



(12)

EUROPEAN PATENT APPLICATION

- (43) Date of publication:
17.09.2014 Bulletin 2014/38

(21) Application number: 13158499.7

(22) Date of filing: 11.03.2013
- (51) Int Cl.:

B24B 7/00 (2006.01)
 B24B 7/06 (2006.01)
 B24B 27/00 (2006.01)
 B24B 41/06 (2012.01)
 B23Q 9/00 (2006.01)
 B25H 1/02 (2006.01)

B24B 7/02 (2006.01)
 B24B 7/07 (2006.01)
 B24B 41/02 (2006.01)
 B24B 41/047 (2006.01)
 B23Q 1/62 (2006.01)

- (84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: Pedersen, Steen Glerup
7441 Bording (DK)
- (72) Inventor: Pedersen, Steen Glerup
7441 Bording (DK)

(74) Representative: Nielsen, Leif
Patrade A/S
Fredens Torv 3A
8000 Aarhus C (DK)

(54)

Hand-guided surface grinding machine

- (57)

A surface grinding machine (1) comprising a machine frame supporting a machine bed (2) and a grinding unit (3), said machine bed (2) including support means adapted to support a workpiece (22) to be grinded and said grinding unit (3) including one ore more rotating grinding tools having grinding elements arranged at a surface of said grinding tools, said machine bed (2) and said grinding unit (3) being arranged mutually moveable, whereby said grinding unit (3) is adapted to be brought to any position over said machine bed (2) in order to effect

a grinding of workpieces (22) supported on said machine bed (2), wherein said grinding unit (3) comprises at least two grinding tools in form of two grinding heads rotating in opposite directions around rotation axes perpendicular to said machine bed (2), wherein said grinding elements on each of said grinding heads provide a grinding surface being parallel with said machine bed (2), said machine bed (2) and/or said grinding unit (3) having one or more handles (17,18,19,20,21) allowing for a manual establishment of said mutual movement by an operator.

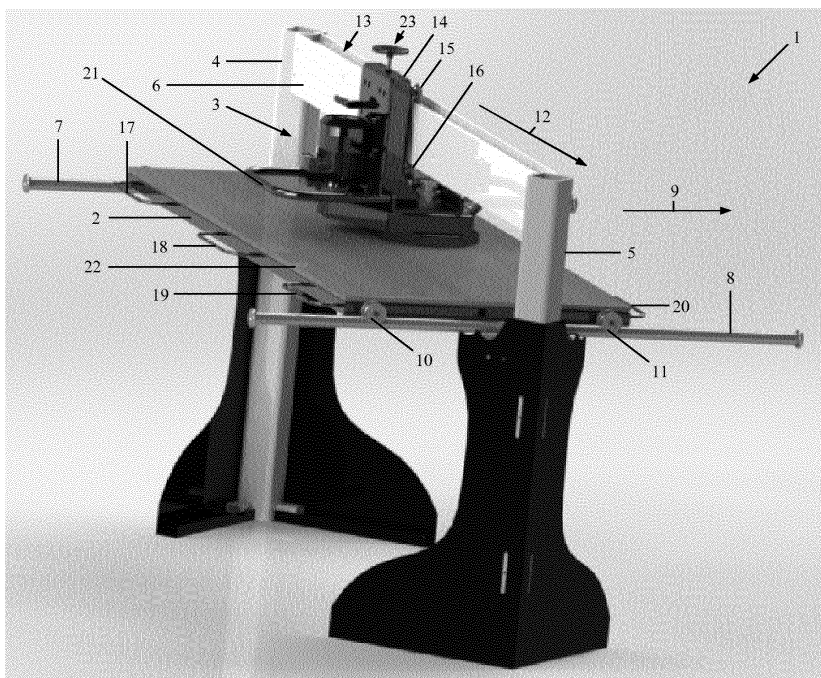


FIG.1

Description

Field of the Invention

[0001] The present invention relates to a surface grinding machine comprising a machine frame supporting a machine bed, preferably arranged in a horizontal plane, and a grinding unit, said machine bed including support means adapted to support a workpiece to be grinded and said grinding unit including one or more rotating grinding tools having grinding elements arranged at a surface of said grinding tools, said machine bed and said grinding unit being arranged mutually moveable, whereby said grinding unit is adapted to be brought to any position over said machine bed in order to effect a grinding of workpieces supported on said machine bed.

Background of the Invention

[0002] Many surface grinding machines are either totally-automated machines, which may require a minimum intervention of an operator, or handheld machines. Obviously, the former type of machines may require specialized knowledge to be operated and maintained and, at the same time, is extremely expensive and necessitates a large space at a company's premises to be accommodated. On the other hand, handheld machines are not as reliable, since the grinding is generally not carried out homogeneously throughout the whole surface. Hence, there is a need in the technical field of surface grinding machines of overcoming the aforementioned drawbacks of the state-of-the-art solutions.

Object of the Invention

[0003] The object of the invention is to provide a surface grinding machine, which is simple to operate, is economically viable, does not require a large space to be accommodated and performs consistently.

Description of the Invention

[0004] The aforementioned objects of the invention are achieved by a surface grinding machine as described in the preamble of claim 1, wherein said grinding unit comprises at least two grinding tools in form of two grinding heads rotating in opposite directions around rotation axes perpendicular to said machine bed, wherein said grinding elements on each of said grinding heads provide a grinding surface being parallel with said machine bed, said machine bed and/or said grinding unit having one or more handles allowing for a manual establishment of said mutual movement by an operator. Note that within the context of the invention, the word "grinding" refers to any operation having abrasive or polishing effect.

[0005] The advantage of the invention is that such a surface grinding machine is not as complicated as a totally-automated machine and therefore does not require

a specialized knowledge on its functioning and maintenance; indeed, it may be easily manoeuvred by an operator via the handles. Also, the fact that it is not automated implies a reduction of production costs, which then results in a more affordable machine on the market. Moreover, the fact that it is not handheld but has a structure (i.e., the machine frame) supporting the machine bed and the grinding unit permits, through the use of the handles, controllable and consistent movements; in this way, the operation is more reliable and a homogeneous grinding is achievable. Additionally, contrarily to the case with a single grinding head in the grinding unit, the combination of two grinding heads rotating in opposite directions permits to achieve a better grinding of any corner of a workpiece, regardless its shape. Note that the use of more than two grinding heads in the grinding unit would imply a faster grinding of the overall surface. Finally, depending on the grinding heads utilized in the grinding unit, the invention can be advantageously used both for unidirectional grinding and grinding with movements in an arbitrary pattern.

[0006] In an embodiment of the invention, said machine frame comprises at least two vertical posts and at least one horizontal beam connecting said two vertical posts, wherein a guide arrangement is attached to said vertical posts for supporting said machine bed in such way that said machine bed is adapted to shift forwardly or backwardly in a first direction in-between said two vertical posts, said grinding unit being attached to said horizontal beam for moving in a second direction perpendicular to said first direction. An advantage of this embodiment is that the machine frame being structured with the two vertical posts, the horizontal beam and the guide arrangement permits a systematic grinding process thanks to a controlled mutual movement of the machine bed and the grinding unit.

[0007] In an embodiment of the invention, said one or more handles are attached to the same side of said machine bed and/or said grinding unit. An advantage of this embodiment is that an operator can simultaneously grab a handle on said machine bed and said grinding unit. Alternatively, the displacement of the grinding unit may be automated whereas the machine bed is manually-operated.

[0008] In an embodiment of the invention, said guide arrangement comprises at least two rods, each rod being attached to one of said vertical posts and being displaced along said first direction, wherein said machine bed further comprises at least two wheels attached along each side of said machine bed being parallel to said first direction, said wheels engaging with said rods so as to enable said machine bed to be shifted forwards and backwards in-between said two vertical posts. An advantage of this embodiment is that such a guide arrangement permits the movement of the machine bed in-between the two vertical posts while, at the same time, securing a stable support for it during the grinding operation.

[0009] In an embodiment of the invention, said hori-

zontal beam has a top and a bottom, which horizontal beam comprises a recess at said top, wherein said grinding unit further comprises a housing including at least two wheels, one wheel engaging with said top recess and one wheel engaging at said bottom. An advantage of this embodiment is that the grinding unit can be moved forward and backward on the horizontal beam. Preferably, a recess is also present at said bottom. Accordingly, the grinding unit can also be more firmly fastened to the horizontal beam. Alternatively, the grinding unit may be moved forward and backward on the horizontal beam by means of a linear guide.

[0010] In an embodiment of the invention, said grinding unit further comprises an arrangement to adjust a height of said grinding unit with respect to said machine bed. An advantage of this embodiment is that the height of the grinding unit is adjustable according to the shape and the height of the workpiece.

[0011] In an embodiment of the invention, said machine bed comprises an endless conveyor belt. An advantage of this embodiment is that the movement of the machine bed may be superfluous and thus there is only a need for manually moving the grinding unit or the machine bed transversally with respect to the movement of the endless conveyor belt.

[0012] In an embodiment of the invention, said support means on said machine bed comprises a vacuum pump and openings in said machine bed, which openings are connected to said vacuum pump for releasable fixation of said workpiece in position onto said machine bed during operation. In another embodiment of the invention, said workpiece is clamped into or/and magnetically attached to said machine bed. An advantage of these embodiments is that workpieces made of different materials and different sizes (even smaller than the size of the machine bed) can be firmly attached to the machine bed while grinding, thus providing a more reliable result.

[0013] In an embodiment of the invention, said support means on said machine bed comprises an arrangement for lifting said workpiece with respect to said machine bed. Preferably, one or more shims (e.g., made of rubber) with a certain thickness are displaceable under said workpiece to stably lift said workpiece with respect to said machine bed. An advantage of this embodiment is that a better grinding of side edges and edge areas of the workpiece is thereby achieved.

[0014] In an embodiment of the invention, each grinding head comprises a grinding surface provided with retainer grooves for edge profile parts of a number of abrasive paper members with associated support brushes. Alternatively, a plane abrasive paper is arranged on the grinding surface. An advantage of these embodiments is that such grinding heads achieve an optimal abrading, particularly of side edges and edge areas of a workpiece.

[0015] In an embodiment of the invention, said horizontal beam is pivotally-connected to one of said vertical posts (or a separate post) through an arrangement comprising two arm parts being pivotally-interconnected

through a link with a vertical rotational axis, wherein said horizontal beam is arranged at a distal end of said arrangement and is adapted to be rotated around said distal end. An advantage of this embodiment is that the grinding unit may be manually, arbitrarily moved in a horizontal plane while the movement of the machine bed may be superfluous.

[0016] In an embodiment of the invention, said horizontal beam is pivotally-connected to one of said vertical posts through an arrangement comprising an element adapted to rotate around a vertical axis. An advantage of this embodiment is that the combination of the radial movement of the horizontal beam around the vertical post, the translational movement of the grinding unit along the horizontal beam and the forward/backward movement of the machine bed permits grinding the whole workpiece.

[0017] Hereafter, the invention will be described in connection with drawings illustrating nonlimiting examples of a surface grinding machine.

Description of the Drawing

[0018]

Fig. 1 A surface grinding machine.

Fig. 2 A surface grinding machine with a "parallel arm" configuration.

Fig. 3 A surface grinding machine with a "traverse arm" configuration.

Detailed Description of the Invention

[0019] Fig. 1 shows an example of a surface grinding machine 1 comprising a machine frame supporting a machine bed 2 and a grinding unit 3. The machine frame comprises two vertical posts 4,5 and one horizontal beam 6 connecting the two vertical posts 4,5.

[0020] A guide arrangement comprises two rods 7,8, each rod 7,8 being attached to one of the vertical posts 4,5 and being displaced along a first direction 9. The machine bed 2 further comprises two wheels 10,11 attached along each side of the machine bed 2 being parallel to the first direction 9. The wheels 10,11 engage with the rods 7,8 so as to enable the machine bed 2 to be shifted forwards and backwards in-between the two vertical posts 4,5.

[0021] The grinding unit 3 is attached to the horizontal beam 6 for moving forward and backward in a second direction 12 perpendicular to the first direction 9. Although Fig.1 shows that the grinding unit 3 moves in a direction 12 perpendicular to the direction 9 of movement of the machine bed 2, the grinding unit 3 may also be arranged such as to move in the same direction 9 as the machine bed 2. The horizontal beam 6 has a top and a bottom and comprises a recess 13 at the top and a recess at the bottom. The grinding unit 3 further comprises a housing 14 including a drive motor for the grinding heads.

The housing 14 includes two pairs of wheels, one pair of wheels engaging with the top recess and one pair of wheels engaging with the bottom recess. Fig. 1 shows one wheel 15,16 for each pair.

[0022] A plurality of handles 17,18,19,20,21 is attached to the machine bed 2 and the grinding unit 3 allowing for a manual establishment of the mutual movement between the machine bed 2 and the grinding unit 3 by an operator. For example, the operator may manually move the machine bed 2 of 10-20 cm at a time, stop it and then start grinding a workpiece 22 by moving the grinding unit 3 along the horizontal beam 6.

[0023] The grinding unit 3 further comprises a trapezoidal thread 23 arranged at the top of the grinding unit 3 to adjust a height of the grinding unit 3 with respect to the machine bed 2.

[0024] Fig. 2 shows another example of a surface grinding machine 1, wherein the horizontal beam 6 is pivotally-connected to one vertical post 4 through an arrangement comprising two arm parts being pivotally-interconnected through a link with a vertical rotational axis. The horizontal beam 6 is arranged at a distal end of the arrangement and is adapted to be rotated around the distal end. As in Fig. 1, the grinding unit 3 may move along the horizontal beam 6. This embodiment is referred to as "parallel arm".

[0025] Fig. 3 shows another example of a surface grinding machine 1, wherein the horizontal beam 6 is pivotally-connected to one vertical post 4 through an arrangement comprising an element 23 adapted to rotate around a vertical axis. As shown in Fig. 3, the horizontal beam 6 may be attached to the element 23 in two points. This embodiment is referred to as "transverse arm".

Claims

1. A surface grinding machine (1) comprising a machine frame supporting a machine bed (2), preferably arranged in a horizontal plane, and a grinding unit (3), said machine bed (2) including support means adapted to support a workpiece (22) to be grinded and said grinding unit (3) including one or more rotating grinding tools having grinding elements arranged at a surface of said grinding tools, said machine bed (2) and said grinding unit (3) being arranged mutually moveable, whereby said grinding unit (3) is adapted to be brought to any position over said machine bed (2) in order to effect a grinding of workpieces (22) supported on said machine bed (2), **characterized in that** said grinding unit (3) comprises at least two grinding tools in form of two grinding heads rotating in opposite directions around rotation axes perpendicular to said machine bed (2), wherein said grinding elements on each of said grinding heads provide a grinding surface being parallel with said machine bed (2), said machine bed (2) and/or said grinding unit (3) having one or more handles

(17,18,19,20,21) allowing for a manual establishment of said mutual movement by an operator.

2. A surface grinding machine (1) according to claim 1, **characterized in that** said machine frame comprises at least two vertical posts (4,5) and at least one horizontal beam (6) connecting said two vertical posts (4,5), wherein a guide arrangement is attached to said vertical posts (4,5) for supporting said machine bed (2) in such way that said machine bed (2) is adapted to shift forwardly or backwardly in a first direction (9) in-between said two vertical posts (4,5), said grinding unit (3) being attached to said horizontal beam (6) for moving in a second direction (12) perpendicular to said first direction (9).
3. A surface grinding machine (1) according to claim 1 or claim 2, **characterized in that** said one or more handles (17,18,19,20,21) are attached to the same side of said machine bed (2) and/or said grinding unit (3).
4. A surface grinding machine (1) according to claim 2 or claim 3, **characterized in that** said guide arrangement comprises at least two rods (7,8), each rod (7,8) being attached to one of said vertical posts (4,5) and being displaced along said first direction (9), wherein said machine bed (2) further comprises at least two wheels (10,11) attached along each side of said machine bed (2) being parallel to said first direction (9), said wheels (10,11) engaging with said rods (7,8) so as to enable said machine bed (2) to be shifted forwards and backwards in-between said two vertical posts (4,5).
5. A surface grinding machine (1) according to any of the claims 2-4, **characterized in that** said horizontal beam (6) has a top and a bottom and comprises a recess (13) at said top, wherein said grinding unit (3) further comprises a housing (14) including at least two wheels (15,16), one wheel (15) engaging with said top recess and one wheel (16) engaging at said bottom.
6. A surface grinding machine (1) according to any of the preceding claims, **characterized in that** said machine bed (2) comprises an endless conveyor belt.
7. A surface grinding machine (1) according to any of the preceding claims, **characterized in that** said support means on said machine bed (2) comprises a vacuum pump and openings in said machine bed (2), which openings are connected to said vacuum pump for releasable fixation of said workpiece (22) in position onto said machine bed (2) during operation.

8. A surface grinding machine (1) according to any of the preceding claims, **characterized in that**, said support means on said machine bed (2) comprises an arrangement for lifting said workpiece (22) with respect to said machine bed (2). 5
9. A surface grinding machine (1) according to any of the preceding claims, **characterized in that** each grinding head comprises a grinding surface provided with retainer grooves for edge profile parts of a number of abrasive paper members with associated support brushes. 10
10. A surface grinding machine (1) according to any of the preceding claims, **characterized in that** said horizontal beam (6) is pivotally-connected to one of said vertical posts (4,5) through an arrangement comprising two arm parts being pivotally-interconnected through a link with a vertical rotational axis, wherein said horizontal beam (6) is arranged at a distal end of said arrangement and is adapted to be rotated around said distal end. 15
20
11. A surface grinding machine (1) according to any of the preceding claims, **characterized in that** said horizontal beam (6) is pivotally-connected to one of said vertical posts (4,5) through an arrangement comprising an element (23) adapted to rotate around a vertical axis. 25
30

30

35

40

45

50

55

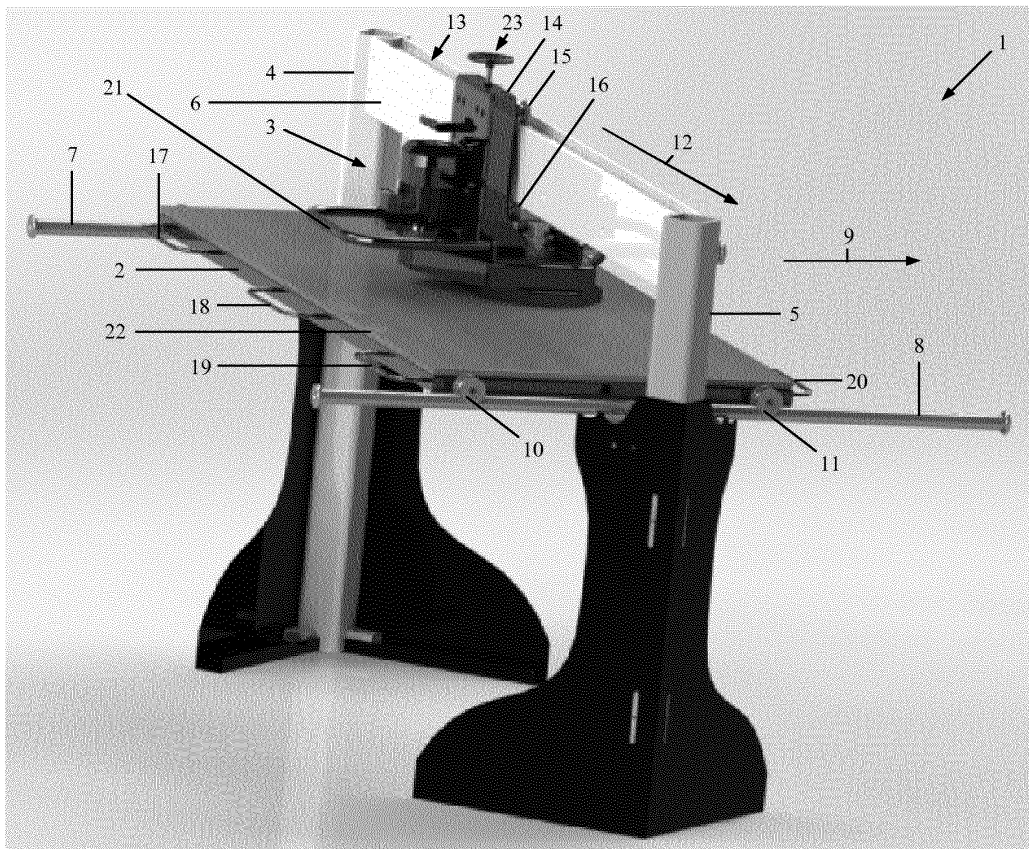


FIG.1

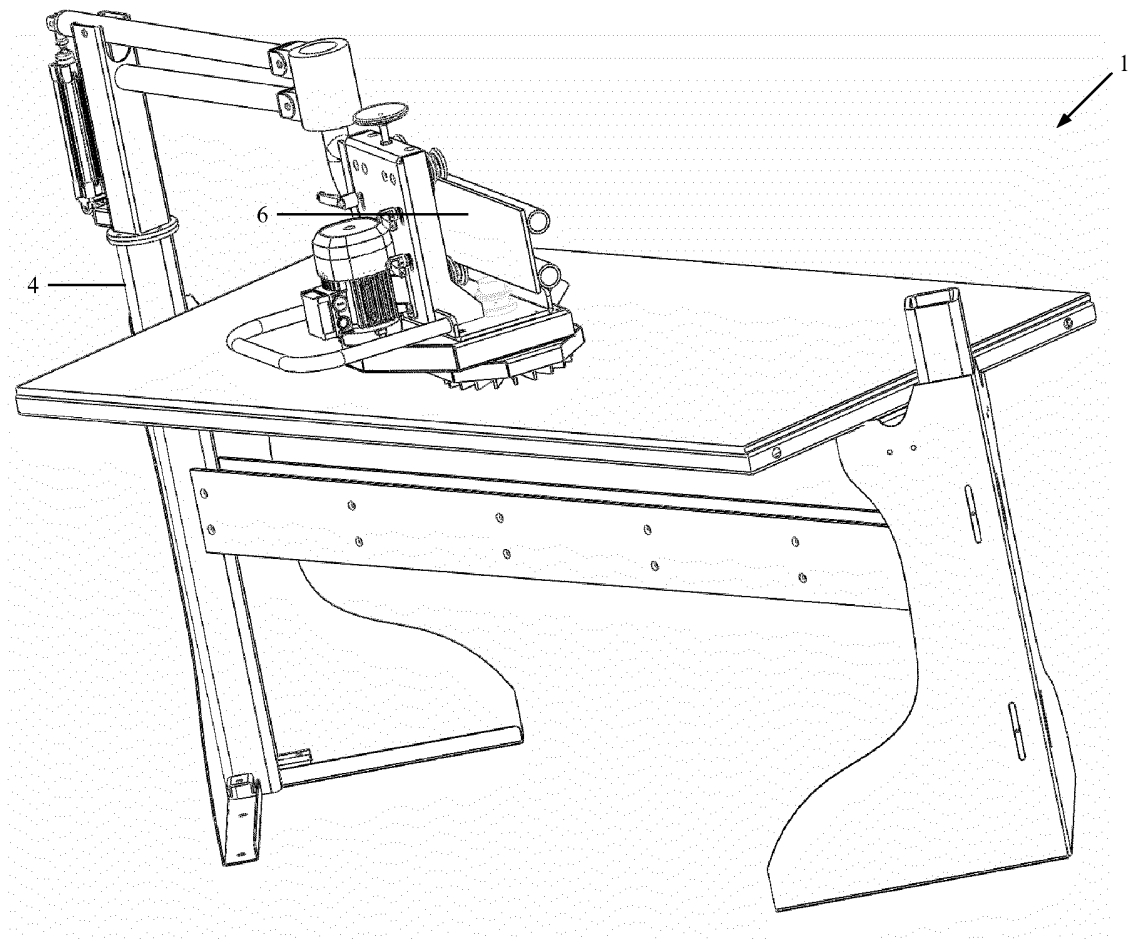


FIG.2

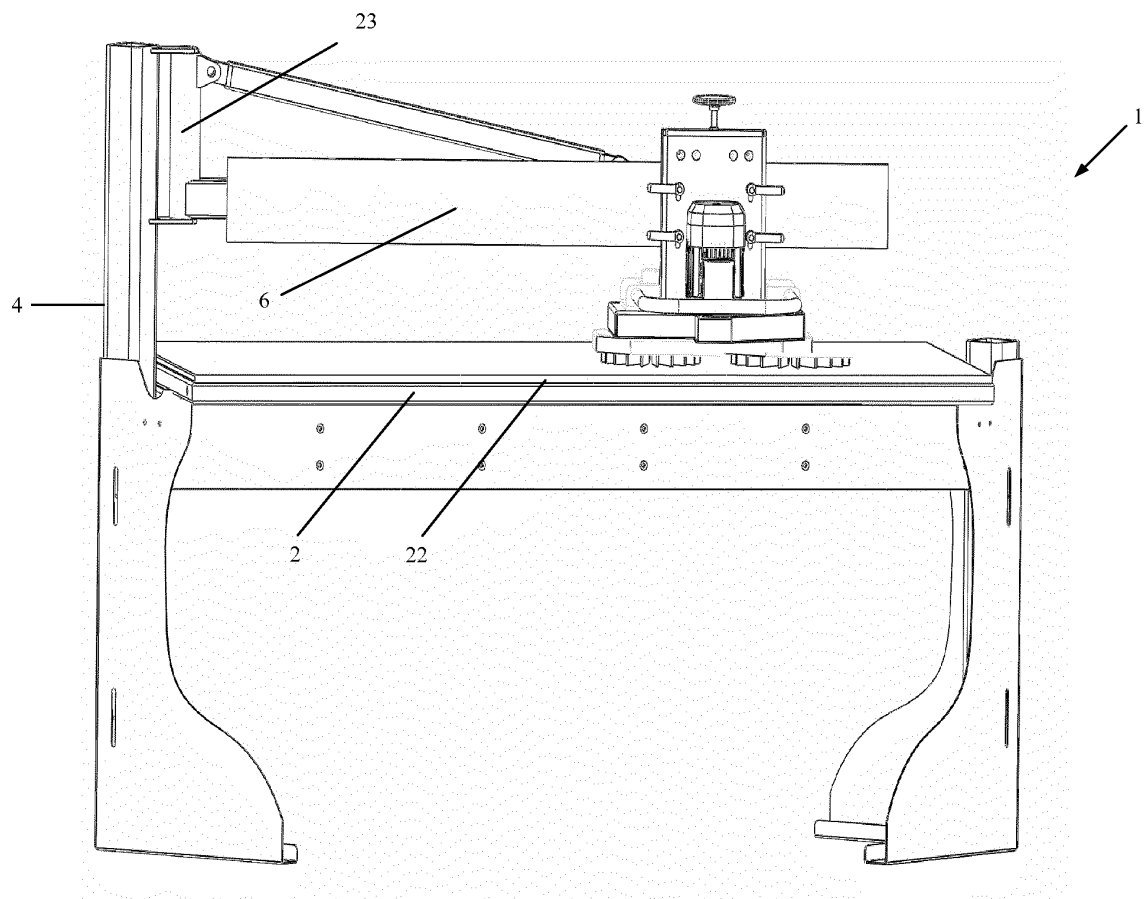


FIG.3



EUROPEAN SEARCH REPORT

Application Number
EP 13 15 8499

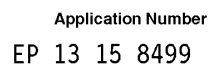
DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 181 466 A (D.C. MYERS) 22 August 1876 (1876-08-22) * figures 1,2 * * page 1 *	1-11	INV. B24B7/00 B24B7/02 B24B7/06 B24B7/07 B24B27/00 B24B41/02 B24B41/06 B24B41/047 B23Q9/00 B23Q1/62 B25H1/02
Y	FR 2 073 627 A5 (LAZZARI GIOSUE; BONVINO MICHELE) 1 October 1971 (1971-10-01) * page 1, line 13 - line 38 * * page 3, line 26 - page 4, line 6 * * figures 1-4 *	1-11	
Y	WO 2008/031463 A1 (ANCORA S P A [IT]; CORRADINI MARIO [IT]) 20 March 2008 (2008-03-20) * page 1, line 1 - line 12 * * page 3, line 12 - line 26 * * figures 1-3 *	1-11	
Y	GB 1 231 680 A (NOT KNOWN) 12 May 1971 (1971-05-12) * page 1, line 59 - line 73 * * page 2, line 8 - line 16 * * page 2, line 92 - line 96 * * page 2, line 124 - page 3, line 8 * * figures 1,3 *	1-11	TECHNICAL FIELDS SEARCHED (IPC) B24B B23Q B25H
Y	US 3 667 166 A (WHITE JAMES C) 6 June 1972 (1972-06-06) * figures 1,2 * * column 2, line 33 - line 36 *	2	
Y	US 2008/216808 A1 (O'BANION MICHAEL L [US] ET AL) 11 September 2008 (2008-09-11) * abstract; figures 1-3,7 *	2,4	
Y	JP S55 85251 U (NOT KNOWN) 12 June 1980 (1980-06-12) * the whole document *	5	
-/--			
The present search report has been drawn up for all claims			

1

Place of search	Date of completion of the search	Examiner
Munich	24 July 2013	Endres, Mirja
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

EPO FORM 1503 03.82 (P04C01)

55

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 15 8499

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European 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 these particulars which are merely given for the purpose of information.

24-07-2013

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 181466 A	22-08-1876	NONE	
FR 2073627 A5	01-10-1971	BE 760052 A1 FR 2073627 A5	17-05-1971 01-10-1971
WO 2008031463 A1	20-03-2008	NONE	
GB 1231680 A	12-05-1971	CA 917926 A1 GB 1231680 A US 3562959 A	02-01-1973 12-05-1971 16-02-1971
US 3667166 A	06-06-1972	NONE	
US 2008216808 A1	11-09-2008	NONE	
JP S5585251 U	12-06-1980	NONE	
NL 257678 A	10-04-1964	NONE	
CN 102366912 A	07-03-2012	NONE	
DE 1652198 A1	21-01-1971	NONE	

EPO FORM P0459

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