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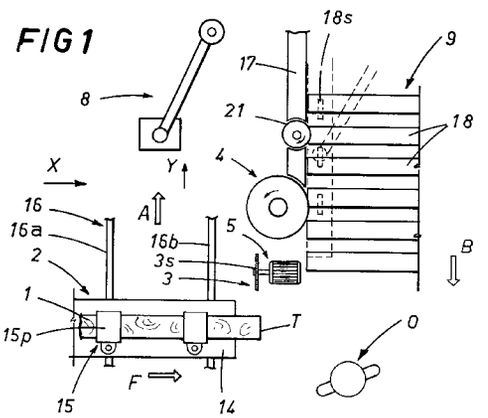
(54) A woodworking machine.

(57) The machine comprises : first transport means (2) for workpieces (1) which bring, along an advancement line (A), a workpiece (1) to engage with a first (3) and a second (4) tool, so that the workpiece (1) head (T) can be sheared ; it further comprises a pair of first and second fixed chucks (5 and 6), one having a horizontal (X) and another a vertical (Z) axis, arranged along an operative adnvancement line (A) of the first transport means (2). The machine further comprises workpiece (1) positioning means (8) disposed at the endrun zone of the first transport means (2), acting on the same workpiece (19 and aimed at rotating the said piece (1) at a position of second transport means (9) arranged at a different height to the first (2), and having the aim of moving the piece in an opposite direction (B) to the first advancement line (A) such as to engage a third tool (10) in an opposite zone to the second tool (4), both tools (10 and 4) being chucked on the same chuck (6) and being arranged coaxially to each other at different heights (Qv, Qv1), so as to perform work operations on the workpiece (1) along its longitudinal profile.

FIG 1



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The invention relates to a woodworking machine, in particular for tenoning, profiling, squaring, finishing and suchlike operations.

At present such machines work standardly to produce tenons and crosspieces for wood window frames. Several work stations are necesssary in order to arrive at a finished product, with the workpieces being horizontally transported along guides from one to station to another.

The generally longitudinally-developing lengths of wood follow a work itinerary similar to the following. First, they are taken to a shearing station bearing a first tool, usually a circular saw adjustable on both its axes and set according to the piece to be worked. From the above, the piece passes on to a second station equipped with another tool, height-adjustable like the first, which transversally profiles the piece on its smaller sides, an operation commonly known as tenoning. A perpendicular guide then conveys the piece to a third station equipped with another height-adjustable tool that profiles the piece along its longer sides.

Once these primary phases have been completed, the piece can be further processed by taking it to yet another station and performing an operation whereby the strip of frame which will form the beading for the eventual glass pane is removed whole. The external finishing of the window frame can also be performed here.

From the above summary description of machines of this type, it can be deduced that they contain several drawbacks, such as:

- considerable mass, due to the distance between the workstations, not forgetting that the machines are not exactly coordinated, which can lead to delays while workpieces are transported or positioned correctly by hand;
- high costs relative to production levels, low-to-medium per unit/hour, partly due also to the not-infrequent tool-adjustments which have to be performed manually.

A more advanced solution to this type of machine (see patent DE-3536221) envisages the use of a multi-tool chuck arranged in a central position on one machine, which chuck has a vertical axis or TOUPIE, the axis being adjustable and mobile horizontally, so that an operator can use it both for tenoning and for profiling, or for finishing only.

In practice, the above solution is used by first chucking the tenoning tool at the tenoning station arranged downstream of the initial shearing station. Once the tenoning operation - whether single or plural - has been completed, the chuck with its tool are slid horizontally (and contemporaneously along the vertical axis) up until it reaches the position of a second transport guide to the profiling station, perpendicular to the preceding guide and enabling the longitudinal profiling of the workpiece to be carried out.

This solution certainly compacts the main work operations into a smaller space, and especially reduces the costs of the machine (since no profiling tool is in fact used), but it does not obviate the need for manually adjusting the tool each time the type of task is changed.

Also, with the above machine, work cycles remain long, being dependent on the operative runs of the workpieces.

So it can be concluded that in this particular work sector there is no machine structured in such a way as to be capable of effecting two different tasks, such as for example tenoning and profiling, on the same workpiece and during the same work cycle. Further, no machine returns the same workpiece to the operator's position, but usually distances it from him, transporting it to a successive work station.

The aim of the present invention is thus to obviate the above-mentioned drawbacks by providing a woodworking machine structured having a small mass while being capable of performing all of the essential operations, such as squaring, tenoning and profiling simultaneously and in a single work cycle on a single operative unit, leading thus to considerable economic savings as well as time and personnel saving.

The technical characteristics of the invention according to the above aims will clearly emerge from the contents of the appended claims, and the advantages of the invention will better emerge from the detainled description that follows, made with reference to the accompanying figures of the drawings, which represent an embodiment here included purely by way of non-limiting example, and in which:

- figures 1 to 4 schematically show the woodworking machine of the present invention in various positions during the work cycle;
- figure 5 shows in an enlarged lateral view with some parts removed in order better to evidence others, a detail of the machine of the previous figures.

With reference to the figures, the woodworking machine 1 can be used in the field of realising uprights and crosspieces to make up a wood frame, through the operations of shearing, tenoning and longitudinal profiling.

The principal elements of the machine are: first transport means 2 of the workpieces 1, positioning or rotating means of the workpieces 1 as they leave the first transport means 2, and second transport means 9.

More specifically (see figures 1 to 5), the first transport means 2, of known type, comprise a rest plane 14 (constituting the mobile part of a transport system having at least two commanded axes X and Y on the horizontal plane) provided with blocking means 15, so as to hold the workpiece 1 in position. The blocking means 15 are of known type and are

constituted by at least a pair of pliers 15p, openable at one end and capable of blocking the workpiece 1 or more than one workpiece 1 held side-by-side. The rest plane 14 is adjustable by adjustment means 16 constituted by a series of guides 16a and 16b to which the rest plane 14 is constrained on the lower non-operative surface, commanded by pneumatic or mechanical means (not illustrated since of known type) and thus the plane 14 can be moved along the commanded axes.

Being thus mobile, the rest plane 14 can bring the workpiece 1 to engage with a first 3 and a second 4 tool as it slides along the guides 16a and 16b according to an advancement direction along axes X and Y (see figures 2 and 3). Successive work phases are then carried out on the end T of the workpiece 1 at a predetermined height Qv. In the illustrated case the operations depicted are squaring and tenoning.

The first and second tools 3 and 4 are supported by first and second fixed chucks 5 and 6 with respectively horizontal X and vertical Z axes, which are arranged along the operative advancement lines X and Y of the rest plane 14. Preferably the first chuck 5 is vertically adjustable (for reasons of changes in the workpiece 1 shape) and has a circular saw 3s keyed on to its shaft, which saw 3s constitutes the first cutting tool 3: the second chuck 6 exhibits at least two superposed tools which perform at least two of the abovementioned essential tasks destined to produce a tenon or a crosspiece (all of which will be described in more detail hereinbelow). In the illustrated case five tools can be seen, stacked one above the next, and together capable of producing the profile to be realised on the workpiece 1, which will be different according to the task, whether tenoning, profiling or finishing.

The second chuck 6 is also provided with a tool protective casing 11c, (visible in figure 5) having a pair of opposite openings 12 and 13 arranged at different heights Qv and Qv1, defining a work zone at the position of the second tool 4 and a third tool 10 working on the workpiece 1 in turn according to advancement directions A and B (this will be further elucidated hereinbelow).

In proximity of the endrun zone of the rest plane 14, workpiece 1 positioning means 8 are provided, which act on the rest plane 14 so as to rotate it towards the second transport means 9. Figures 1 to 5 show how the positioning means 8 can be constituted, in the most simplified solution, by pliers 19 connected to a mobile arm 20, which engage the workpiece 1 and rotate it to traverse it from the rest plane 14 to the second transport means 9.

In the illustrated case the positioning means 8 actuate a rotation of the workpiece 1 by about 90 degrees, indicated by alpha in figure 3. This rotation is such that the rest plane 14 and the second transport means 9 have parallel but opposite advancement directions A and B.

The second transport means 9 of the workpiece 1 comprise a fixed guide 17 of the rotated piece 1 and a roller plane 18 with a superior commanded advancement device 18s (for example a rubberised roller conveyor) for horizontally moving the workpiece 1 so that it engages with the third tool 10 with its longitudinal profile. The second means 9 are arranged at a different height Qv1 to the rest plane 14 so as to move the workpiece 1 in direction B opposite to the preceding advancement line A so as to place the third tool 10 in the opposite zone to the zone occupied by the second tool 4, in order that the workpiece 1 is worked on at its longitudinal profile.

A fourth tool 21 cooperates with and is identical to the third tool 10, except in that it rotates in an opposite direction. It is upstream of (in direction B) but close to the third tool 10 and the two tools combined 10 and 21 create a longitudinal shaping of the workpiece 1 which is thus shaped without residual splintering at its tool entrance and exit ends.

A fifth tool is envisaged in the exit zone of the workpiece 1 from the roller plane 18, which fifth tool 22, by exploiting the advancement of the workpiece 1 on the roller plane 18, separates a bead of wood L from the workpiece 1 which bead will become the glass-constraining beading of the frame (see the detail of figure 5).

In the embodiment shown in the figures, the fourth tool 22 can be placed close to the circular saw 3s or can even be an integral part of the saw 3s with the aim of rendering the machine even more compact, which is made possible only by the special architecture of the machine of the invention.

The functioning of the machine will now be described.

The workpiece 1, one or more at a time depending on dimensions and work-cycles, is positioned and blocked on the rest plane 14 (see figure 1), which rest plane 14 moves first in direction X and then Y, bringing the workpiece 1 head up to the saw 3s so as to shear the head.

The rest plane 14 then moves in advancement direction A, which is perpendicular to the second commanded axis Y and brings the workpiece 1 up to the second tool 4 so that the tenoning operation can be carried out at the workpiece 1 head (see figure 2).

Once the tenoning operation has been completed, the rest plane 14 can repeat the above-described cycle when the workpiece 1 has been turned by 180 degrees, shearing and tenoning the second head, then being stopped by the operator, or automatically by the general machine control means, and manoeuvred by the mobile arm 20 with its pliers 19, the said arm 20 blocking the workpiece 1 and lifting it off the rest plane 14 (see figure 3, broken line).

At this point the workpiece 1 is rotated (see figure 3, continuous line and arrow F1) by about a right an-

gle, denoted by alpha, and positioned on the roller plane 18 to strike against the guide 17 with one of its longitudinal sides LG. Then the roller plane 18 and the feeder device 18s bring the workpiece 1 along advancement line B to engage the third tool 10 placed at a lower height than the second tool 4, so that the longitudinal profiling of the workpiece 1 can be performed (see figure 4). This constructional detail does not prevent a successive workpiece 1 from being headed and tenoned on the opposite advancement line A.

At the end of the second operative run the workpiece 1 is situated at the same place as at the beginning, that is, at the operator's position O, where the beading operation can be carried out thanks to the fact that the workpiece 1 exits head-first from the roller plane 18.

With a machine structured in this way it is possible to obtain a greater level of productivity, due to the advancement lines moving in opposite directions, while at the same time the whole machine is of a smaller mass than preceding solutions since two distinct operations (using two distinct tools) are carried out during the same workpiece 1 run, although only one multi-tool vertical shaft Z is used. By a vertical movement of the vertical shaft Z a correct tool can be selected for finishing the workpiece 1, or two other tools for tenoning, profiling or otherwise working the wood workpiece 1.

A further advantage is constituted by the fact that the operator can position himself at position O, from where he can advantageously control all work phases. A still further advantage is that the machine affords a more rational suction of the shavings at the casing 11c, since the tools are much closer to each other than in the prior art machines, so that a single aspiration point can be defined.

Claims

1. A woodworking machine, in particular for realising uprights and crosspieces for frames through a working of at least heads, tenons and longitudinal profiles of a wooden workpiece (1), characterised in that it comprises:
   - first transport means (2) of wooden workpieces (1), which transport means (2), in accordance with an advancement line (A) lying on a horizontal plane at a determined height (Qv), bring a workpiece (1) to engage a first (3) and a second (4) tool, which tools (3 and 4) each work on the workpiece (1) at a head (T) of the workpiece (1), respectively carrying out a shearing and a tenoning operation, the said tools (3 and 4) being constituted by:
   - a pair of first (5) and second (6) fixed chucks, one of the chucks having a horizontal axis (X) and another having a vertical axis (Z), the chucks (5 and 6) being arranged along the advancement line (A) of the first transport means (2) and supporting the first (3) and second (4) tools, the second tool (4) being placed at a determined height (Qv); the second chuck (6) exhibiting at least a third tool (10), placed at a different height (Qv1) from the height (Qv) of the second tool (4), to perform a remaining work operation, which can be a longitudinal profiling;
   - workpiece (1) positioning means (8), arranged in an endrun zone of the first transport means (2), acting on the workpiece (1) and aimed at rotating the workpiece (2) at a position of;
   - second transport means (9) of the workpiece (1), arranged at a different height (Qv1) from the first transport means (2) and aimed at moving the workpiece (1) according to an advancement direction (B) which is opposite to the first advancement direction (A) so that it will engage the third tool (10) on a horizontal plane in an opposing zone to a work zone of the second tool (4), such as to permit of working the workpiece (1) along its longitudinal profile (LG) and to bring the workpiece (1) to the position of the first tool (3).

2. A machine as in claim 1, characterised in that the second chuck (6) has a minimum configuration of at least two tools (4) superposed one above another and defining a stack of tools; the second chuck (6) being also provided with covering means (11) of the tool stack, which covering means (11) exhibits a pair of apertures (12 and 13) which face in opposite directions at differing heights (Qv, Qv1), and which define an operative zone of the second (4) and third (10) tools engaged by the workpiece (1) in the advancement lines (A,B).

3. A machine as in claim 1, characterised in that the first transport means (2) are constituted by a rest plane (14) provided with blocking means (15) of the workpiece (1) which blocking means (15) are height-adjustable, by using appropriate height-adjusting means (16), as well as adjustable on their own longitudinal and transversal axes.

4. A machine as in claim 1, characterised in that the second transport means (9) are constituted by a fixed guide (17) for the workpiece (1) and a roller plane (18) for moving the workpiece horizontally, which roller plane (18) is provided with an upper

commanded advancement device (18s), such as to engage the third tool (10) with a longitudinal profile of the workpiece (1).

5. A machine as in claim 1, characterised in that the positioning means (8) are constituted by a pair of pliers (19) for gripping the workpiece (1), which pliers (19) are connected to a mobile arm (20) to permit of rotating the workpiece (1) with passage of the workpiece (1) from the first (2) to the second transport means (9).

6. A machine as in claim 1, characterised in that the first tool (3) is constituted by a circular saw (3) keyed on to the first height-adjustable chuck (5).

7. A machine as in claim 1, characterised in that the positioning means (8) actuate a rotation of the workpiece (1) by an angle (alpha) of approximately 90 degrees, and the first (2) and second transport means (9) exhibit their respective advancement lines (A and B) parallel and in opposite directions to each other.

8. A machine as in claim 1, characterised in that in proximity to the second and third tools (4, 10) is a fourth tool (21) having a rotation direction opposite to that of the third tool (10), arranged upstream with respect to the preceding tools according to the advancement line (B) and at a height equal to the height (Qv1) of the third tool (10), which fourth tool (10), cooperating with the third tool (10), performs a longitudinal profiling of the workpiece (1).

9. A machine as in claim 1, characterised in that at an outlet zone of the workpiece (1) from the second transport means (9) a fifth tool (22) is provided, to perform a beading operation on the workpiece (1) at the workpiece (1) head.

FIG 1

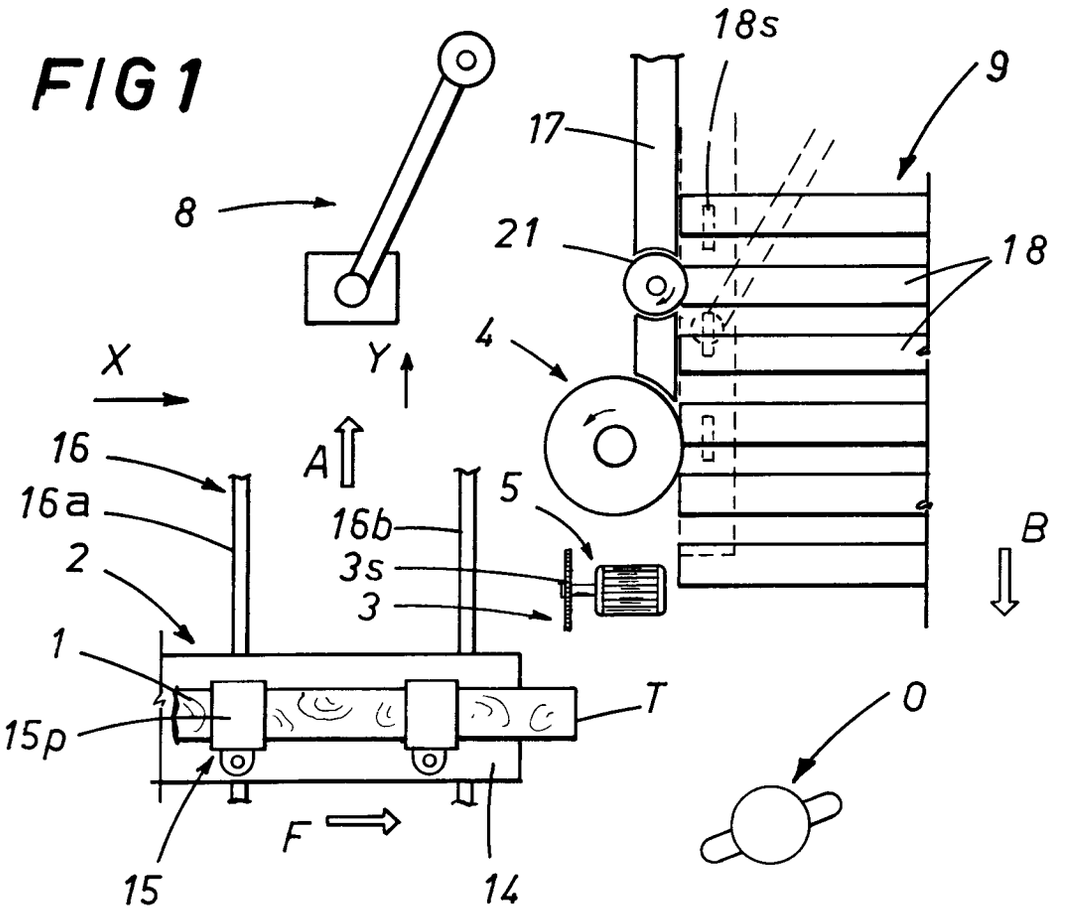
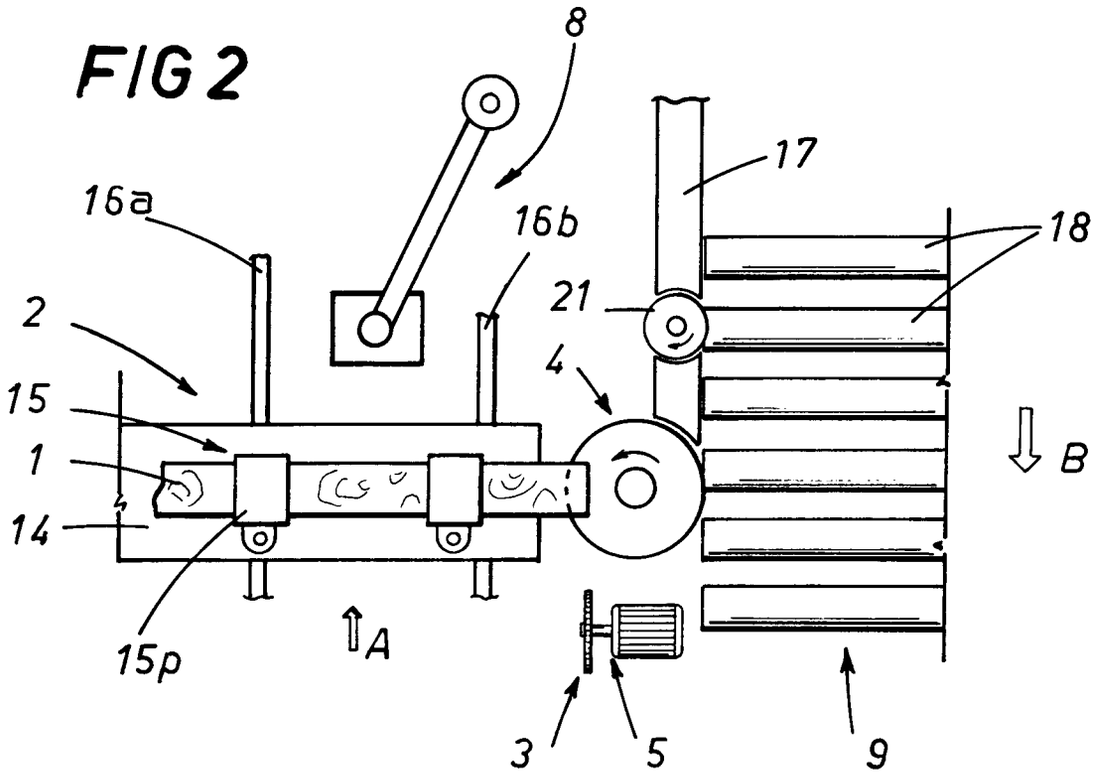

18s
9
17
8
21
18
X
Y
4
A
16
16a
16b
5
2
3s
3
B
1
T
15p
0
F
15
14

FIG 2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17
16a
16b
18
21
2
4
15
1
B
14
A
15p
3
5
9

FIG 3

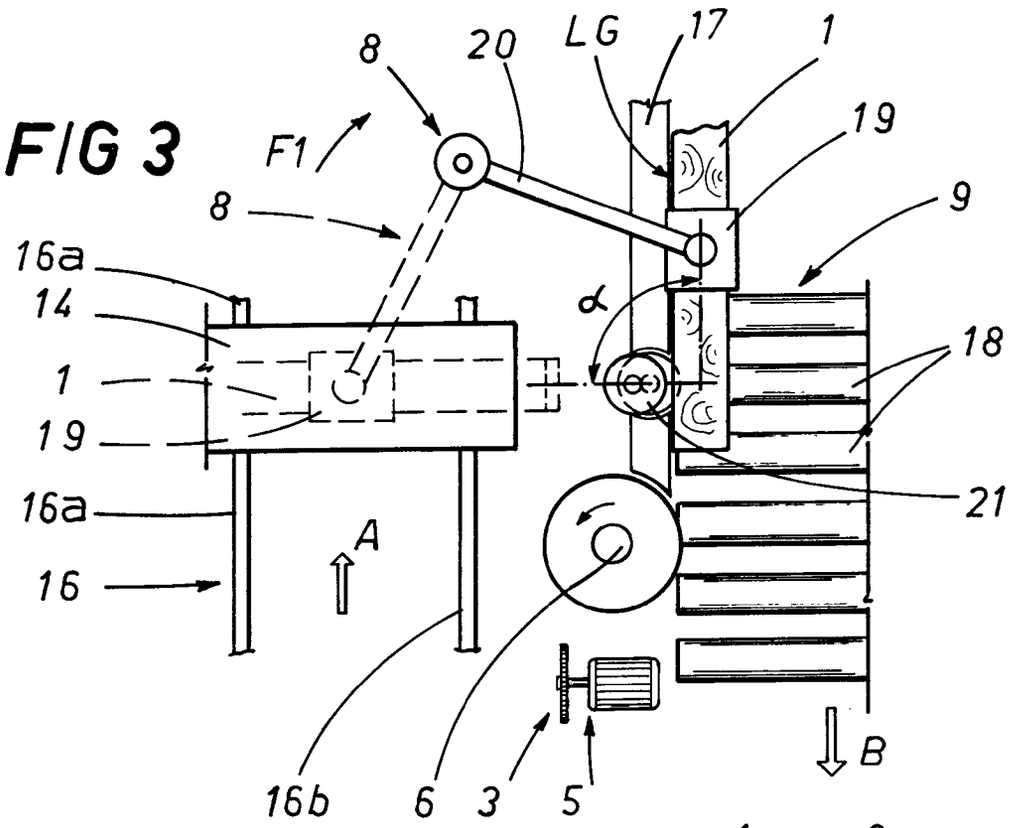
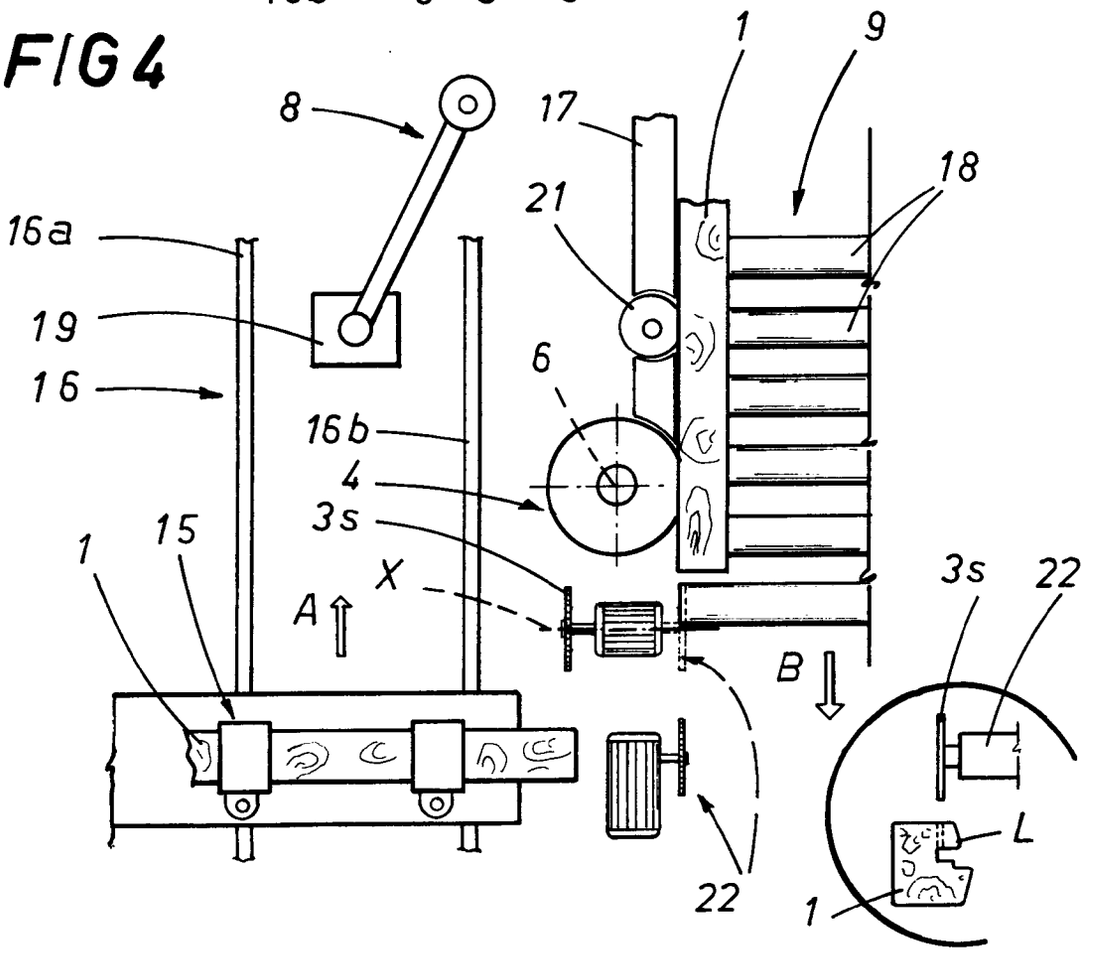

8
20
LG
17
1
19
F1
8
9
16a
14
α
18
1
19
21
16a
A
16
16b
6
3
5
B

FIG 4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17
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18
21
16a
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16b
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15
1
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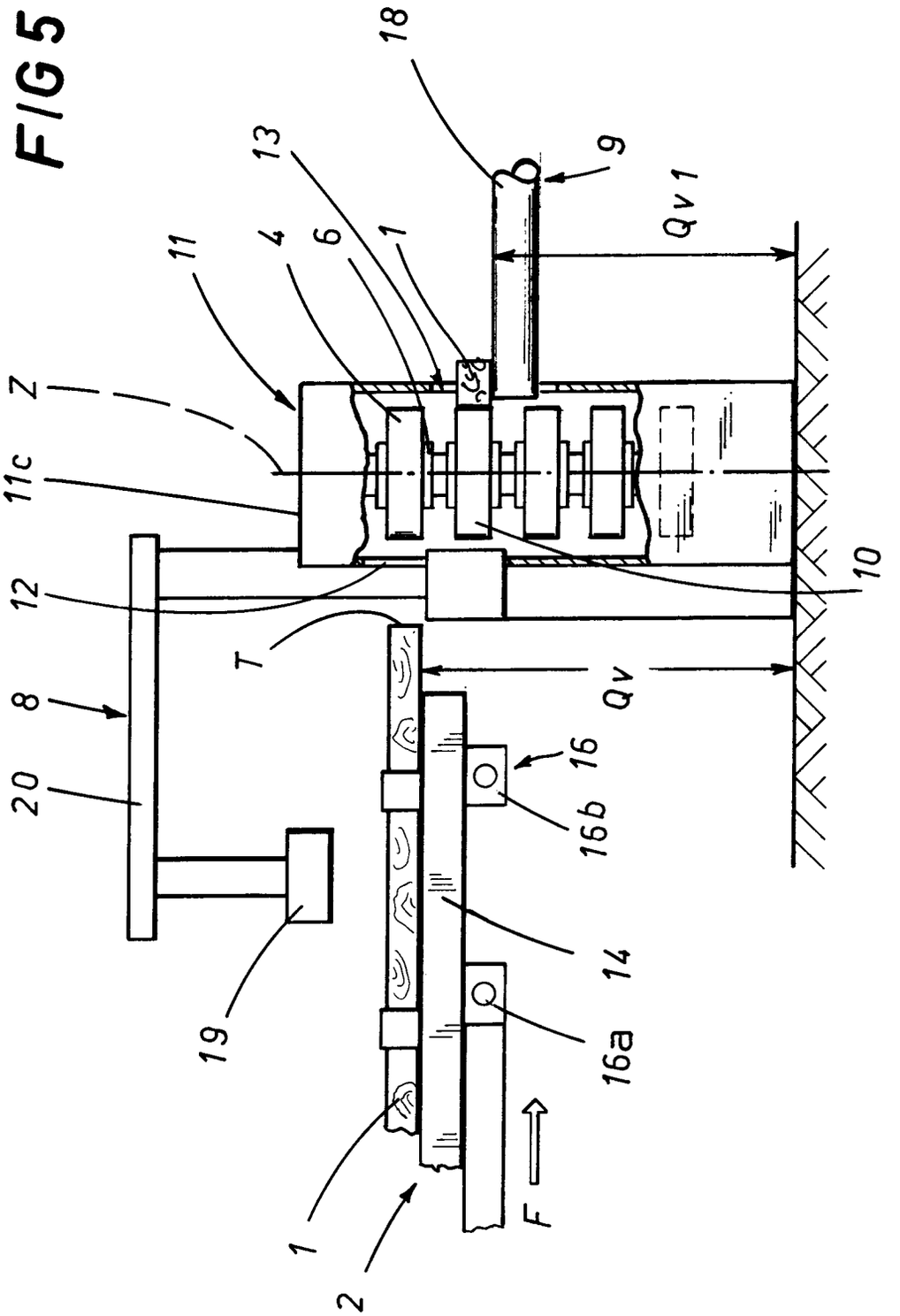
A
3s
22
B
L
22
1

FIG 5



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EUROPEAN SEARCH REPORT

Application Number
EP 93 83 0515

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.5)
D,A	DE-C-35 36 221 (WEINIG) * column 3, line 7 - line 11; figures 2,3 * ---	1	B27F1/02 B27G19/10
A	GB-A-668 988 (AITTOMAKI) * page 1, line 37 - line 49; figures 1-3 * ---	1	
A	US-A-3 008 501 (HAMMER) ---		
A	FR-A-529 269 (FAAS) ---		
A	DE-C-40 14 921 (BERGER) ---		
A	FR-A-1 097 250 (TIRABI) -----		

TECHNICAL FIELDS SEARCHED (Int.Cl.5)
B27F B27G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 March 1994	Huggins, J

CATEGORY OF CITED DOCUMENTS

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