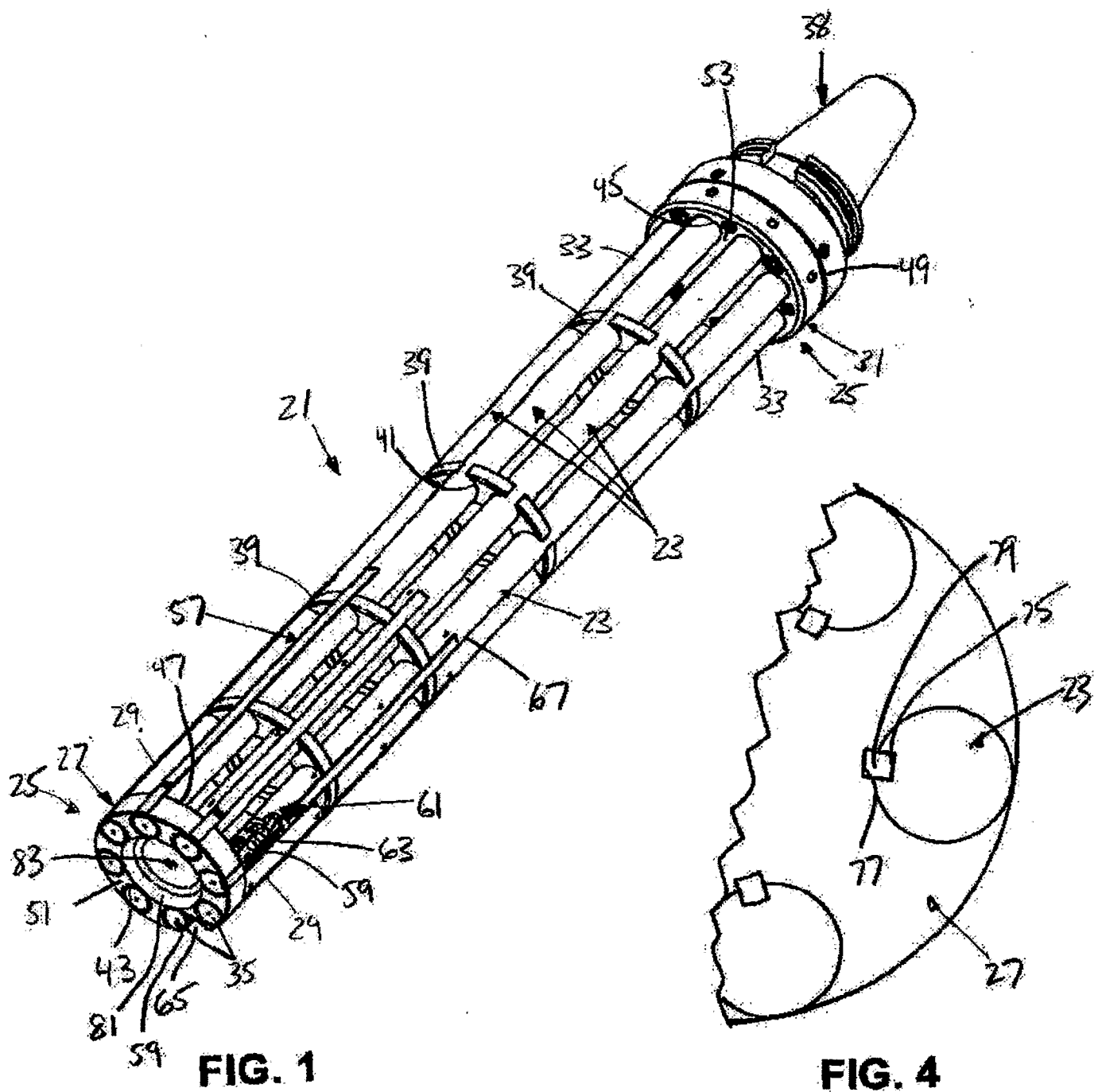
11. The rotating tool (21) as set forth in claim 5, wherein the cutting edge (59) extends radially from a side (67) of at least one of the elongated members (23).

12. The rotating tool (21) as set forth in any of claims 1-11, wherein a guiding pad (57) extends from at least one of the elongated members (23).

13. The rotating tool (21) as set forth in any of claims 1-12, wherein at least one of the elongated members (23) comprises an internal passage (69).

14. The rotating tool (21) as set forth in claim 13, wherein a channel (71) extends from the internal passage (69) to an exterior of the at least one of the elongated members (23) proximate a cutting edge (59) on the at least one of the elongated members (23).

15. The rotating tool (21) as set forth in claim 13, wherein a channel (73) extends from the internal passage (69) to an exterior of the at least one of the elongated members (23) proximate a guiding pad (57) on the at least one of the elongated members (23).



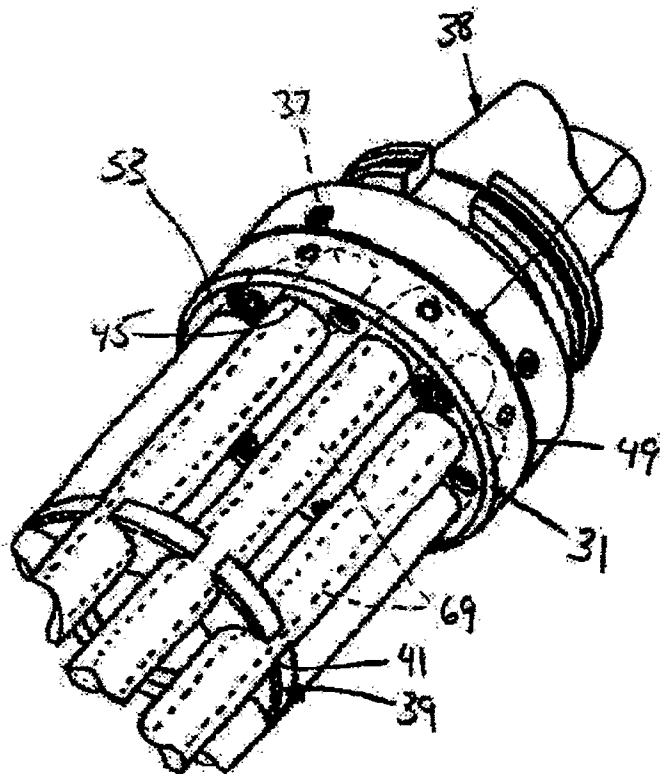


FIG. 2

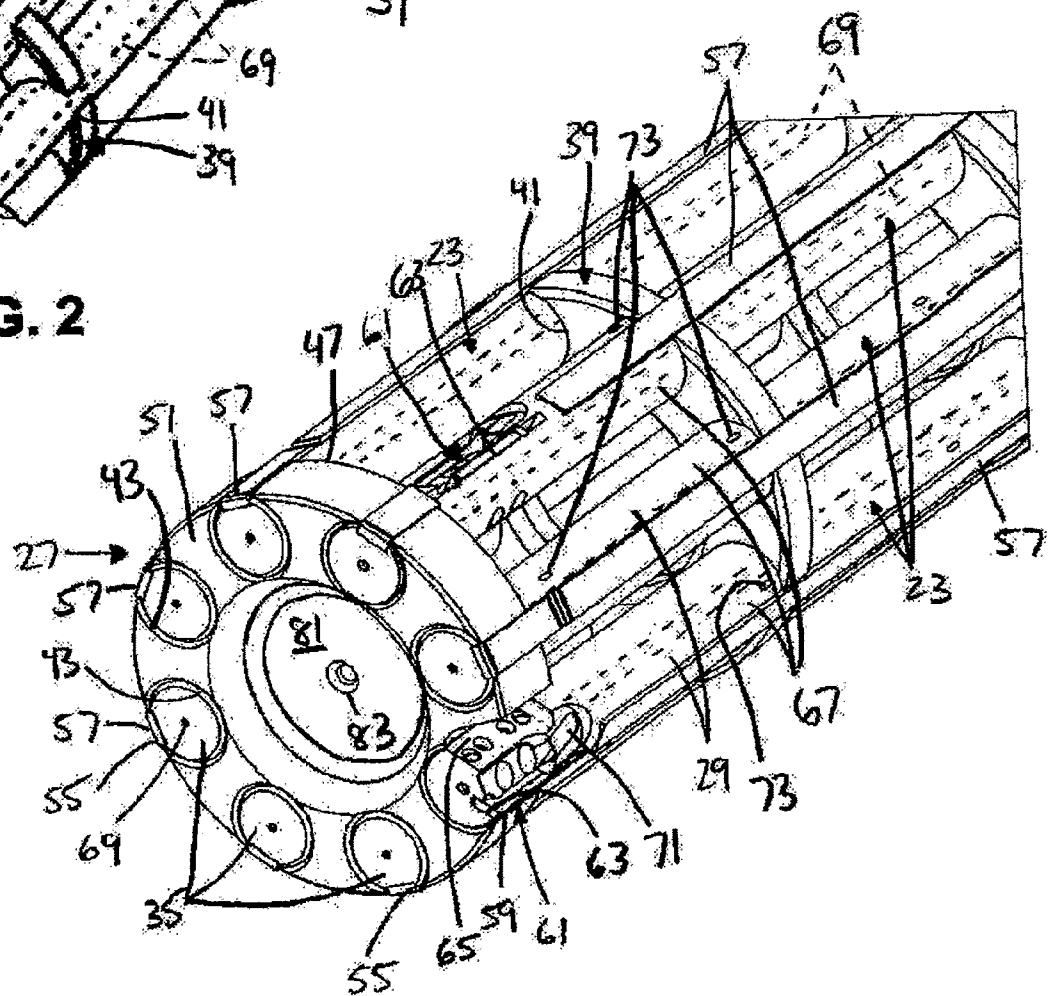


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2010/050224

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B23D, B23B, B23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20080318747 A1 (PHELY), 25 December 2008 (25.12.2008), figure 2, abstract --	1-15
A	GB 1342567 A (JAMES ALFRED BELANGER), 3 January 1974 (03.01.1974), page 2, line 80 - line 125, figures 1,2a --	1-15
A	US 18313371 A (HARRY O. SMITH), 10 November 1931 (10.11.1931), figure 10 --	1-15
A	EP 1864738 A1 (MITSUBISHI MATERIALS CORPORATION), 12 December 2007 (12.12.2007), figure 3, abstract --	1-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

11 May 2010

Date of mailing of the international search report

12 -05- 2010

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Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE2010/050224

US	20080318747	A1	25/12/2008	NONE		
GB	1342567	A	03/01/1974	NONE		
US	18313371	A	10/11/1931	NONE		
EP	1864738	A1	12/12/2007	EP	2130634 A	09/12/2009
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