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(54) Apparatus for cutting panels.

(57) An apparatus for cutting panels (P) of wood or the like comprises a cutting carriage (C) which is movable along a cutting line with respect to a worktable supporting the panel to be cut, and includes a circular saw (S) and means (9, 10) for rotatively actuating the saw and for adjusting its position perpendicularly to the worktable. The saw (S) is constituted by at least two co-axial and aparallel saw discs (1, 101) which may be displaced axially with respect to each other with the aid of remotely-controlled adjusting means (15, 22, 122) whereby during a forward stroke (A) of the cutting carriage (C) the saw (S) performs a first cut (T1) of larger width (L') and of partial depth, and during the return stroke (R) it performs a second cut (T2) of smaller width (L) and penetrating throughout the thickness of the panel (P).

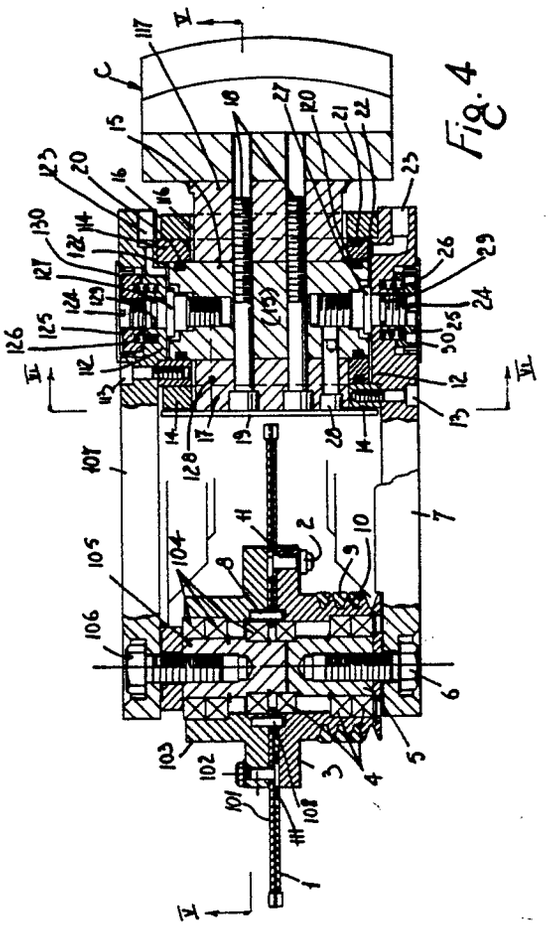

Fig. 4

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"Apparatus for cutting panels."

The present invention relates to an apparatus for cutting panels or packs of panels, of wood, plastics material, or similar materials, by means of a cutting carriage comprising a circular saw and means for rotatively actuating said saw, said carriage being movable in either directions along a cutting line with respect to a worktable whereon the panel or pack of panels to be cut is supported, means being provided to adjust the position of said saw normally to said table, whereby during a forward stroke of the cutting carriage is effected a first cut by which said circular saw only partially penetrates the thickness of the panel or pack of panels, and during the return stroke of the cutting carriage is effected a second cut by which said saw completes the first cut by penetrating throughout the thickness of the panel or pack of panels.

The machines of this type are known, for example, from the Italian Patent Application 12532 A/85. In these known machines, the saw is formed by a single saw-disc and the first cut, performed during the forward stroke of the cutting carriage, has the same width as the second cut which is performed during the return stroke of the cutting carriage. As a result, during the return stroke of the cutting carriage, the saw may engage the edges of the slit created by the first cut, with resulting splintering of these edges.

This invention aims to eliminate these disadvantages and to provide a machine of the type described in the preamble, wherein the splintering of the edges of the slit created by the first cut is avoided.

The problem is solved by the invention in that the saw is formed by at least two co-axial, parallel saw discs which may be displaced axially with respect to each other so as to vary the total width of the peripheral cutting edge of the saw, remotely-controlled adjustment means being provided to adjust the width of the cutting edge of the saw during the forward stroke of the cutting carriage to a higher value than the width of the cutting edge of the saw during the return stroke of the cutting carriage, so as to obtain a first cut which is wider than the second cut.

Some advantageous embodiments of the invention will be characterized in the sub-claims.

The characteristics of the invention and the advantages resulting therefrom will be apparent from the following description of a preferred, exemplary embodiment, shown merely by way of non-limiting example in the figures of the accompany drawings, wherein:

Figure 1 is a diagrammatic side elevational view of a cutting apparatus according to the invention.

Figures 2 and 3 are cross sectional views of the composite saw of the apparatus according to the invention, during successive operational steps.

Figure 4 is a sectional view of the apparatus on an imaginary horizontal plane containing the axis of the composite saw.

Figures 5 and 6 are sectional views on the lines V-V and VI-VI, respectively, showing further constructional details of the apparatus of figure 4.

Figure 7 is an elevational view of the inner side of one of the arms supporting the saw of the apparatus according to the invention.

Figure 8 is a sectional view on the line VIII-VIII of figure 7, showing further details of the arm of figure 7.

The cutting apparatus according to the invention utilizes a circular saw S which cuts a pack of panels or a single panel P in two steps, i.e. through a portion T1 of its thickness during the forward or rightward stroke A, and through the remaining portion T2 during the return or leftward stroke R, the axis of rotation of saw S remaining at all times below or above said material P.

The direction of rotation of the saw S and the direction of its teeth are such that the surfaces of the lower face and upper face of the material P to be cut, and the surfaces of the two sides of said material, acted upon successively during the forward and backward strokes of said saw and, possibly, during supplementary strokes thereof, will be submitted to compressive forces inwards of said material P, so as to avoid the formation of splinters or other defects on the cut edges.

The circular saw S is composed of two side-by-side co-axial saw discs or blades having the same characteristics and the mutual spacing of which may be adjusted, through servo-controls, with self-centering and symmetric displacements, whereby the assembly of said saw discs may effect a cut of variable width depending upon a remote control, which may be easily automated with limit-sensors. During the forward stroke A of this saw S, the latter effects a cut T1 having a longitudinal axis aligned therewith, whereby during the execution of the cut T2, the assembly of the saw discs will not interfere with the sides of the cut T1 and, therefore, will not cause the formation of any splinters as, contrarily, occurs in the previous art.

With reference to figure 4, the numerals 1, 101 indicate the two saw discs having usually the same characteristics and size, axially in line with each

other, closely spaced from each other and so that the teeth of one saw disc are disposed intermediately of the interval existing between two consecutive teeth of the adjacent saw disc. As a limit condition, it may be provided that the bodies of the two saw discs 1, 101 be in contact with each other when said saw discs are in their most approached condition, but it is to be understood that this condition is not a limiting or strictly required condition. It is also to be understood that, in contrast with what shown herein, the inner or opposite sides of the teeth of said saw discs may be co-planar with the corresponding inner face of said saw discs, so that the teeth of the two saw discs need not be staggered from each other.

Finally, it is to be understood that the saw discs 1, 101 may have teeth of different characteristics though having the same diameter, or that they may have slightly different outer diameters.

However, preferably, the teeth of the two saw discs 1, 101 protrude by the same extent from both sides of the body of said saw discs, whereby in both conditions of maximum and minimum spacing between said saw discs there will be no void space in the transverse direction, so that the cuts effected by the composite saw 1, 101 will be exempt from intermediate scraps.

Again with reference to figure 4, it will be noted that said saw discs 1, 101 are secured by means of screws 2, 102 to the flanges 3, 103 which, through bearings 4, 104, are rotatably mounted on hubs 5, 105 which are fixed perpendicularly, by means of screws 6, 106, on parallel arms 7, 107 which connect said hubs in cantilever fashion to a supporting structure to be described below.

The inner race of one 4 of the bearings acts as a guiding and centering means for the free end of the hub 105.

By means of axial pins 8, 108 fixed to one 103 of the flanges 3, 103 and received into holes formed in the other flange 3, said flanges are keyed to each other to be both rotated by belts 9 which co-operate with grooves 10 formed in the collar of said flange 3. Each saw disc is also characterized in that it is provided with holes 11, 111 receiving, in staggered fashion, the screws 2, 102 to secure said saws to the flanges 3, 103, whereby said saw-discs will be arranged as close as possible to each other so that their bodies will engage, or substantially engage, with each other.

With reference also to figures 7 and 8, it will be noted that said arms 7, 107 are constituted by ribbed plates arranged edgewise and provided, on their inner sides, at their ends opposite to those supporting the saw discs, with round and co-axial hubs 12, 112 sealingly receiving thereon round-section sleeves 14, 114, the latter being fixed thereto at one of their ends by means of screws 13, 113 and being slidably telescoped together. A cylindrical member 15 is axially slidably arranged within the sleeve 114.

Said sleeves 14, 114 are formed longitudinally with equal slots 16, 116 the longitudinal central axis of which is located on an imaginary horizontal plane containing the axis of said sleeves, and the horizontal sides of which are located on other imaginary planes which are parallel and equally spaced from the first-mentioned imaginary plane. Arranged in said slots are members 17, 117 which are firmly secured to the member 15 by means of screws 18 and which are so shaped as to firmly clamp said member 15. It is to be understood that unlike the embodiment shown herein, said member 15 may be formed with flats for contacting flat ends of the members 17, 117, and it is also to be understood that said flats may be of any shape.

A shield or guard 19 is fixed to the end of said member 17 that protrudes from the sleeve 14, to prevent dust and chips from entering the slots 16, 116. The member 117 is secured in a conventional and adjustable manner to the structure of the powered saw-carrying carriage C which, under command, drives the saw S along the forward and backward strokes discussed above with reference to figure 1. The constructional details of said saw-carrying carriage C may be found in the patent application mentioned in the introductory part of this specification.

It will be noted in figure 6 that said slots 16, 116 are in contact with the members 17, 117 only at the ends thereof, so as to facilitate the sliding movement of said sleeves 14, 114 on said members 17, 117 for the displacement permitted by the length of said slots, which is suitably larger than the width of said members 17, 117. It will be noted in figure 4 that mounted at the ends of said member 15 are respective annular seals 20, 120 the outer faces of which sealingly co-operate with the facing end surfaces of the sleeve 114 which, in turn, is provided exteriorly, in front of the arm 7, with a further annular seal 21 the outer face of which sealingly co-operates with the inner face of the sleeve 14, so as to form at the base of each sleeve, around the respective hubs 12, 112, plenum chambers 22, 122 perfectly sealed from the outside which may be filled with pressurized fluid through conduits 23, 123 formed in the arms 7, 107 (see also figure 7).

Axially screwed in the ends of said member 15 are respective screws 24, 124 which are passed with sufficient backlash through holes in the arms 7, 107 (see below) and which are threadedly provided with respective nuts 25, 125 co-operating with springs 26, 126 urging said arms against shoulders or rims 27, 127 integral with said screws.

By adjusting the extent of screwing of said screws 24, 124 in the member 15, the operator may adjust the position at rest of the arms 7, 107 and, therefore, the spacing between the saw discs 1, 101 when the latter are in their minimum-spacing condition. Said screws 24, 124 can be locked by means of set-screws 28, 128. On the contrary, by acting on the nuts 25, 125, the operator may adjust the extent of calibration of the springs 26, 126 and the spacing between the arms 7, 107 and saw discs 1, 101, since said nuts serve as stop means in the spreading-apart movement of said saw-carrying arms. By introducing pressurized fluid into the chambers 22, 122, said saw discs will be spaced apart in a self-centering manner to a pre-established extent, whereas by connecting said pressurized chambers with a discharge outlet, the action of said springs 26, 126 will move said saw discs again to their minimum spacing. In order to avoid any leak of pressurized fluid from the chambers 22, 122, suitable annular seals 29, 129 are provided on the portions of the screws 24, 124 in the arms 7, 107.

The operation of the apparatus described above is simple and apparent. During the performance of the first cutting step, in the forward stroke A, the saw discs 1, 101 are in their maximum spacing condition, as shown in figure 2. In this condition, the plenum chambers 22, 122 are under the action of the pressurized fluid. During the performance of the second cutting step, in the backward stroke R, said plenum chambers are in communication with the discharge outlet and said saw discs 1, 101 are in their minimum spacing condition as shown in figure 3. As a result, the cut T2 effected during the second step has a suitably smaller width L than the width L' of the cut T1 effected in the first step, and the two cuts are perfectly aligned with a central plane, so that the outer sides of said saw discs and the chips entrained thereby will never interfere with the edges of the first cut and will cause no splintering of said edges, as would occur if both cuts had been effected by a single tool.

The apparatus of the invention can be utilized otherwise, such as for performing blind cuts, or for other operations. It is also to be understood that many changes and modifications, especially of constructional nature, may be made to the apparatus as described above. For example, the arms 7, 107 may support the saws 1, 101 at an intermediate point thereof, so that said arms may be supported by the carriage C at both ends thereof. The means for adjusting the spacing between the saws 1, 101 may be different from those illustrated herein, and said means may perform their action either on the arms 7, 107 or directly on the flanges 3, 103 or on the hubs 5, 105 of said saw discs. Moreover, it may be contemplated that, through one of the hubs 5, 105 pressurized fluid may be admitted into the gap between the two saw discs in order to assure that said gap will be always cleaned and/or in order to cool the material being cut.

Claims

1. An apparatus for cutting panels (P) or packs of panels, of wood, plastics material, or similar materials, by means of a cutting carriage (C) comprising a circular saw (S) and means (9, 10) for rotatively actuating said saw, said carriage being movable in either directions along a cutting line with respect to a worktable (B) whereon the panel (P) or pack of panels to be cut is supported, means being provided to adjust the position of said saw (5) perpendicularly to the table (B), whereby during a forward stroke (A) of the cutting carriage (C) is effected a first cut (T1) by which said circular saw (S) only partially penetrates the thickness of the panel (P) or pack of panels, and during the return stroke (R) of the cutting carriage (C) is effected a second cut (T2) by which said saw (S) completes the first cut by penetrating throughout the thickness of the panel (P) or pack of panels, characterized in that said saw (S) comprises at least two co-axial, parallel saw discs (1, 101) which may be displaced axially with respect to each other so as to vary the total width of the peripheral cutting edge of the saw (S), remotely-controlled adjusting means (15, 22, 122) being provided to adjust the width of the peripheral cutting edge of the saw (S) during the forward stroke (A) of the cutting carriage (C) to a value (L') which is higher than that of the width (L) of the cutting edge of the saw (S) during the return stroke (R) of the cutting carriage (C), so as to obtain a first cut (T1) which is wider than the second cut (T2).

2. Cutting apparatus according to claim 1, characterized in that the saw discs (1, 101) have the same characteristics and have teeth which are staggered from each other and preferably protrude to the same extent from both sides of the bodies of said saw discs, whereby when said saw discs (1, 101) are in their maximum spacing condition no void space is left between the teeth of said saw discs and, therefore, no intermediate scrap will be formed in the portion of material acted upon by said saw discs.

3. Cutting apparatus according to claims 1 and 2, characterized in that means are provided to admit fluid into at least an axial recess of at least one of said saw discs (1, 101) and into the gap between said saw discs (1, 101), in order to clean said gap and/or cool the material being cut.

4. Cutting apparatus according to claims 1-3, characterized by means (screws 24, 124; nuts 25, 125) to adjust the spacing between said saw discs (1, 101) when at rest and to modify the extent of the spacing apart and self-centering displacement of said saw discs.

5. Cutting apparatus according to the preceding claims, characterized in that flanges (3, 103) carrying the two saw discs (1, 101) are keyed together by means of parallel pins (8, 108) permitting axial displacement of said saw discs, said saw discs (1, 101) being rotatably supported by respective parallel arms (7, 107) which are provided on their inner sides with telescopically-coupled sleeves (14, 114), the inner sleeve (114) being slidably mounted on a member (15) which, in turn, is supported by the structure of the cutting carriage (C) by means of supports (17, 117) extending, with a suitable backlash, through longitudinal opposite slots (16, 116) formed in said telescopic sleeves, annular seals (20, 120, 21) being provided on the ends of said inner member (15) and of said sleeves (14, 114) in order to form plenum chambers (22, 122) whereinto pressurized fluid may be admitted to effect the desired mutual spacing of said saw-carrying arms (7, 107) and of said saw discs (1, 101), the ends of said inner member (15) being provided with screws (24, 124) with inner shoulders or rims (27, 127) to stop the saw-carrying arms (7, 107) in the desired condition of minimum spacing and with outer nuts (25, 125) to stop the saw-carrying arms (7, 107) in the desired condition of maximum spacing and to oppose the springs (26, 126) urging said arms (7, 107) toward the condition of minimum spacing.

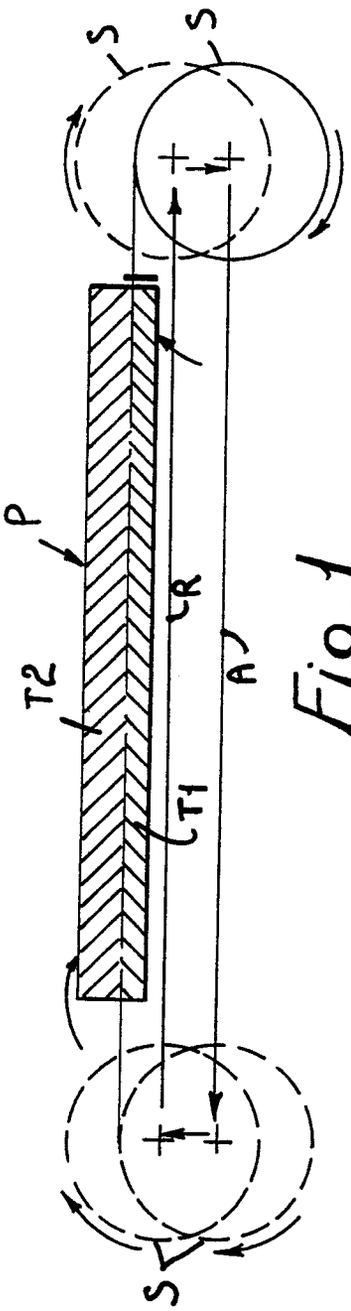


Fig. 1

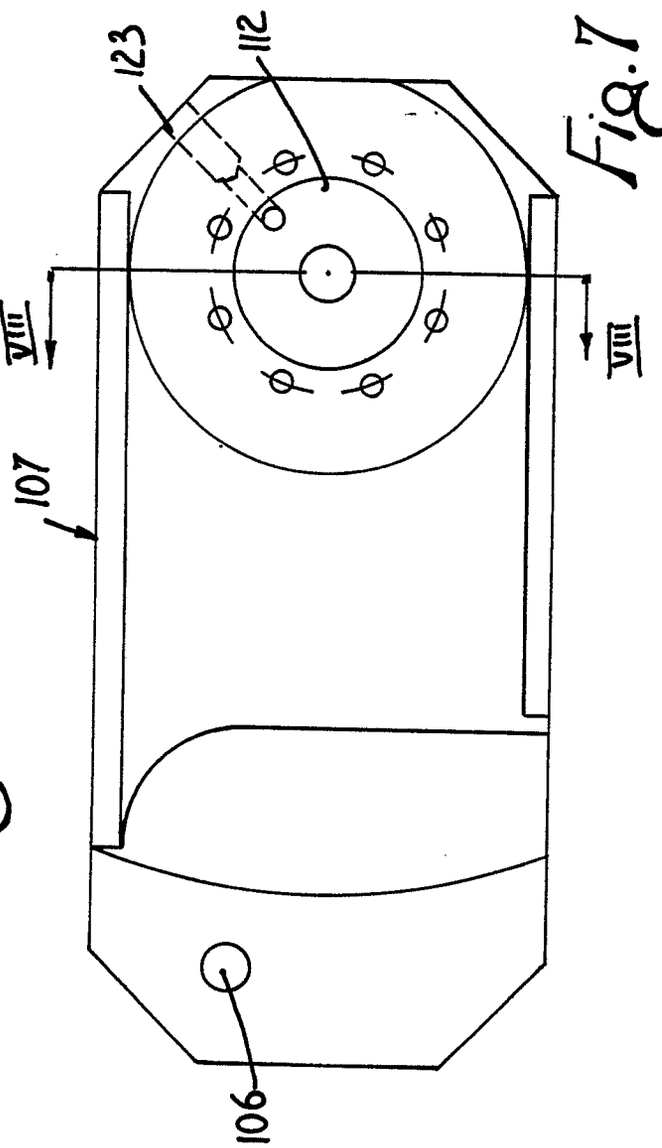


Fig. 7

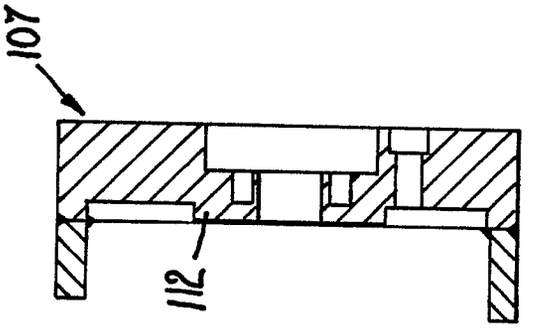


Fig. 8

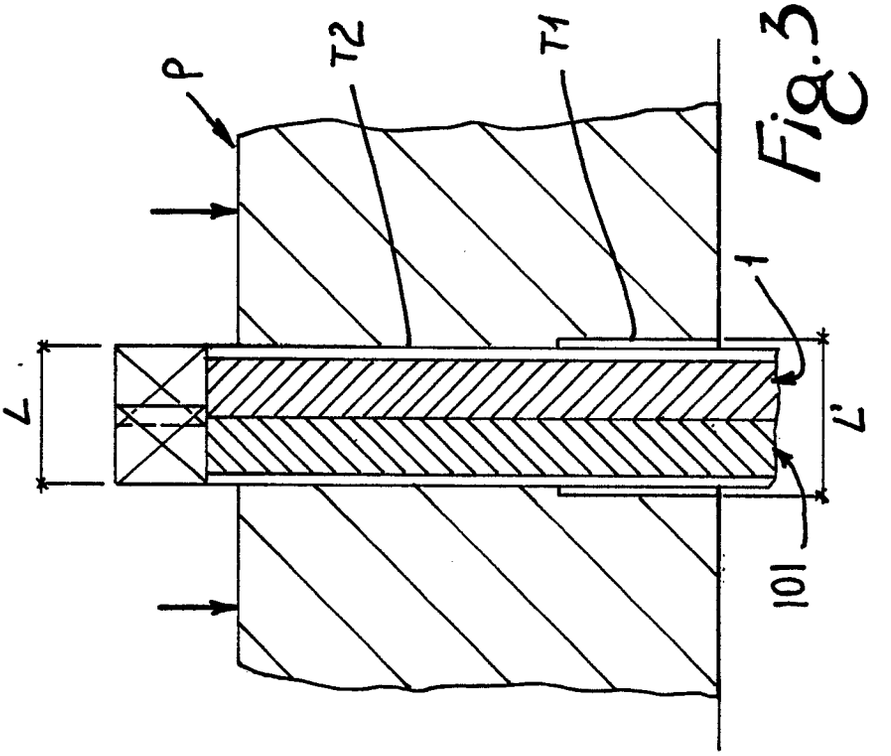


Fig.3

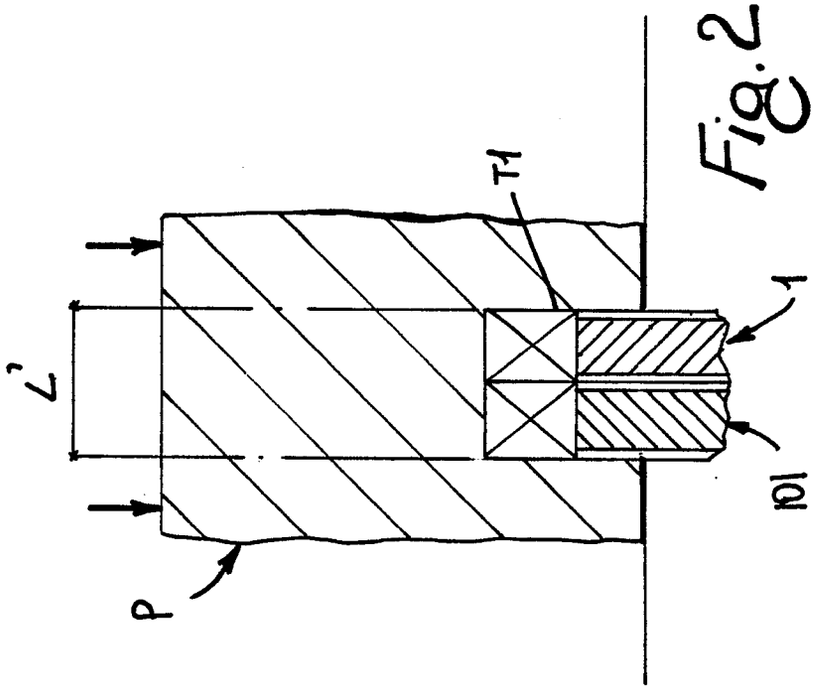


Fig.2

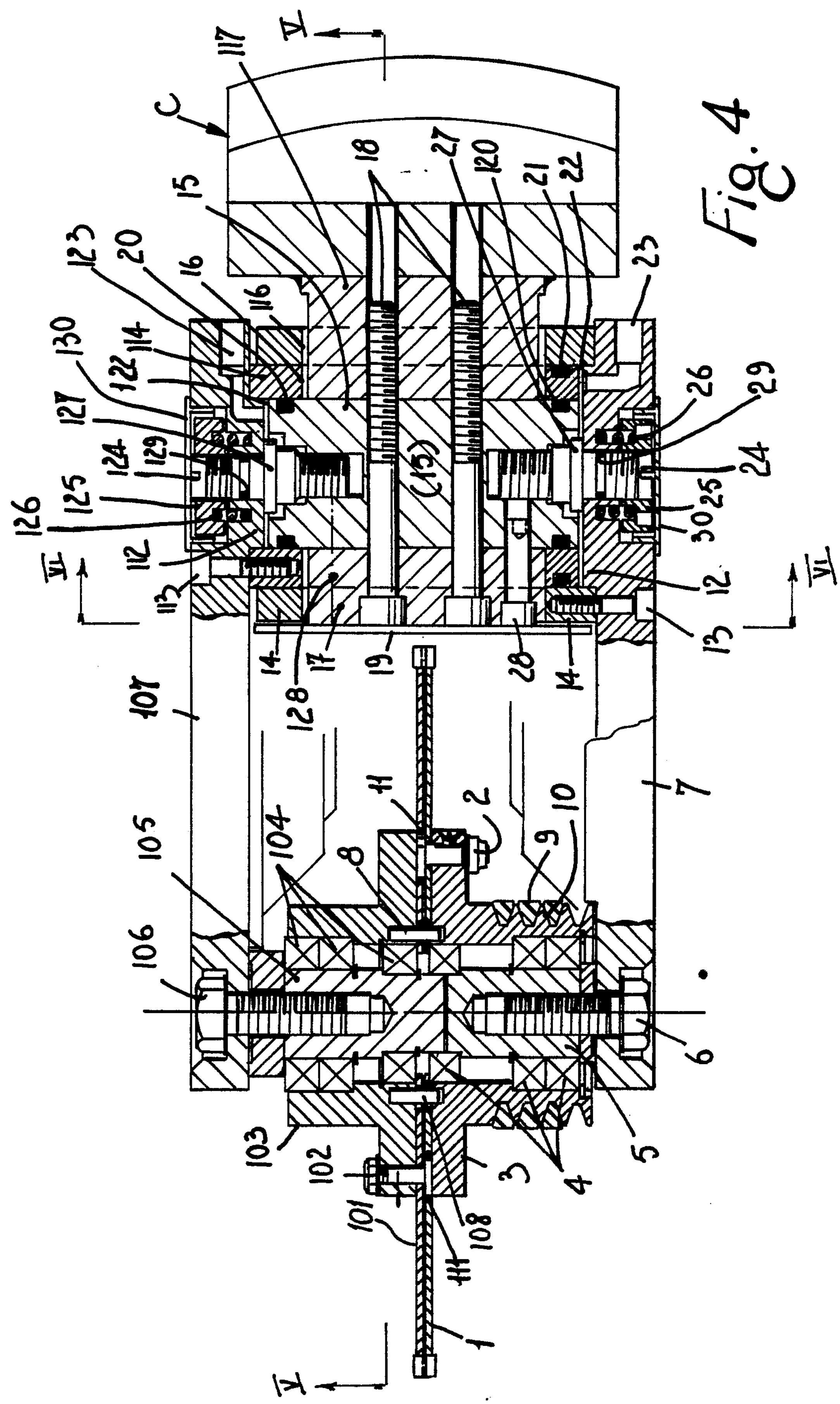
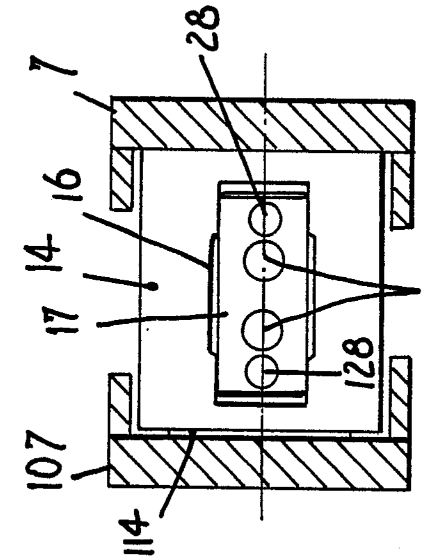


Fig. 4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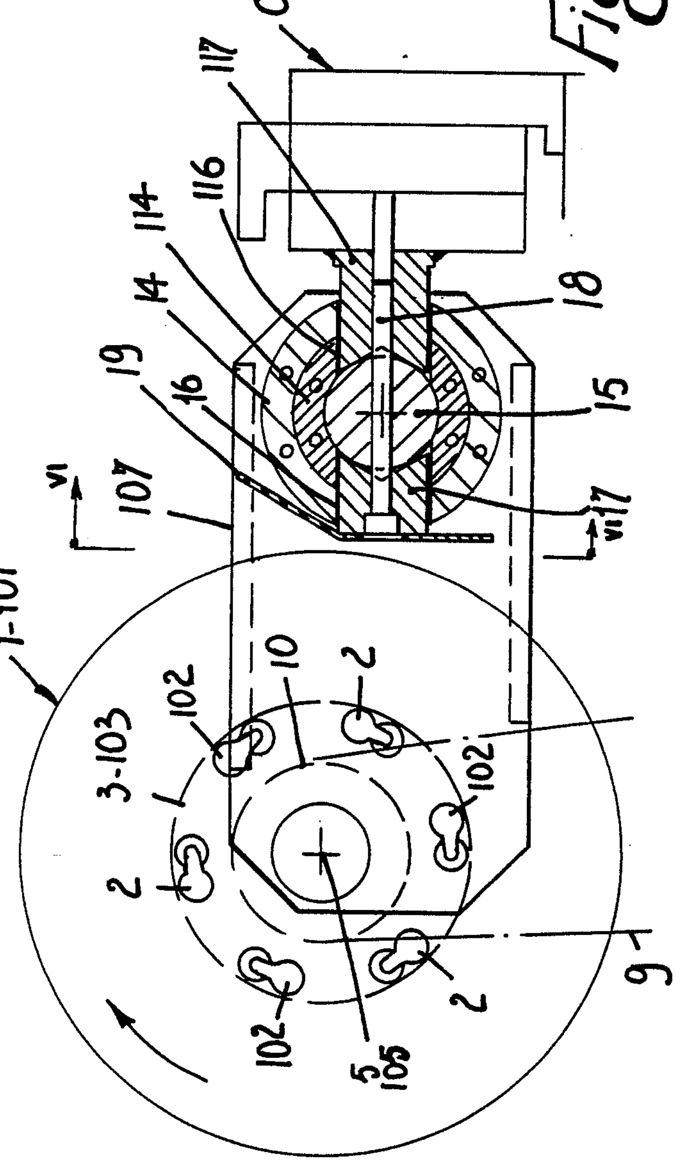
114

Fig. 6
C


C
117
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114
14
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16
107
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VI
VI
1-101
3-103
102
10
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102
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102
2
5
105
9

Fig. 5
C

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EUROPEAN SEARCH REPORT

Application Number

EP 87 11 7388

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)
Y	GB-A-2 059 338 (ALBERY) * Page 1, lines 9-43; page 2, lines 64-94; page 3, lines 4-10,76,77,85-105; figures 4a,4b,7 *	1,2,4	B 27 G 19/10 B 27 B 5/34
Y	US-A-2 788 812 (JACOBS) * Column 1, lines 15-26,54-61; figures 1,3,4 *	1,2,4	
A		5	
A	DE-A-2 458 330 (MEYER) * Page 4; figures 1,2 *	1	
A	GB-A-2 166 082 (VERMONT AMERICAN) * Page 1, lines 5-10; page 2, lines 21-32; page 3, lines 66-70; figures 2,4 *	1	
A	US-A-3 240 243 (GOLICK) * Column 1, lines 23-30; figures 3-5 *	3	
A	US-A-2 179 250 (D'AMATO) * Whole document *	5	TECHNICAL FIELDS SEARCHED (Int. Cl.4) B 27 G B 27 B
A	EP-A-0 077 517 (GIBEN IMPIANTI)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-03-1988	HUGGINS J.D.

CATEGORY OF CITED DOCUMENTS

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