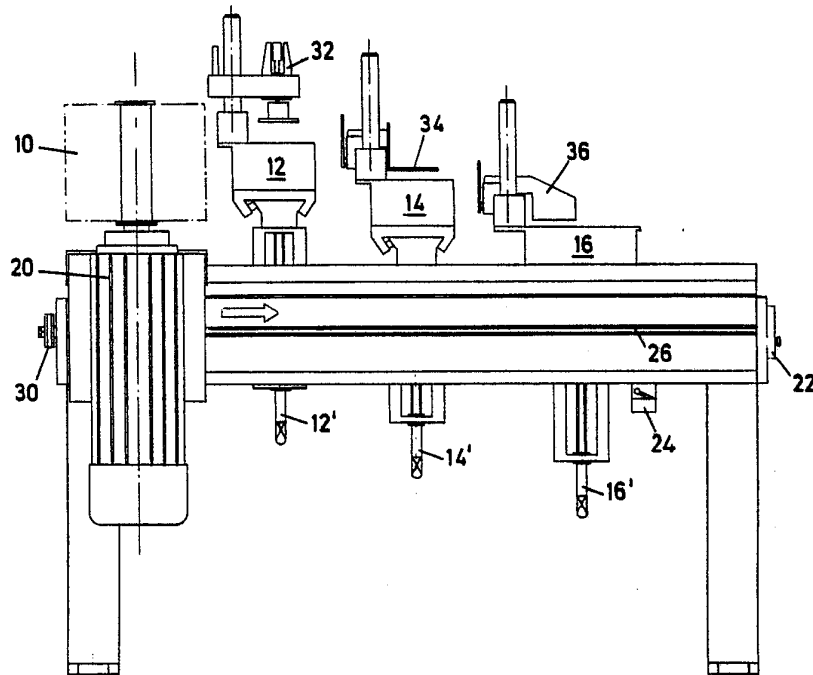




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: MACHINES FOR CUTTING END JOINTS



## (57) Abstract

The machine is suitable for working wood, materials derived from wood, etc. A rotary cutter (10) is movable past tables (12, 14, 16) for supporting workpieces. The cutter (10) comprises a number of cutting discs set coaxially and separated by spacers. On each table (12, 14, 16) a workpiece can be set at a different level. Movement of the cutter along the ends of the workpieces on a single pass can cut a different joint in each workpiece. The thickness and diameter respectively of the cutting discs determine the width and depth of the slots cut in the workpieces for the formation of joints. The thickness of the spacers determines the spacing of the slots, not only in an individual workpiece but also on a number of workpieces set on the various tables (12, 14, 16).

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- 1 -

TITLE:

Machines for Cutting End Joints

DESCRIPTION:Technical Field

5 The invention relates to machines for cutting end joints on workpieces of wood, materials derived from wood, plastics and the like. Machines according to the invention are suitable for processing square dressed or moulded timber in the manufacture of frame members for windows or doors. In  
10 this operation, they can be used to cut a tenon in a single end of each of a number of workpieces in a single cycle. Alternatively, such machines can be used for cutting tongues and grooves, mitres, finger joints, or locating feathers.

15

Background Art

Single-end tenoning machines generally comprise a rotary cutter fixed in relation to the machine, and a bed for moving a workpiece past the cutter. Such machines have  
20 limited capacity as the backing piece has to be changed at the end of each cycle. Patent Specification GB 2,125,729A (Boardman) describes an end-forming machine in which a tenoning cutter is moved in a lateral direction to engage one end of each of two workpieces. After one end has been  
25 tenoned, a workpiece can be moved longitudinally to a position in which the cutter tenons the other end. The machine still has limited capacity.

The Invention

30 The invention provides a machine for cutting end joints which comprises a rotary cutter movable past means for supporting workpieces characterised in that the cutter has a number of cutting discs set coaxially and separated by spacers, and the support means comprises at least two  
35 tables on each of which tables a workpiece can be set at a

- 2 -

different level from the other tables. Movement of the cutter along the ends of the workpieces in a single pass is thus capable of cutting a different joint in each workpiece. The thickness and diameter respectively of the cutting discs determine the width and depth of the slots cut in the workpieces for the formation of joints. The thickness of the spacers determines the spacing of the slots, not only in an individual workpiece but also on a number of workpieces set on the various tables. A single extractor for chips cut in the machining may be provided around the cutter.

The arrangement of three tables side by side is preferred, as it is not practicable to have more than three cutting discs on a spindle without top support, and a top support would complicate the design. Additional tables may be arranged on the other side of the cutter so that a greater number of workpieces can be cut in a single pass. Mechanism may be provided for a workpiece to be moved longitudinally from one side of the cutter to the other after one end has been cut, so that the other end can be cut on the next pass of the cutter.

The cutter may be provided with a multi-speed motor for adjustment according to cutter diameter and to provide optimum space for the workpiece. The means for moving the cutter may include a multi-speed motor, so that the machine can be programmed to make a return movement of a cutter not engaging a workpiece quicker than an advance or cutting movement or may be programmed to move at varying speeds on the cutting stroke. In this way break-out may be mitigated, and cycle time may be optimized. It is also possible to power the table movement, and provide a programme for its control in cooperation with the cutter so as to automate the machine.

- 3 -

The workpieces are preferably set at different levels through the tables themselves being settable so that a number of similar workpieces can each have the same end joint formation cut in an end. Alternatively a number of  
5 workpieces can be loaded on each table. The level of the tables may be adjusted, for example by half a pitch so that complimentary end joints are cut in the workpieces on each table. This can be useful in the formation of finger joints or corner locking for example.

10

#### Drawings:

Figure 1 is a side elevation of a machine according to the invention;

Figure 2 is a front elevation of the machine shown in  
15 Figure 1, with the arrangement of an additional set of tables shown in broken lines to the left; and

Figure 3 is a plan corresponding to Figure 2.

#### Best Mode

20 With particular reference to Figure 1, the machine comprises a rotary cutter 10 movable from left to right past three tables 12, 14, 16 for supporting workpieces. The cutter 10 has a number of cutting discs (not individually shown) separated by spacers and set on a  
25 sleeve for rotation as a unit about a spindle in a manner known in itself. The tables are each provided with a vertical adjustment screw 12', 14', 16' through which workpieces can be set at different levels in relation to the machine. Thus movement of the cutter 10 along the ends  
30 of the workpieces from left to right in Figure 1 cuts a joint in the end of each workpiece in a single pass.

The cutter 10 is provided with a main motor 20 which can be switched on with the remainder of the machine by pushing a  
35 button on a control panel 22. The cutter 10 and main

- 4 -

motor 20 are movable past the tables 12, 14, 16 along a traverse screw 26 by a traverse motor 28 (Figure 3) through a drive connection 30. The traverse motor 28 can be reversed at the end of the pass by a limit switch 24. The position of the limit switch 24 may be adjusted or varied, possibly so as to be situated after each table, to assist in the control of the machine.

The table 12 is shown as provided with a clamp 32 for securing a workpiece. The table 14 is shown as provided with a shoulder stop 34, and the table 16 with an end stop 36. In fact, each table is provided with all these accessories, and those not shown have been omitted in the interests of clarity. These accessories are manually operable, but could be pneumatically actuated, for example as part of a numerical control system for the machine as a whole.

Figure 2 shows how the traverse screw 26 is mounted on a beam 40, which itself is mounted on a beam support 42, which is the main frame member of the machine. Figure 2 also shows a horizontal adjustment screw 44 through which the proximity of the tables 12, 14, 16 to the cutter 10 can be varied. The cutter 10, through the main motor 20, is fast on a carriage 46 which runs along the traverse screw under the power of the traverse motor 28.

#### Operation

Workpieces are clamped on the three tables 12, 14, 16, each contacting an end stop 36, and having its other end projecting from the table towards the cutter 10. The workpieces may have been cut to a desired length, and or have been moved longitudinally from a position to the other side of the cutter 10 at which the other end has had a joint formed, or may be cut to a desired length by means of

- 5 -

a saw (not shown) ahead of the cutter 10 on the carriage 46. A start button on the control panel 22 is then pressed, the main motor 20 is thus actuated and the cutter 10 starts to rotate anti-clockwise as shown in Figure 3.

5 The traverse motor 28 is then actuated to move the carriage 46 (together with the main motor 20 and cutter 10) along the traverse screw 26 from a park position to the left as shown in Figure 1 towards the right. As the cutter 10 passes the tables 12, 14, 16, it cuts an end joint in the

10 workpiece clamped on each table. During this pass, the operator can be doing other jobs around the machine. When the cutter 10 reaches the end of its pass, the limit switch 24 is actuated to reverse the traverse motor 28 so that the cutter 10 is returned to its park position. This operation

15 may be controlled so that the return pass is performed more quickly than the advance.

- 6 -

CLAIMS:

1. A machine for cutting end joints which comprises a rotary cutter (10) movable past means (12, 14, 16) for supporting workpieces characterised in that the cutter (10)  
5 has a number of cutting discs set coaxially and separated by spacers, and the support means comprises at least two tables (12, 14, 16) on each of which tables a workpiece can be set at a different level from the other tables.
- 10 2. A machine according to claim 1 in which three tables (12, 14, 16) are arranged side by side.
3. A machine according to claim 1 or claim 2 in which additional tables are arranged on the other side of the  
15 cutter (10).
4. A machine according to any preceding claim in which a mechanism is provided for a workpiece to be moved longitudinally from one side of the cutter (10) to the  
20 other after one end has been cut.
5. A machine according to any preceding claim in which the tables (12, 14, 16) can be adjusted as to level.

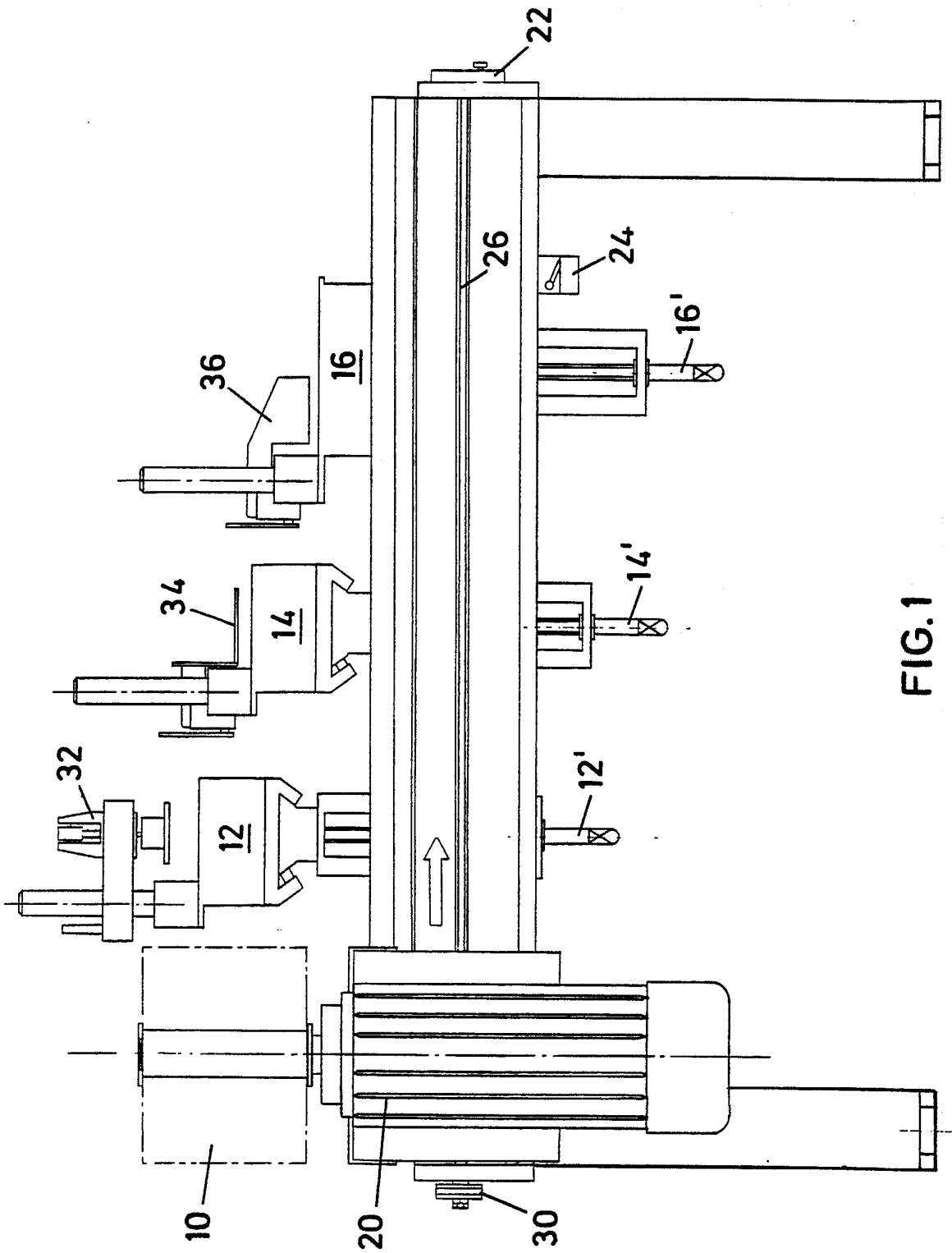


FIG. 1

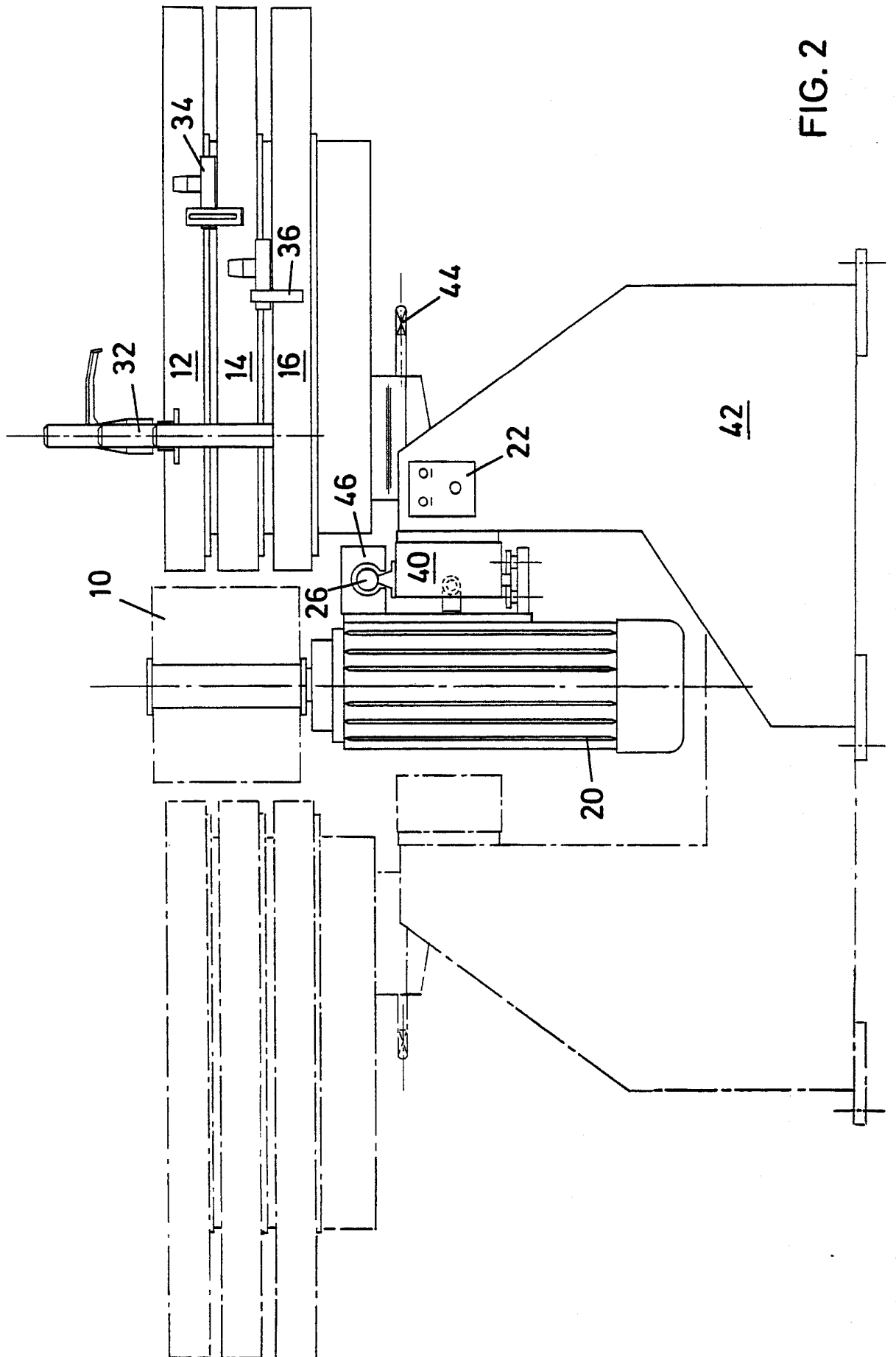


FIG. 2

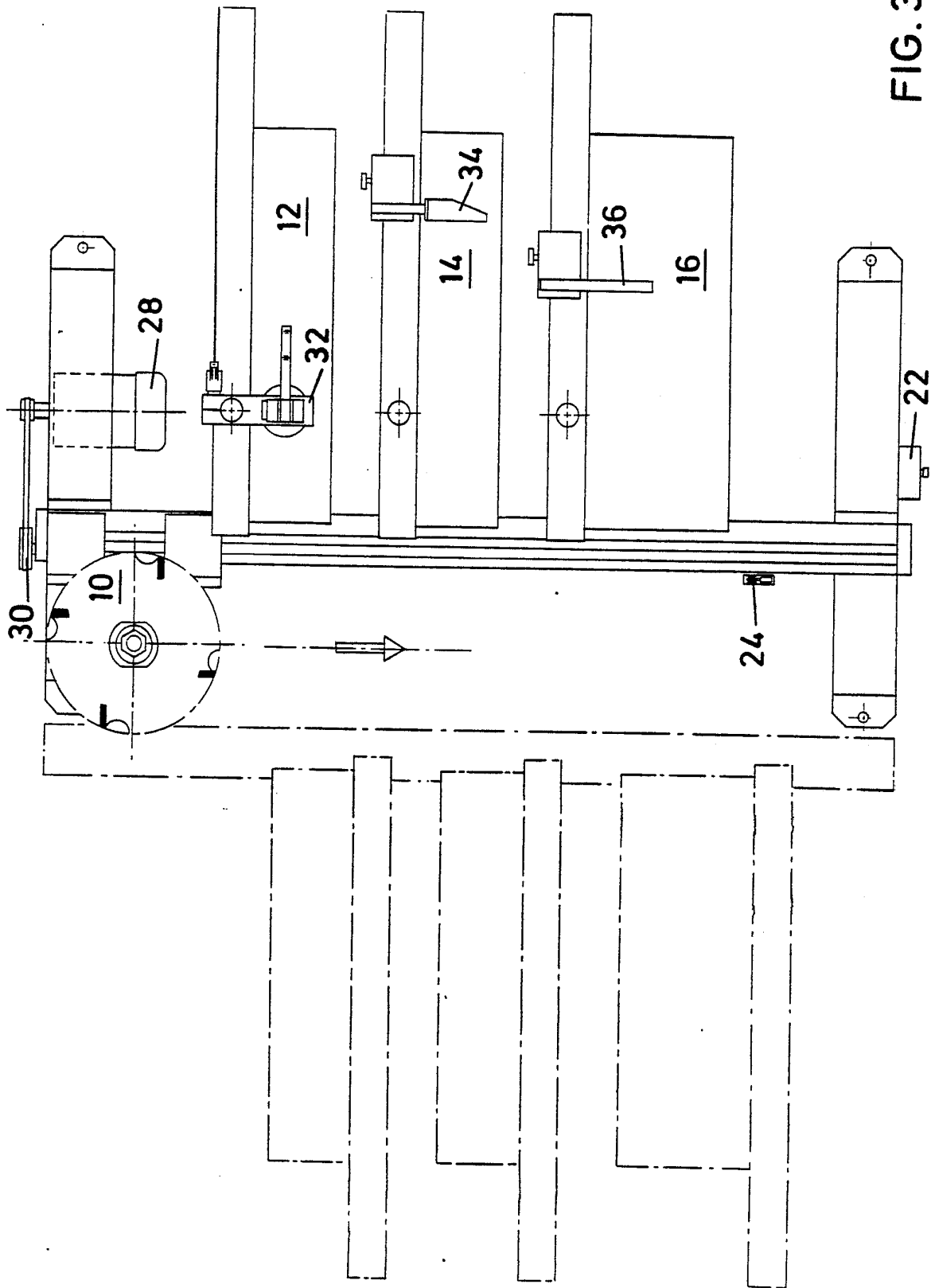



FIG. 3

# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 87/00166

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>4</sup> : B 27 F 1/02		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC <sup>4</sup>	B 27 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	FR, A, 612778 (GUILLIET) 7 August 1926 see page 1, lines 42-45, 58-61; page 2, lines 46-51, 58-69, 80-97; figures 1-4	1
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A	FR, A, 2541926 (WEINIG) 7 September 1984 see page 4, lines 10-19; page 6, line 35 - page 9, line 34; figures 1-3	1,3,4
	--	
A	FR, A, 2521058 (CELASCHI) 12 August 1983 see page 4, lines 10-34; figure 2	1
	--	
A	FR, A, 1478625 (THEBAULT) 20 March 1967 see page 2, left-hand column, paragraph 1; figures	1
	--	
A	US, A, 4248280 (TAYLOR) 3 February 1981 see column 2, lines 34-36; figures 1-3	1-4
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A	./.	
<p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
26th May 1987	23 JUN 1987	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	M. VAN MOL 	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	EP, A, 0102806 (BOARDMAN) 14 March 1984 see the whole document cited in the application	1
--		
A	US, A, 4557303 (GARDNER) 10 December 1985 see column 5, lines 62-68; figure 8	5
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 87/00166 (SA 16454)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 18/06/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 612778		None	
FR-A- 2541926	07/09/84	DE-A- 3307809	06/09/84
FR-A- 2521058	12/08/83	None	
FR-A- 1478625		None	
US-A- 4248280	03/02/81	None	
EP-A- 0102806	14/03/84	GB-A- 2125729	14/03/84
US-A- 4557303	10/12/85	EP-A- 0169286	29/01/86

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