

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 260 361
A3

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **86307236.9**(51) Int. Cl. 4: **B21D 1/02**(22) Date of filing: **19.09.86**(43) Date of publication of application:
23.03.88 Bulletin 88/12(84) Designated Contracting States:
DE FR GB IT SE(88) Date of deferred publication of the search report:
08.06.88 Bulletin 88/23(71) Applicant: **THE MONARCH MACHINE TOOL**
COMPANY

125 South Herman Street
New Bremen Ohio 45869(US)

(72) Inventor: **Bradlee, Charles Robert**
215 Overland Drive
Sidney Ohio 45365(US)(74) Representative: **Warren, Keith Stanley et al**
BARON & WARREN 18 South End Kensington
London W8 5BU(GB)(54) **Leveling apparatus.**

(57) A leveling apparatus supports a plurality of back-up roller assemblies (62), each of which is individually positionable to vary the penetration of a portion of the work rolls (78) it contacts such that the penetration of the entry work rolls can be varied independently of the penetration of the exit work roll. Each back-up roller assembly includes an elongate back-up block (64) having a longitudinal channel (68) and a rearwardly-positioned concave portion (146), an elongate support member (70) positioned within the slot and including a rearwardly-positioned convex portion (148) positioned to matingly engage the concave portion, and a plurality of back-up rollers (72) positioned along the support member. The support member is urged against the back-up block by a resilient connection (132), and each support member is independently relative to the back-up block. The concave and convex portions of the back-up block and support member, respectively, have centers of curvature which coincide with the rotational axis (154) of the rearmost associated work roll (156) so that pivoting movement of the support member does not affect the penetration of the rearmost work roll. Consequently, the leveled sheet assumes a planar configuration upon exiting the apparatus.

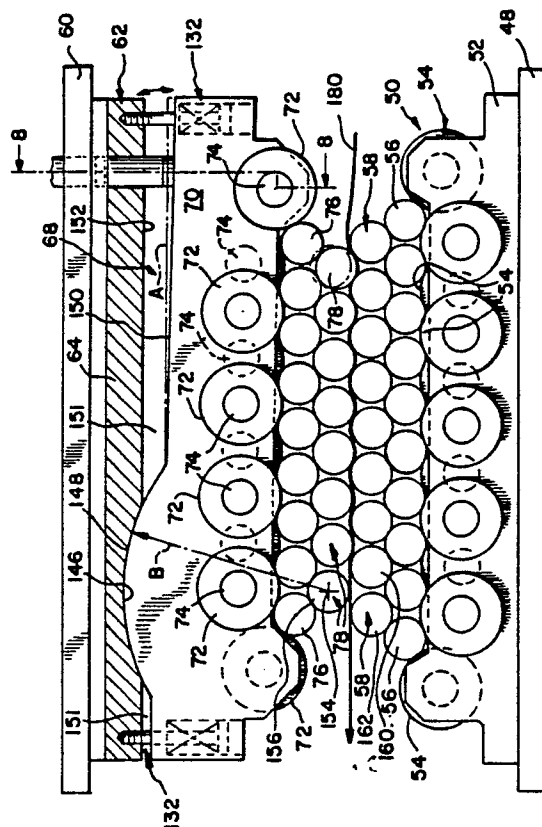


FIG-4

EP 0 260 361 A3



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)																
D,A	US-A-2 963 071 (KRYNYTZKY) * claim 1, figure 3 * ----	1	B 21 D 1/02																
D,A	US-A-3 301 031 (BEARER) * claims 1, 2; column 4, lines 12-17, figures 4, 17, position 200 * ----	1																	
D,A	US-A-4 454 738 (BUTA) * claim 1, figures 2, 3 * ----	1																	
A	DE-A-1 752 211 (HINRICHS) * claim 1; figure 1, position 5 * ----	1,2																	
A	US-A-2 827 945 (NAUST) * claim 1, figures 2, 4, positions 28-33, column 2, lines 53-61 * ----	1																	
A	GB-A-1 128 888 (WILSON) * claim 1, figures 1, 3, positions 76, 79 * ----	1																	
A	DE-U-1 988 614 (SIEMAG) * figure 1, positions 4, 5, 8, 9, claim 4 * -----	2	TECHNICAL FIELDS SEARCHED (Int. Cl. 4) B 21 D 1/00																
The present search report has been drawn up for all claims																			
Place of search BERLIN		Date of completion of the search 01-03-1988	Examiner SCHLAITZ J																
<table border="0"><tr><td>CATEGORY OF CITED DOCUMENTS</td><td>T : theory or principle underlying the invention</td></tr><tr><td>X : particularly relevant if taken alone</td><td>E : earlier patent document, but published on, or</td></tr><tr><td>Y : particularly relevant if combined with another</td><td>after the filing date</td></tr><tr><td>document of the same category</td><td>D : document cited in the application</td></tr><tr><td>A : technological background</td><td>L : document cited for other reasons</td></tr><tr><td>O : non-written disclosure</td><td>-----</td></tr><tr><td>P : intermediate document</td><td>& : member of the same patent family, corresponding</td></tr><tr><td></td><td>document</td></tr></table>				CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention	X : particularly relevant if taken alone	E : earlier patent document, but published on, or	Y : particularly relevant if combined with another	after the filing date	document of the same category	D : document cited in the application	A : technological background	L : document cited for other reasons	O : non-written disclosure	-----	P : intermediate document	& : member of the same patent family, corresponding		document
CATEGORY OF CITED DOCUMENTS	T : theory or principle underlying the invention																		
X : particularly relevant if taken alone	E : earlier patent document, but published on, or																		
Y : particularly relevant if combined with another	after the filing date																		
document of the same category	D : document cited in the application																		
A : technological background	L : document cited for other reasons																		
O : non-written disclosure	-----																		
P : intermediate document	& : member of the same patent family, corresponding																		
	document																		