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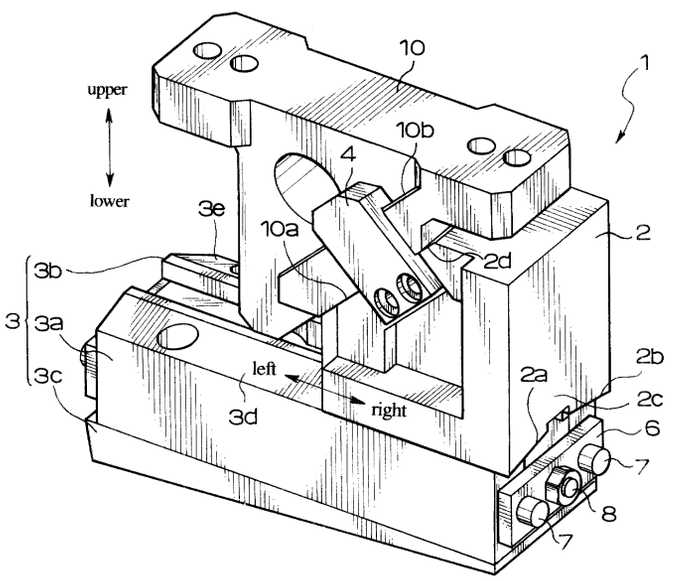
(54) Cam unit equipped with self-centering means

(57) Disclosed is an improved cam unit (1) to be mounted to a stationary metal mold tool and a movable metal mold tool for use in effecting a required machining on a pressed plate article. It comprises a cam driver (10) to be fixed to the movable metal mold, a cam slider (2) to be driven by the cam driver (10) and a cam base (3) to be fixed to the stationary mold tool for supporting slidably the cam slider. It further comprises self-centering means (2a, 2b, 3a, 3e) on the sliding surfaces of the cam slider and the cam base. The self-centering means comprises the inverted-"V" shapes formed on the confronting surfaces of the counter sliding parts. Thanks to the self-centering means the cam unit is free of any decentering of the cam slider even if a significant wearing is caused between the sliding surfaces of the counter sliding parts.

FIG. 1



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Description

[0001] The present invention relates to a cam unit for metal mold tools, such as a horizontal cam unit or an inclined cam unit for use in giving a desired bent form to a pressed plate at its selected edge or end to provide a car body shape.

[0002] Referring to Figs.4a and 4b, particularly Fig. 4a, a conventional horizontal cam unit comprises a cam driver 10 to be fixed to the upper movable mold tool, a cam slider 11 whose inclined slide surface abuts on the inclined cam surface of the cam driver 10, and a cam base 12 supporting the cam slider 11, and fixed to the lower stationary mold tool. The rising and lowering of the cam driver will make the cam slider 11 to move a predetermined distance right and left.

[0003] The cam slider 11 has a projection formed on its bottom side. The projection slidably fits in the recess of the cam base 12, and the projection has a return spring 13 fixed to its spring pin rod 11a.

[0004] In operation the rising and lowering of the cam driver 10 makes the cam slider 11 having a machining tool fixed to its front end to reciprocate right and left, thereby performing a required machining on a pressed plate article. The rising of the cam driver 10 permits the cam slider 11 to return leftward to the original rest position under the influence of the return spring 13.

[0005] As seen from Fig.4b, the lower part 11a of the cam slider 11 is sandwiched between the opposite upright portions 12a of the cam base 12, and is fastened to the opposite upright portions 12a by applying retainer pieces 14 both to the side projections 11b of the lower part 11a of the cam slider 11 and the top surfaces of the opposite upright portions 12a, thus providing a guide arrangement which permits the cam slider 11 to move smoothly.

[0006] As seen from Fig.4b, the size "b" from the front to rear side, or width of the cam base 12 is much larger than the width "a" of the cam slider 11, and accordingly the weight of the cam unit increases. The sliding surface of the lower part lla of the cam slider is horizontal, and the counter surface of the cam base 12 is horizontal, too. If uneven wearing is caused on the horizontal surfaces of the confronting parts 11 and 12, the overlying part 11 may be inclined somewhat forward or backward, thus causing the moving parts 10 and 11 to be sticky in motion. Also, if it is desired that the pressing force is increased significantly, the sizes of the cam slider 11 and cam base 12 need to be increased accordingly.

[0007] One object of the present invention is to provide a cam unit which is free of such defects as described above.

[0008] To attain this object a cam unit to be mounted to a stationary metal mold tool and a movable metal mold tool for use in effecting a required machining on a pressed article, comprising a cam driver to be fixed to the movable metal mold, a cam slider to be driven by the cam driver and a cam base to be fixed to the stationary mold tool for supporting slidably the cam slider, is improved according to the present invention in that it further comprises self-centering means on the sliding surfaces of the cam slider and cam base.

[0009] The self-centering means may comprise an inverted "V"-shaped section formed on the cam base with the ridge of the inverted "V"-shaped section extending along the center longitudinal line of the cam base, running parallel to the sliding direction in which the cam slider moves, and an inverted "V"-shaped sliding surface formed on the bottom of the cam slider, which inverted "V"-shaped sliding surface rides closely on the inverted "V"-shaped section of the cam base.

[0010] The cam slider may have the same or substantially same width as the cam base, the width being measured in the direction perpendicular to the sliding direction in which the cam slider moves.

[0011] Thanks to use of the overlapping inverted "V"-shaped sliding surfaces as self-centering means the cam slider can be repeatedly moved on the cam base without causing such an uneven wearing as would be experienced in the horizontal-to-horizontal sliding surfaces in the conventional cam unit structure, thus assuring the stable work all the time. Also advantageously, the cam slider can have the same width as the cam base, permitting the machining tool attaching surface of the cam slider to be increased significantly in comparison with the conventional cam unit structure, in which the cam slider is sandwiched between the opposite projections standing upright from the cam base. Also, the size and weight of the cam unit can be reduced substantially in comparison with the conventional cam unit.

[0012] Other objects and advantages of the present invention will be understood from the following description of a cam unit according to one preferred embodiment of the present invention, which is shown in accompanying drawings.

Fig.1 is a perspective view of a cam unit according to the present invention;

Fig.2 is another perspective view of the cam unit as viewed from its rear side;

Fig.3 is an end view of the cam unit with the cam driver removed; and

Figs. 4a and 4b are a front view and an end view of a conventional cam unit respectively.

[0013] Referring to Fig.1, a cam unit 1 comprises a cam driver 10 to be mounted to an upper movable mold tool, a cam slider 2 and a cam base 3 to be mounted to a lower stationary metal mold tool. The cam driver 10 has an inclined cam surface 10a. Likewise, the cam slider 2 has an inclined surface, and is combined with the cam driver 10 with their inclined surfaces laid on each other, thereby permitting the cam slider 2 to move left or right as a counter action to the rising or lowering of the cam driver 10. The cam base 3 supports the cam slider 2 slidably.

[0014] The cam base 3 has an inverted "V"-shaped upper surface with its ridge extending along the center longitudinal line of the cam base, running parallel to the sliding direction in which the cam slider 2 moves. Likewise, the cam slider 2 has an inverted "V"-shaped bottom. The inverted "V"-shaped sliding bottom surface of the cam slider 2 rides closely on the inverted "V"-shaped top section of the cam base 3.

[0015] Specifically the cam slider 2 has oblique bottom surface halves 2a and 2b sloping up from its opposite longitudinal edges into its longitudinal center line, thus forming a roof-like sliding surface on its bottom side.

[0016] The inclined cam surface 2d of the cam slider 2 is slidably laid on the inclined cam surface 10a of the cam driver 10. The cam slider 2 has tow forcedly returning followers 4 bolted to its opposite sides for jerking the cam slider 2 toward its original position subsequent to the cam action.

[0017] The cam base 3 comprises a base body 3c to be bolted to the lower stationary mold tool, and two guide blocks 3a and 3b parallelarranged, leaving a longitudinal space therebetween, running in the sliding direction (see Fig.3). The guide blocks 3a and 3b has two reinforcement plates 6 bolted to their opposite ends. A spring pin rod 8 for a return spring appears on the reinforcement plate 6.

[0018] As best seen from Fig.3, each guide block 3a or 3b has an inclined top surface 3d or 3e, which slopes up from its outer longitudinal edge toward the top center line. The so formed roof-like shape is exactly same as the roof-like shape defined by the oblique bottom surface halves 2a and 2b of the cam slider 2. Thus, the self-centering means is provided. The parallel arrangement of two confronting guide blocks 3a and 3b with a given longitudinal space left therebetween makes it possible to reduce substantially the size of the cam base 3 in comparison with the overlying cam slider 2, accordingly permitting the saving of the material and weight of the cam base 3.

[0019] As seen from Fig.3, the size from the front side to rear side, or width of the cam base 3 perpendicular to the direction in which the cam slider 2 slidably moves is substantially equal to that of the overlying cam slider 2. What is intended to mean here by saying "substantially equal" is that the minimum difference therebetween is 10 millimeters or below.

[0020] As may be understood from the above, the rising and descending of the cam driver 10 will make the machining tool bearing cam slider 2 to move slidably on the cam base 3 without fear of the center deviation of the cam slider 2 which, otherwise, would be caused by the wearing of the sliding surfaces of the counter parts 2 and 3; the inverted "V"-shaped sliding surfaces will not cause any deviation of their center ridges even if a significant wearing is caused between the sliding surfaces of the counter parts 2 and 3.

[0021] The inverted "V"-shaped surfaces of the counter sliding parts 2 and 3 will increase significantly their sliding areas over those of the horizontal surfaces of the counter sliding parts 11 and 12 (Figs.4a and 4b), accordingly increasing the resistance to the pressing force. Also advantageously, the machining tool bearing area of the cam slider 2 can be increased by setting its dimension from front to rear side to be equal to the width of the cam base 3, thus permitting the fixing of machining tools of increased size.

[0022] As may be understood from the above, a cam unit equipped with self-centering means according to the present invention is guaranteed to be free of any decentering of the cam slider even if a significant wearing is caused between the sliding surfaces of the counter sliding parts.

[0023] The inverted "V"-shaped forms of the counter sliding parts have the effect of increasing the area of the cam unit to which the pressing force is applied, and hence, increasing the resistance to the pressing force applied to the cam unit.

[0024] The size from the front side to rear side or width of the cam base perpendicular to the direction in which the cam slider moves is substantially equal to that of the cam slider. This permits the machining tool bearing area of the cam slider to be increased significantly. The parallel arrangement of two confronting guide blocks with a given longitudinal space left therebetween makes it possible to reduce the weight of the whole cam unit to approximately one third of the weight of the conventional cam unit.

Claims

1. A cam unit to be mounted to a stationary metal mold tool and a movable metal mold tool for use in effecting a required machining on a pressed article, comprising a cam driver to be fixed to the movable metal mold, a cam slider to be driven by the cam driver and a cam base to be fixed to the stationary mold tool for supporting slidably the cam slider, **characterized in that** it further comprises self-centering means on the sliding surfaces of the cam slider and cam base.

2. A cam unit according to claim 1, wherein the self-centering means comprises an inverted "V"-shaped section formed on the top of the cam base with the ridge of the inverted "V"-shape extending along the center longitudinal line of the cam base, running parallel to the sliding direction in which the cam slider moves, and an inverted "V"-shaped sliding surface formed on the bottom of the cam slider, which inverted "V"-shaped sliding surface rides closely on the inverted "V"-shaped section of the cam base.

3. A cam unit according to claim 1 or 2, wherein the cam slider has the same or substantially same width

as the cam slider, the width being measured in the direction perpendicular to the sliding direction in which the cam slider moves.

FIG. 1

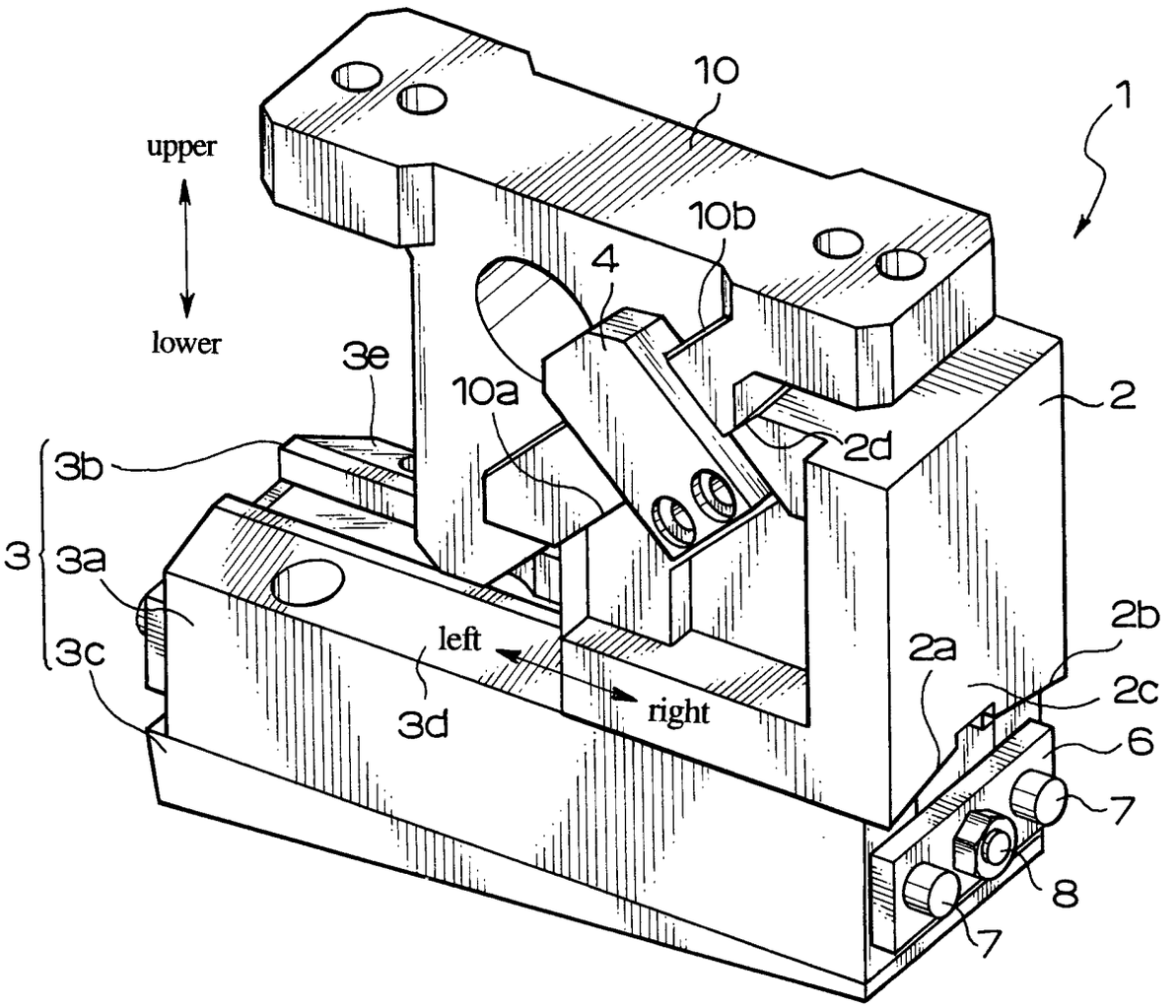

10
1
upper
lower
10b
4
3e
10a
2
2d
3b
3
3a
3c
left
right
3d
2b
2a
2c
6
7
8
7

FIG. 2

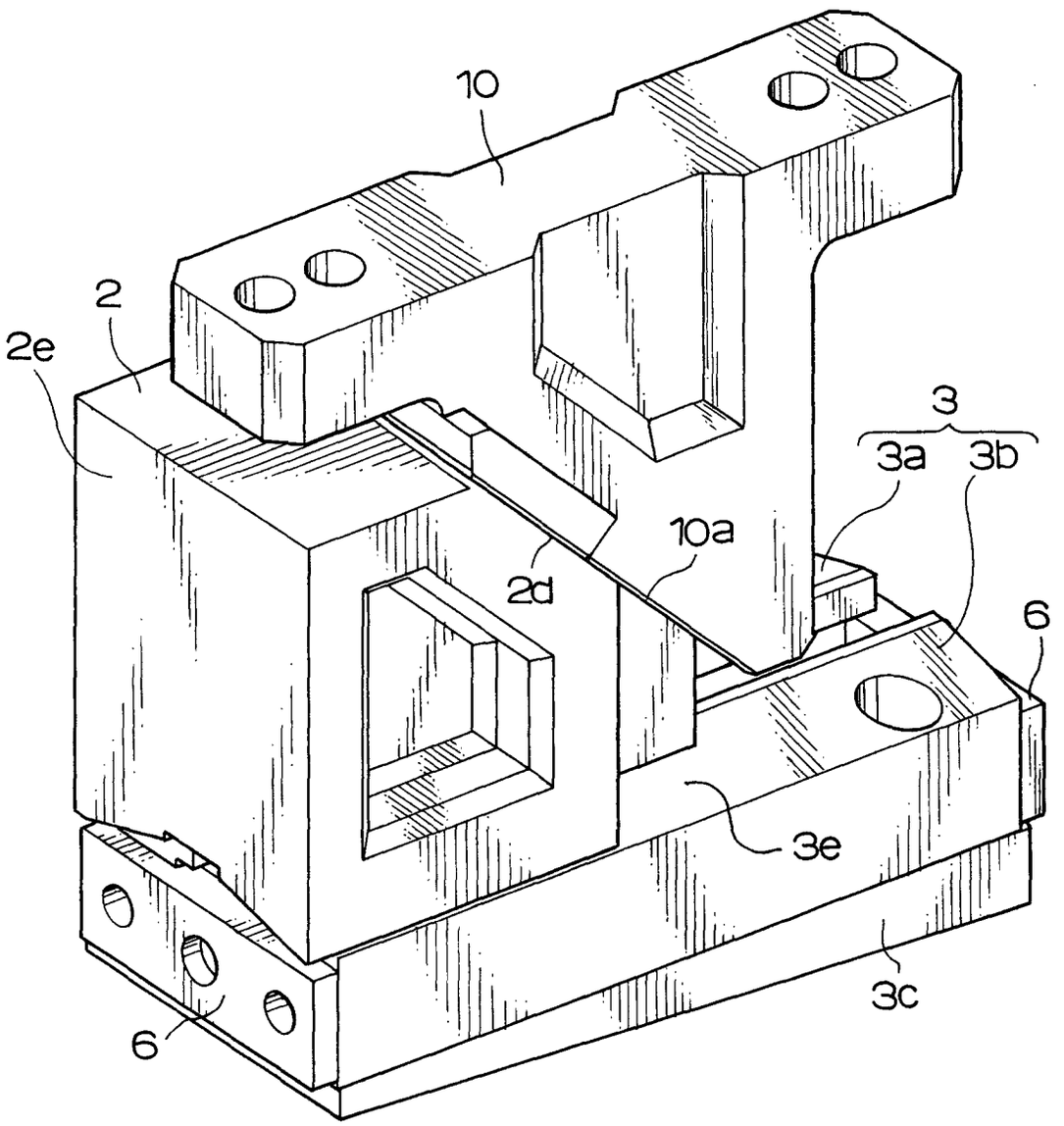


FIG. 3

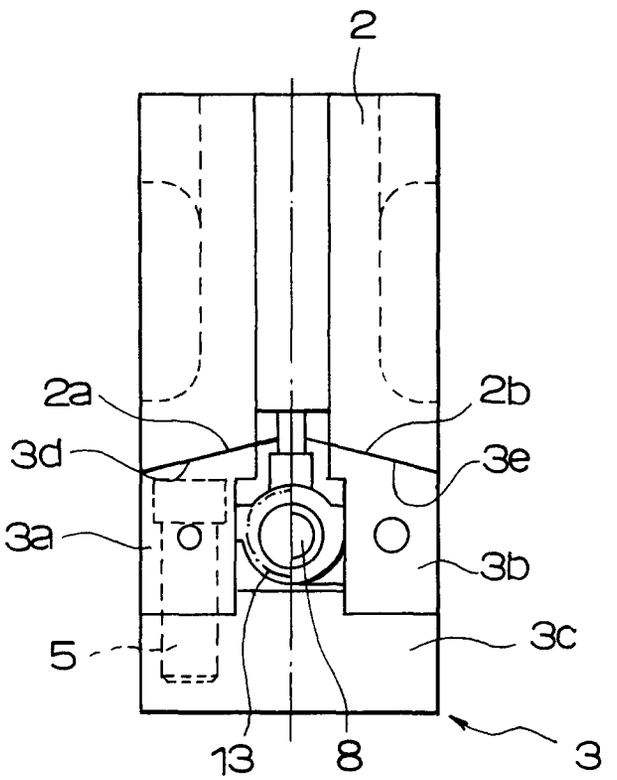


FIG. 4A
PRIOR ART

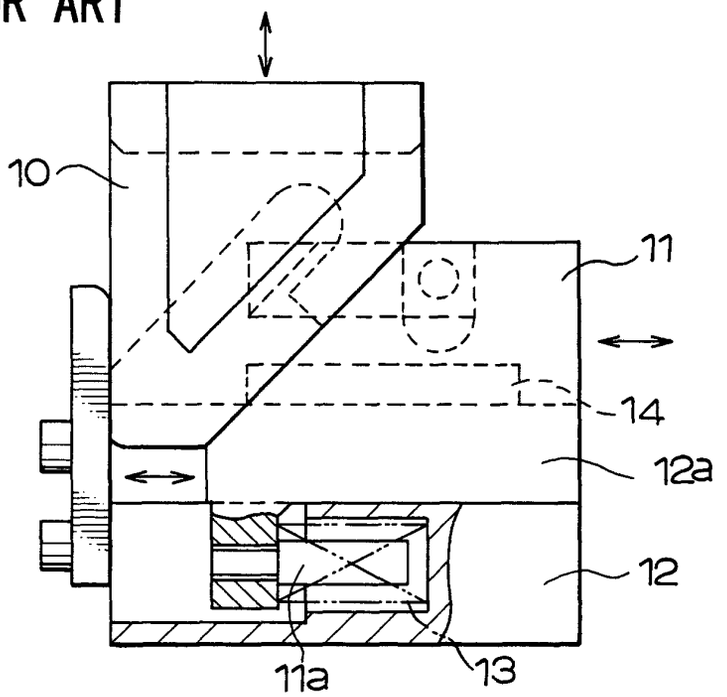
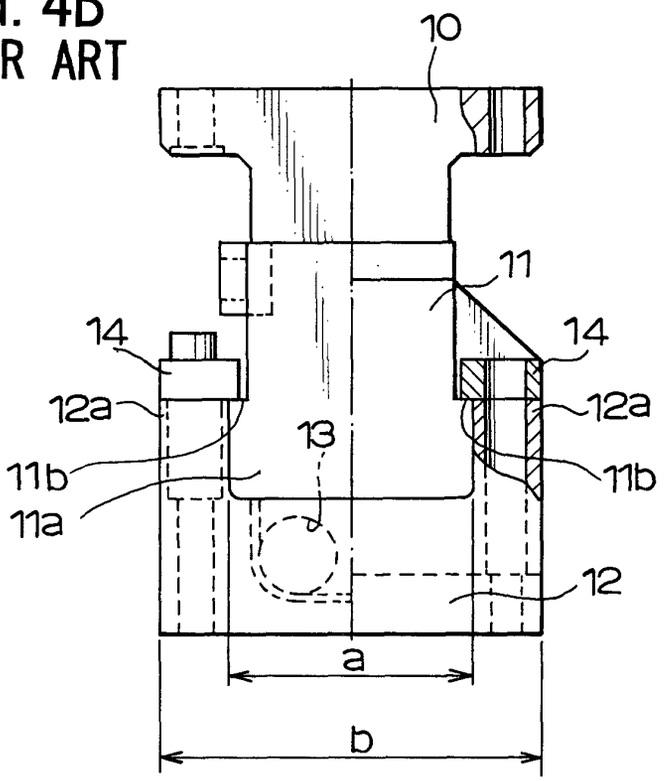


FIG. 4B
PRIOR ART



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EUROPEAN SEARCH REPORT

Application Number
EP 00 10 5369

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.7)
X	EP 0 983 808 A (OILES INDUSTRY CO LTD) 8 March 2000 (2000-03-08) * paragraph '0017! - paragraph '0018!; figures 1-3,11 *	1-3	B21D28/32
X	US 5 904 064 A (HIGUCHI MASAHIRO) 18 May 1999 (1999-05-18) * column 4, paragraph 7 - column 5, paragraph 3; figures 1,3 *	1-3	
X	EP 0 484 588 A (UMIX CO LTD) 13 May 1992 (1992-05-13) * column 4, paragraph 2; figure 3 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 August 2000	Gerard, O

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