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(54) Drill grinding machines.

(57) A drill grinding machine is proposed wherein a drill holder is supported for angular adjustment about two mutually perpendicular axes 15, 16 and is pivotal about a fixed axis 14. Adjustment about the respective mutually perpendicular axes 15, 16 determines the drill point angle and point relief whilst pivotal motion about the fixed axis 14 moves the drill point into and out of cooperative relationship with an abrasive surface 12 in a correct geometrical disposition for requisite point grinding.

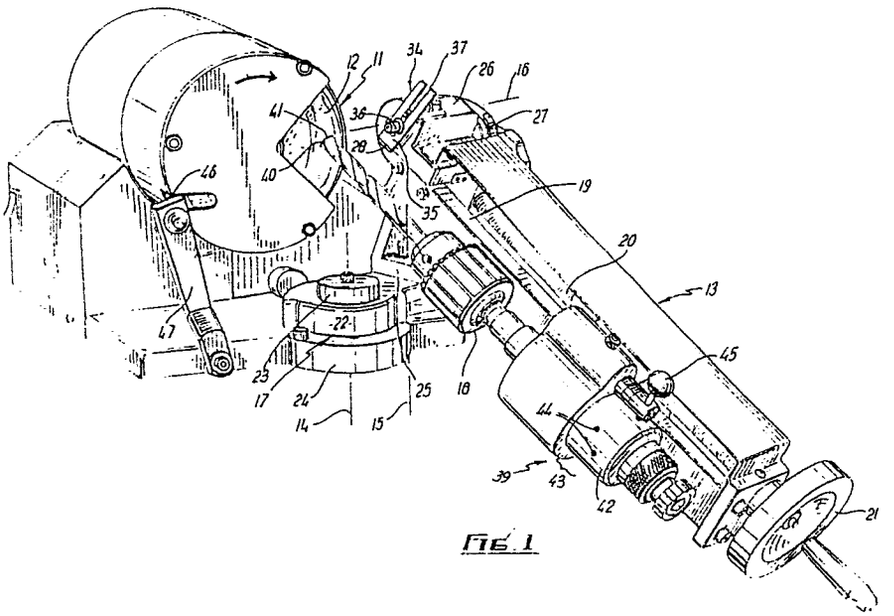

Fig. 1

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DRILL GRINDING MACHINES

The invention concerns drill grinding machines and has particular reference to machines for grinding twist drills.

The object of the invention is to provide a drill grinding machine which will allow of the ready grinding of a twist drill to the requisite drill point geometry.

According to the present invention there is proposed a drill grinding machine comprising a grinding surface, a drill holder, mounting means supporting said drill holder for pivotal motion about a fixed axis spaced from and parallel to said grinding surface, thus to bring a drill present in the holder into and out of engagement with said grinding surface, and for adjustment motion about a second axis parallel to said fixed axis, and abutment means engageable with a drill positioned in the holder for predetermined angular location of said drill bit in said holder.

According to a further feature, the drill holder is pivotally mounted for angular adjustment about a third axis perpendicular to said fixed and second axes.

According to a preferred feature, the grinding surface comprises the abrasive face of a continuously rotatable grinding wheel.

The invention will now be described further, by way of example only, with reference to the accompanying drawings illustrating one embodiment thereof and in which : -

Fig. 1 is a perspective view, in a first direction, of a drill grinding machine constructed in accordance with the invention;

Fig. 2 is a perspective view of the machine of Fig. 1 taken in a second direction; and

Figs. 3 and 4 are diagrammatic illustrations of the relationship between the various pivot axes of the drill holder and the grinding surface.

Referring now to the drawings, in which like reference numerals are used throughout for the same or similar parts, a drill grinding machine comprises a continuously rotatable grinding wheel 11 having a vertically disposed grinding surface 12, and a drill holder 13 mounted for pivotal motion about multiple axes 14, 15, 16 relative to the said grinding surface by support means 17.

The drill holder 13 includes a drill chuck 18 or the like to receive the drill to be ground, the chuck 18 being adjustable longitudinally of a support bar 19 in the holder, to cater for drills of different length, by feed screw means 20 operable through a control wheel 21.

Mounting means 17 include a primary support 22 pivotal about axis 14 defined by bearing means 23 on the machine base plate 24, an intermediate bracket 25 of angle configuration pivotally mounted on the primary support 22 for angular adjustment about an axis 15 parallel to and spaced from axis 14, and a support bracket 26 to which the holder 13 is secured, support bracket 26 being pivotally mounted on the upstanding limb 27 of intermediate bracket 25 for motion about axis 16.

Angular adjustment of intermediate bracket 25 relative to primary support 22 is within limits imposed by a bolt 28 extending from the primary support and engaged with an horizontally disposed arcuate slot 29 provided on intermediate bracket 25 and centred on pivot axis 15, tightening of the bolt against the bracket locking the bracket in position relative to the primary support. A scale 30 is provided adjacent slot 29 to facilitate adjustment.

Similarly, angular adjustment of holder 13 about axis 16 is within limits imposed by bolt 31 extending from support bracket 26 and engaged with an arcuate slot 32 provided on intermediate bracket 25 and centred on axis 16, holder 13 being locked in a requisite angular disposition by tightening bolt 31 against the edges of the slot. A scale 33 is provided adjacent the arcuate slot 32 to facilitate adjustment.

The spaced parallel axes 14 and 15 are disposed substantially vertically and lie parallel to the plane of the grinding surface 12.

Axis 16 is perpendicular to axes 14 and 15 and exists in an horizontal plane passing through or substantially through the rotational axis of the grinding wheel 11, the angular position of the drill relative to axis 16 being determined by the required point angle of the drill.

The axis of the chuck 18 intersects both axis 14 and axis 16, and axes 14 and 15 are separated by a predetermined distance and are arranged in predetermined respective dispositions relative to the plane of the grinding surface. In the particular arrangement shown, the spacing of pivot axes 14 and 15 is 76 mms as measured on a plane parallel to the grinding surface, whilst such axes are located 25 mms and 17 mms respectively from the plane of grinding surface 12, the former dimensions determining the radius of the arc of grinding movement and the latter being relevant to the clearance relief to be provided at the drill flank. The angular position of the drill about axis 15 is determined by the clearance relief required.

The drill grinding machine further includes a setting piece 34, see also Fig. 6, cooperable with the end of a drill positioned in the chuck 18 and serving to locate the drill therein in a requisite angular disposition relative to the axis of the chuck. In its simplest form the setting piece comprises a

plate 35 slidingly mounted on support bracket 26 and secured thereto by a screw 36 engaged with a slot 37 in the plate, the remote end of the plate having a detent 38 to provide a datum surface to receive the drill lip into intimate contact therewith, and thus angularly to locate the same. Typically, the drill lips are set to 20° from the vertical in anti-clockwise direction. If desired, the setting piece 34 may be mounted on support bracket 26 for pivotal motion thereon between operative and non-operative positions, the lower edge of plate 35, and thus the detent 38, being angles to accommodate drills of different sizes.

An indexing means 39 is included to provide for the stepwise angular adjustment of the drill chuck 18 necessary to bring the drill end surfaces 40, 41 to be ground successively into position for engagement with the grinding wheel 11. The indexing means 39 comprises a collar 42 arranged coaxially with the chuck 18, a plurality of rows 43 of recesses 44 in the surface of the collar 42, the rows 43 being spaced apart in the axial direction of the collar and the individual recesses 44 of each respective row being angularly spaced peripherally of the collar, and a spring-loaded plunger 45 selectively engageable with the said recesses. The plunger is mounted for adjustment between the different rows of recesses.

Each row of recesses 44 corresponds to a particular form of drill, there being, in the embodiment illustrated, three such rows corresponding respectively to two-, three- and four- fluted drills. In the case of the two-fluted drill, two recesses are provided in diametrically opposed disposition on the collar, whilst for the three-fluted and four-fluted drills the recesses are provided at 120° and 90° centres respectively. In use, the drill is angularly positioned in the chuck 18 by reference to setting piece 34, plunger 45 being engaged with a recess 44 is the appropriate row of recesses thus to maintain the requisite angular disposition of the chuck and the drill gripped thereon. On completion of the grinding operation on the first drill end surface 40, the drill is indexed merely by withdrawing the plunger 45 from the recess with which it is engaged, rotating the collar to bring the next recess of the same row into register with the plunger 45, and releasing the plunger into engagement with the recess 44 now aligned therewith, the drill thus being held in an adjusted position for grinding of the second drill end surface.

In use in grinding a drill, such drill is located in the chuck, and the holder is adjusted about axes 15 and 16, respectively, according to the relief setting and point angle required. The holder is then moved manually about axis 14, thus to wipe the flank of the drill across the surface of the rotating grinding wheel and thereby sharpen the drill, the drill being locked at the requisite clearance relief angle and point angle settings throughout such movement.

The grinding surface 12 may be dressed, using a diamond dresser 46 on an arm 47 pivotally secured to the base plate 24, and the axial position of the grinding wheel is adjusted, as necessary, to maintain a predetermined spatial relationship to pivot axis 14.

We have found that, by means of the grinding machine hereinproposed, we are able effectively to sharpen drills of a range of sizes to predetermined parameters and within acceptable tolerances, both as regards clearance relief and drill point angle, in a simple and effective manner.

Whilst the apparatus hereindisclosed is capable of adjustment as regards drill point angle, by angular adjustment of drill holder 13 about axis 16, it is to be understood that the inclusion of such a facility is not an essential feature in a grinding machine constructed in accordance with the invention, although the feature will ordinarily be included.

Furthermore, although the invention is described in the context of a grinding wheel rotating about an horizontal axis, it is to be understood that other dispositions may be adopted if preferred.

Of course, a continuously rotating grinding wheel will ordinarily be used in the context of drill grinding, although the invention is not limited to arrangements wherein the grinding surface is a continuously rotating surface.

Claims

1. A drill grinding machine comprising a grinding surface, a drill holder, mounting means supporting said drill holder for pivotal motion about a fixed axis spaced from and parallel to said grinding surface, thus to bring a drill present in the holder into and out of engagement with said grinding surface, and for adjustment motion about a second axis parallel to said fixed axis, and abutment means engageable with a drill positioned in the holder for predetermined angular location of said drill bit in said holder.

2. A drill grinding machine as claimed in claim 1, wherein the mounting means includes a primary support movable about said fixed axis and an intermediate bracket pivotally mounted on said primary support, the intermediate bracket supporting the drill holder and being angularly adjustable about said second axis.

3. A drill grinding machine as claimed in claim 2, including location means between the primary support and the intermediate bracket limiting relative pivotal motion therebetween.

4. A drill grinding machine as claimed in any one of claims 1 to 3 wherein the drill holder is pivotally mounted for angular adjustment about a third axis perpendicular to said fixed and second axes.

5. A drill grinding machine as claimed in claim 4, wherein said third axis passes through said fixed axis and the axis of said drill holder interacts both such axes.

6. A drill grinding machine as claimed in claim 5, when dependent on claim 2 or 3, wherein the drill holder is pivotally supported on the intermediate bracket for angular adjustment about said third axis.

7. A drill grinding machine as claimed in claim 6, wherein the mounting means includes a support bracket pivotally supported on the intermediate bracket for angular adjustment about the said third axis, the drill holder being secured to the said support bracket for angular movement therewith.

8. A drill grinding machine as claimed in claim 7, including location means between the intermediate bracket and the support bracket limiting relative pivotal motion therebetween.

9. A drill grinding machine as claimed in claim 3 or 8, wherein the location means comprise an arcuate slot and a pin provided on the respectively movable elements, the pin being engaged with the slot and being adapted to secure the same in a selected position relative thereto.

10. A drill grinding machine as claimed in any one of the preceding claims, wherein the grinding surface comprises the abrasive face of a continuously rotatable grinding wheel.

11. A drill grinding machine as claimed in any one of the preceding claims, further including a setting piece engageable by a drill supported in the holder for locating the drill angularly about the rotational axis thereof and indexing means adapted to effect stepwise angular adjustment of the drill about its rotational axis.

12. A drill grinding machine as claimed in any one of the preceding claims, wherein the fixed and second axes are spaced apart by a distance of approximately 76 mms and said axes are respectively spaced from the plane of the grinding surface by approximately 25 mms and 17 mms.

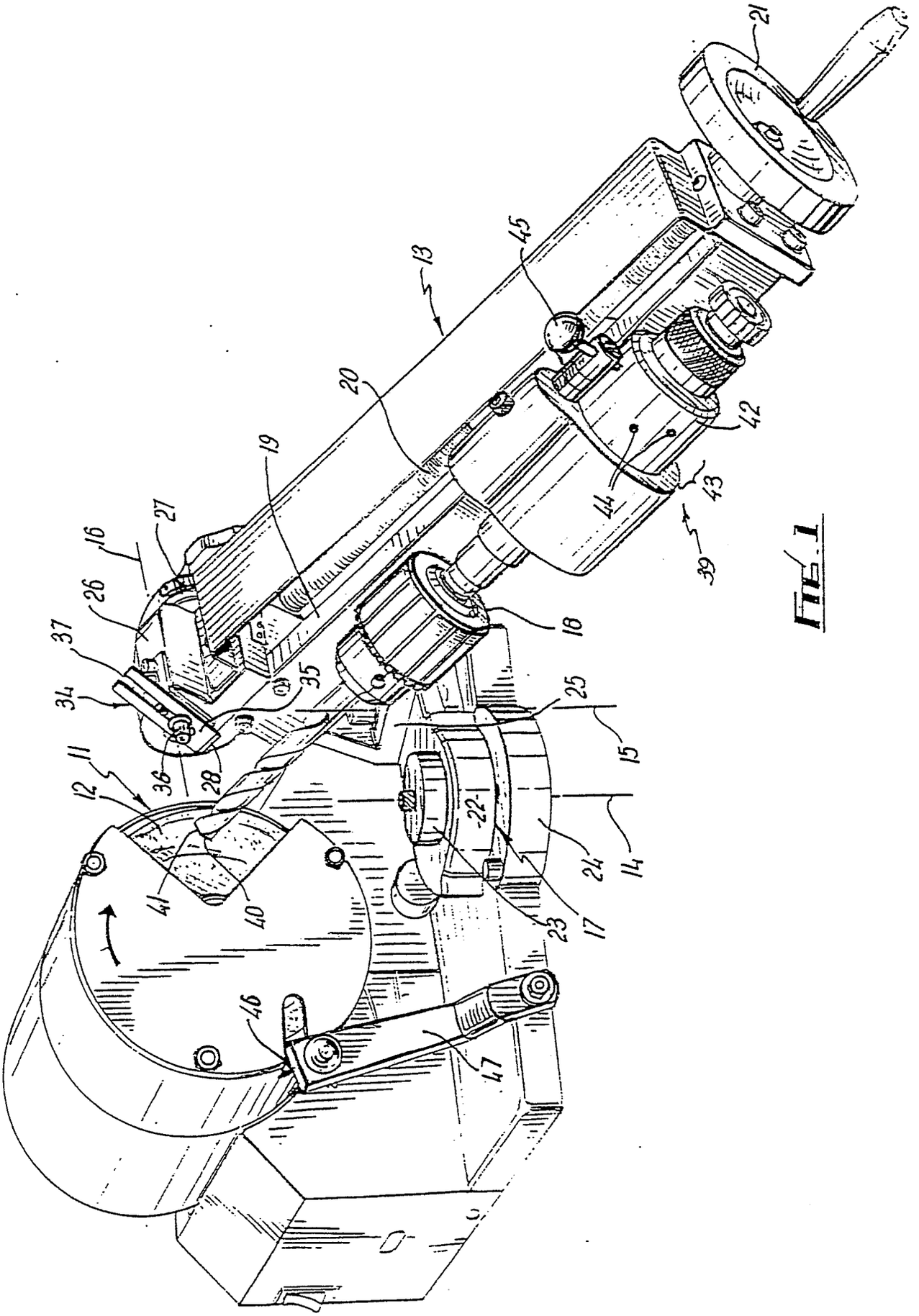
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FIG. 1

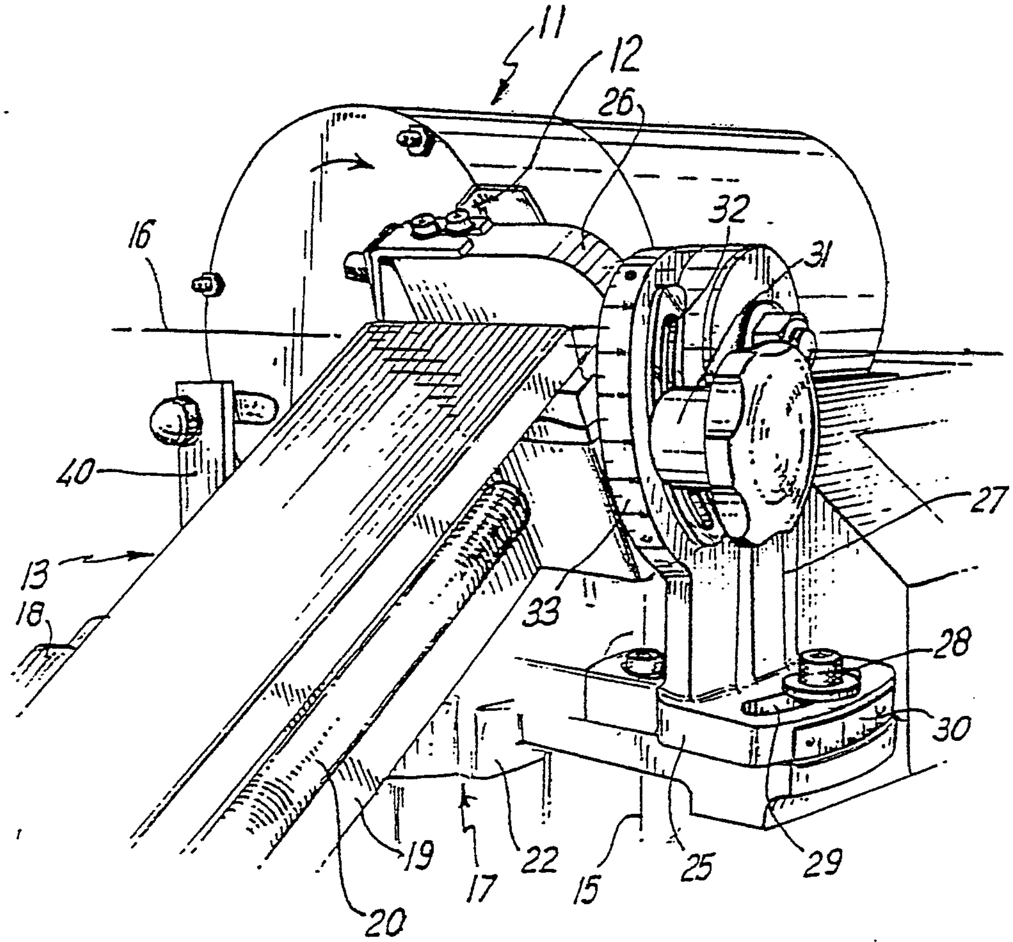

FIG. 2

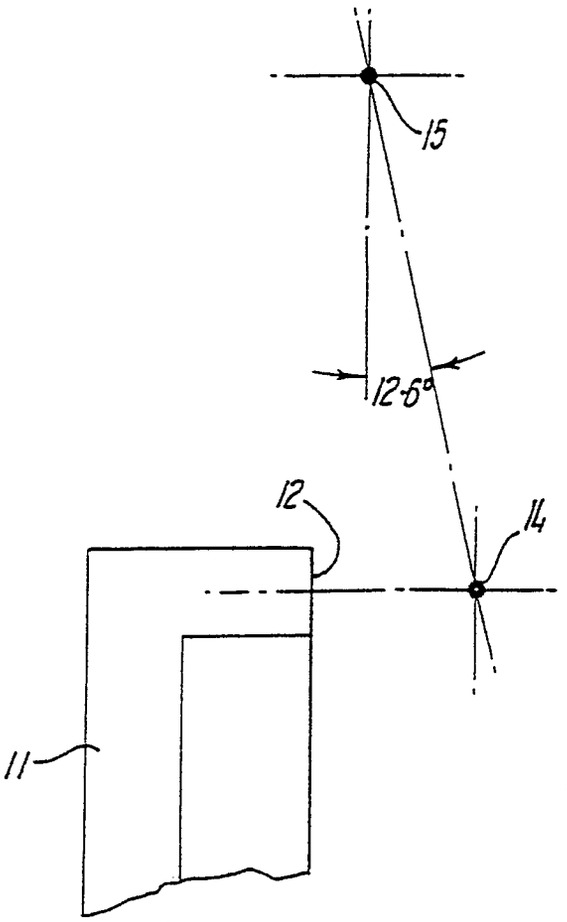

Fig. 3

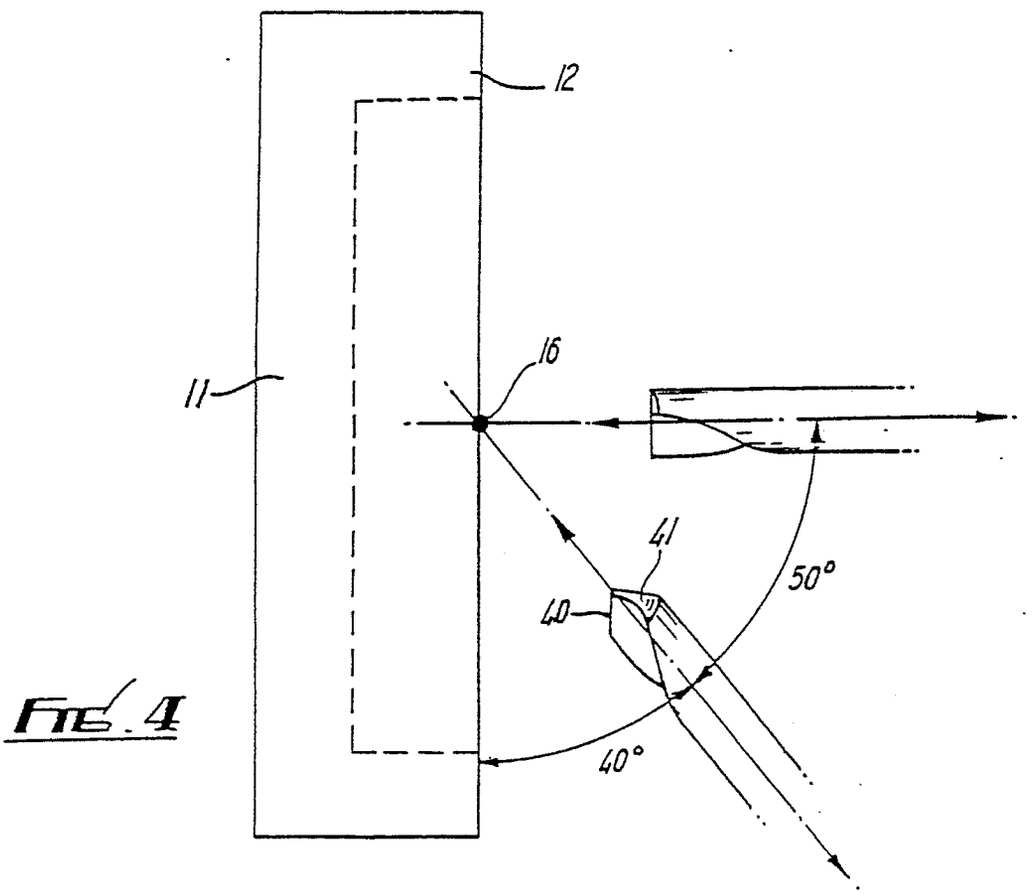

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 5651

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-2 344 420 (A.A. SCHWARTZ) * claims 1,2; page 2, left column, lines 32-59; page 3, left column, lines 6-20; page 4, left column, line 72 - right column, line 10; figures 1,2 *	1,2,10	B 24 B 3/26
Y	EP-A-0 084 855 (G. GÜHRING) * claims 1,4,6; page 7, lines 25-30; figures 3,5 *	1,2,4, 10	
Y	US-A-3 494 080 (E. LAGUNA) * claims 1,2; column 2, lines 14-27; figure 2 *	1,2,4, 10	
A		11	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 24 B 3/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	31-08-1988	BERNAS Y.N.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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

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