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(54) Gluing unit for wood-based panel production plants, and a plant using the gluing unit

(57) The gluing unit for wood-based panel production plants comprises a gluing machine provided with a cylindrical shell of substantially horizontal axis, at one end of which there is provided an entry opening through which the wood fibres or chips are fed, at the other end there being provided an exit opening. Within the cylindrical shell there is provided a mixing means for the wood mass passing through the cylindrical shell. The machine comprises spray nozzles for spraying liquid glue onto the wood mass passing through the cylindrical shell, the nozzles being distributed along the entire or a large part of the length of the cylindrical shell. The gluing unit can consist of several gluing machines arranged in cascade.

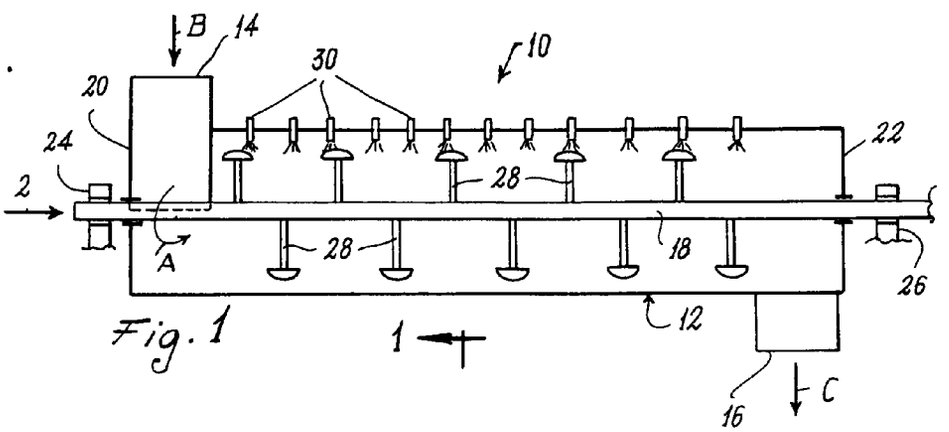

Fig. 1

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Description

This invention relates to a gluing unit usable in production plants for wood-based panels, ie fibreboard and chipboard panels.

As is known to the expert of the art, chipboard production plants comprise a gluing machine provided with a cylindrical shell of substantially horizontal axis, at one end of which the wood chips are fed tangentially by gravity through an upper entry opening. Within a fairly short distance (relative to the length of the cylindrical shell) from the entry opening there are provided a number of liquid glue feed nozzles arranged in the upper part of the cylindrical shell and offset from the vertical plane passing through the shell axis, these nozzles being distributed along a generating line of the shell and facing tangentially inwards. Coaxially to the cylindrical shell there is provided a rotary shaft carrying radial paddles distributed along it to mix the mass of chips passing through the shell with the liquid glue sprayed by said nozzles. At the other end of the cylindrical shell there is provided a lower exit opening which enables the mass of chips and liquid glue to be removed by gravity for subsequent operations. At this exit a discharge adjustment device can be provided.

As is also known to the expert of the art, fibreboard production plants comprise a gluing machine also provided with a cylindrical shell of substantially horizontal axis, to one end of which the wood fibres are fed tangentially through an upper entry opening, entrained by a stream of low pressure air. In this case the liquid glue is fed at the head of the machine close to the fibre entry opening, and is effected by nozzles positioned on the head itself and directed parallel to the axis of the cylindrical shell. This machine is also provided with a coaxial rotary shaft carrying radial paddles to mix together the wood fibre mass and liquid glue passing through the shell transported by the air stream, to then leave from the exit opening located at the other end of the shell. A discharge adjustment device can be provided at the exit opening.

An object of the present invention is to provide a gluing unit which can be used both in wood fibreboard production plants and in chipboard production plants.

A further object of the invention is to provide a gluing unit for fibreboard or chipboard production plants by which a decidedly better, ie more uniform, glue distribution is obtained within the wood mass than that obtainable with the known gluing machines briefly described heretofore.

These objects are attained by the gluing unit according to the present invention, comprising a gluing machine provided with a cylindrical shell of substantially horizontal axis, at one end of which there is provided an entry opening through which the wood fibres or chips are fed, at the other end there being provided an exit opening for the wood mass sprayed with liquid glue; within the cylindrical shell there being provided a mixing means for the wood chip or fibre mass passing through the cylindrical shell, the machine also comprising spray nozzles for spraying liquid glue onto the wood mass passing through the cylindrical shell, characterised in that said nozzles are distributed along the entire or a large part of the length of the cylindrical shell.

In particular the liquid glue spray nozzles can be positioned on the cylindrical shell and/or in its interior.

In this respect, it has been found that the gluing machine of such a gluing unit, provided with nozzles distributed along the entire or a large part of the length of the cylindrical shell of the machine, can be used both if the wood mass consists of wood fibres and if it consists of chips, in both cases it providing results which, for equal quantities of liquid glue, are at least comparable to but usually better than those of relative known gluing machines, whether the mass of material within which the liquid glue is to be distributed is fed by gravity or pneumatically.

To further improve liquid glue distribution within the wood mass, the gluing unit according to the present invention comprises several gluing machines of the aforesaid type arranged in cascade. The total quantity of liquid glue to be sprayed onto the wood fibre or chip mass to be processed is therefore divided between the various gluing machines.

In this respect, it has been surprisingly found that by dividing the glue spraying operation into several stages, the glue distribution within the wood mass is much more uniform, so that the final product obtained is decidedly better than that obtained from known gluing machines; alternatively, for equal product characteristics, there is a reduced glue and thermal energy consumption.

Again alternatively, as the liquid glue distribution is better, for equal results it is possible to use less reactive glues, ie glues with a low free and hence evolvable formaldehyde content, with a consequent lesser environmental impact.

The invention will be more apparent from the ensuing description of some embodiments thereof. In this description reference is made to the accompanying drawings, in which:

Figure 1 is a very schematic longitudinal vertical section through a gluing unit formed from a single gluing machine, taken on the line 1-1 of Figure 2;
Figure 2 is a head view of the gluing machine of Figure 1, taken in the direction of the arrow 2 of Figure 1;
Figure 3 is a modification thereof;
Figure 4 is a further modification thereof;
Figures 5 to 8 show various gluing units all formed from several gluing machines arranged in cascade and in various configurations, shown in plan view from above; and
Figure 9 is a side elevation of the gluing unit of Figure 5.

As can be seen from Figures 1 and 2, the gluing

unit 10 is composed of a single gluing machine having an overall cylindrical shell 12. This latter has an entry opening 14 at the top of the left end (with reference to Figure 1) of the machine 10, this opening being shaped in such a manner as to tangentially introduce the wood fibres or chips into the shell 12. This latter has an exit opening 16 at the bottom of its right end. The machine 10 is provided with a rotary shaft 18 coaxial to the shell 12, its ends projecting from the relative heads 20 and 22 through corresponding holes to be rotatably supported by respective supports 24 and 26. The shaft 18 is rotated (in the direction indicated in Figure 1 by the arrow A) by an electric motor (not shown) and carries a series of radial paddles 28, the function of which is described hereinafter.

In the upper part of the cylindrical shell 12, along a generating line thereof offset towards the right (with reference to Figure 2) from the top generating line, there is arranged a series of inwardly directed vertical nozzles 30 (which in Figure 1 are shown for simplicity as though they lie on the top generating line, whereas in reality this is not so) which enable liquid glue to be sprayed into the shell 12. The nozzles 30 consequently spray in a direction non-radial to the cylindrical shell.

The modified gluing machine 10' shown in Figure 3 differs from that of Figure 1 only in that the spray nozzles 30' are arranged on the mixing shaft 18', this latter being hollow to enable it and hence the nozzles 30' to be fed with liquid glue through its appropriately arranged right end.

The further modified gluing machine 10" shown in Figure 4 differs from the preceding in that the mixing means consists of two consecutive aligned shafts 18A and 18B, and in that the spray nozzles are positioned both on the cylindrical shell 12 (the nozzles 30) and in the interior of this latter (the nozzles 30' positioned on the two shafts 18A and 18B). As can be seen from Figure 4, the shaft 18A passes through the head 20 and the shaft 18B passes through the head 22, each being driven by a relative motor (not shown). The two shafts are hollow to enable the nozzles 30' to be fed, and can rotate in either the same or opposite directions (as indicated in Figure 4 by the arrows A and B).

It should be noted that the nozzles can be fed not only with liquid glue, but also with other known liquid components, to be added to the glue or to be fed independently by separate nozzles.

The operation of the machine 10 will now be briefly described (Figures 1 and 2). Wood fibres or chips are fed through the entry opening 14 to the machine 10 (as indicated by the arrow B of Figure 1) by gravity and/or with the aid of a light air stream (low pressure pneumatic transport). By virtue of the rotation of the shaft 18, this feed is mixed and made to advance within the shell 12, while being simultaneously struck during the entire or a large part of its travel within the shell 12 by the liquid glue sprayed by the nozzles 30, to finally leave from the exit opening 16 (as indicated by the arrow C of Figure 1). In this manner a fibre or chip mass with an optimum distribution of liquid glue therein is obtained at the exit opening.

The operation of the machines 10' (Figure 3) and 10" (Figure 4) is not described, as this is evident from the description relating to the machine 10,

As already stated, according to a further embodiment of the present invention the gluing unit can be composed of several gluing machines similar to those heretofore described and arranged in cascade, in the sense that the wood fibre or chip mass leaving the exit opening of one machine is fed to the entry opening of the gluing machine positioned downstream of the preceding. Consequently the total quantity of liquid glue is distributed between the gluing machines of one and the same gluing unit. It has been found that even better results (ie an even more uniform liquid glue distribution) are obtained if in a gluing unit composed of several gluing machines, the mixing shaft of one gluing machine rotates in the opposite direction to the mixing shaft of the immediately upstream and/or immediately downstream machine.

The glue can be fed, metered and sprayed to one or more machines by using one or more pumping units.

Figures 5 and 9 show a gluing unit 40 composed of four gluing machines 40A, 40B, 40C and 40D similar to that of Figure 3 or 4 and arranged in cascade. The wood fibres or chips are fed through the entry opening 54 and leave, mixed with the glue, from the exit opening 56. The relative mixing shafts (not shown for simplicity) can rotate in the same or, better still, different directions (as indicated by the arrows of Figure 5).

It is apparent that the number of gluing machines forming a gluing unit can also be different from that of Figure 5, this also depending on the results to be obtained.

Figure 6 shows a further example of a gluing unit 50 formed again from four gluing machines 50A, 50B, 50C and 50D of the aforesaid type, again arranged in cascade but with a different plan configuration than that of Figure 5.

In the gluing unit 60 of Figure 7, the number and arrangement of the gluing machines (60A, 60B, 60C, 60D and 60E) are again different, there being five machines arranged in a meandering configuration.

As the final example, Figure 8 shows a gluing unit 70 formed from three machines 70A, 70B and 70C arranged in a roughly triangular configuration.

The choice of the configuration in which to arrange the constituent machines of a gluing unit is generally determined by the space available in the plant of which the unit forms part.

In all cases, because of the fact that liquid glue distribution occurs along the entire or a large part of the length of the gluing machine or machines, the result is a more uniform distribution of this glue, especially if divided among several machines in cascade, and even better if in one machine the direction of rotation of the mixing shaft is opposite to that of the shaft of the adjacent machine.

The final result is that, by virtue of the gluing unit of the present invention, with a plant for producing wood fibreboard panels or a plant for producing chipboard panels, the panels obtained are of decidedly better quality than those obtainable from plants using known gluing machines, and in particular panels free from lumps or stains, in addition to possessing excellent mechanical and technical characteristics; or alternatively, for the same result, a significant saving in liquid glue can be obtained or less reactive glues can be used, ie of low formaldehyde content and hence of lesser environmental impact.

It should be noted that a plant for producing wood-based panels can also comprise several gluing units in parallel, each unit consisting of several gluing machines in cascade.

Claims

1. A gluing unit for wood-based panel production plants, comprising a gluing machine provided with a cylindrical shell of substantially horizontal axis, at one end of which there is provided an entry opening through which the wood fibres or chips are fed, at the other end there being provided an exit opening for the wood mass sprayed with liquid glue; within the cylindrical shell there being provided a mixing means for the wood fibre or chip mass passing through the cylindrical shell, the machine also comprising spray nozzles for spraying liquid glue onto the wood mass passing through the cylindrical shell, characterised in that said nozzles are distributed along the entire or a large part of the length of the cylindrical shell.

2. A gluing unit as claimed in claim 1, wherein the spray nozzles are positioned on the cylindrical shell and/or in its interior.

3. A gluing unit as claimed in claim 1 or 2, wherein the entry opening is formed in such a manner as to introduce the wood fibres or chips tangentially.

4. A gluing unit as claimed in any one of the preceding claims, wherein the mixing means is a rotary shaft coaxial to the cylindrical shell and provided with paddles.

5. A gluing unit as claimed in any one of claims 1 to 3, wherein the mixing means consists of two coaxial shafts provided with paddles, and arranged aligned one following the other, the two shafts being able to rotate in the same or opposite directions.

6. A gluing unit as claimed in claim 4 or 5, wherein all or some of the spray nozzles are positioned on the mixing shaft or shafts.

7. A gluing unit as claimed in claims 2 to 5, wherein all or some of the spray nozzles are positioned on the cylindrical shell.

8. A gluing unit as claimed in any one of the preceding claims, wherein several gluing machines are arranged in cascade.

9. A gluing unit as claimed in claim 8, wherein in each gluing machine the mixing means is a rotary shaft provided with paddles.

10. A gluing unit as claimed in claim 8, wherein in each gluing machine the mixing means consists of two coaxial shafts provided with paddles and arranged aligned one following the other, the two shafts being able to rotate in the same or opposite directions.

11. A gluing unit as claimed in claim 9 or 10, wherein the direction of rotation of the mixing shaft or shafts of a gluing machine is opposite to the direction of rotation of the mixing shaft or shafts of the adjacent machine.

12. A wood-based panel production plant, characterised by comprising a gluing unit in accordance with any one of the preceding claims.

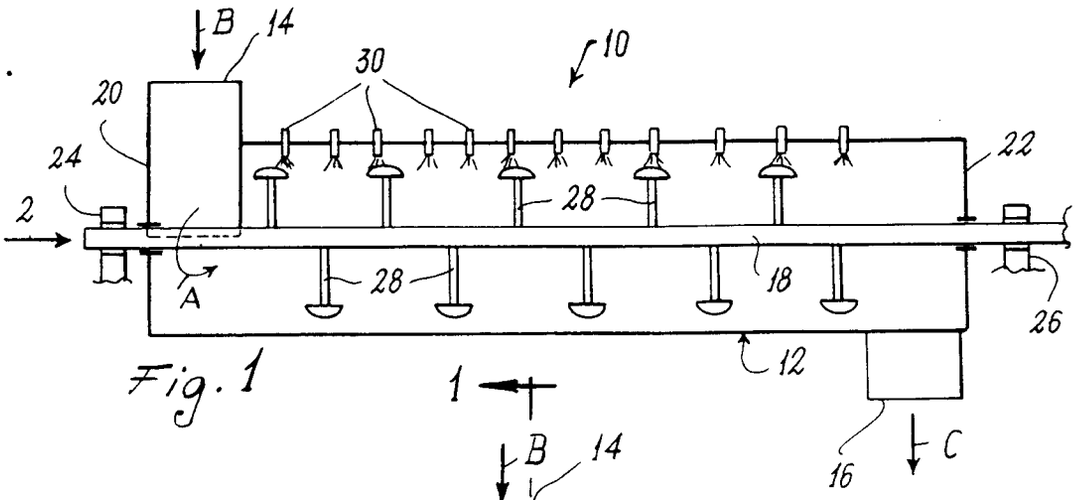

Fig. 1

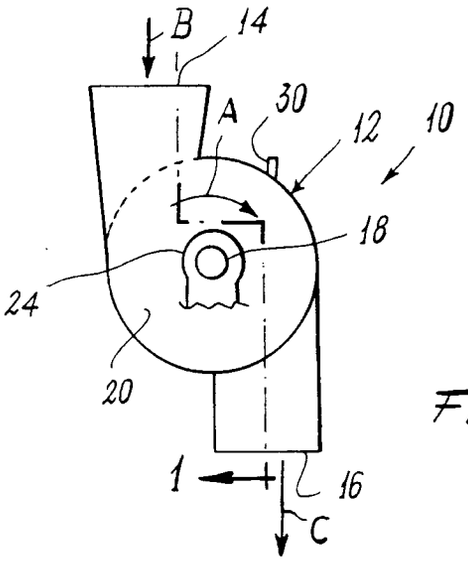

Fig. 2

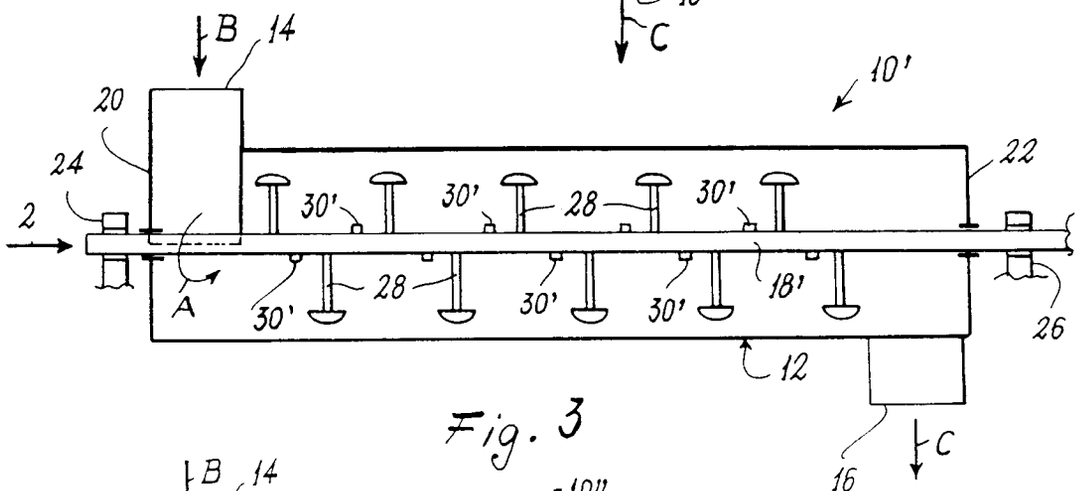

Fig. 3

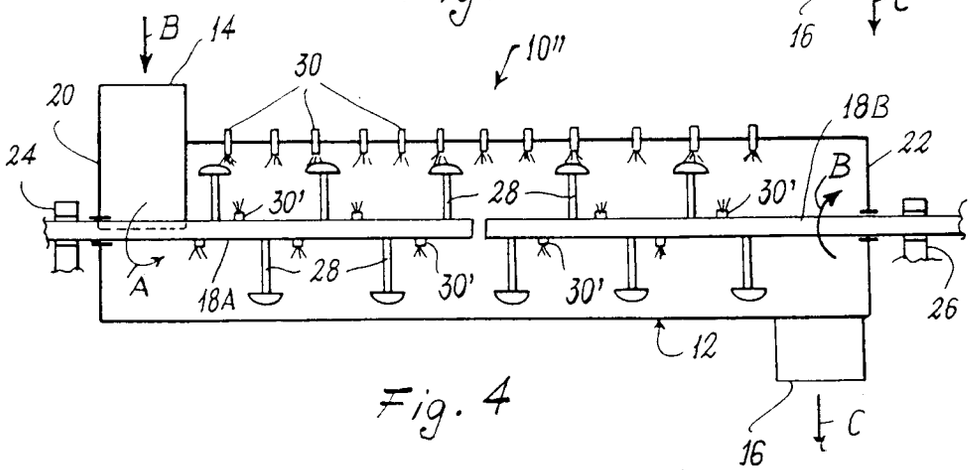

Fig. 4

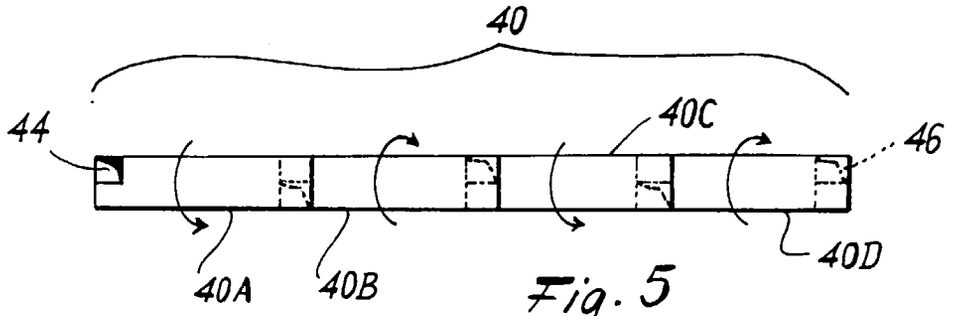

Fig. 5

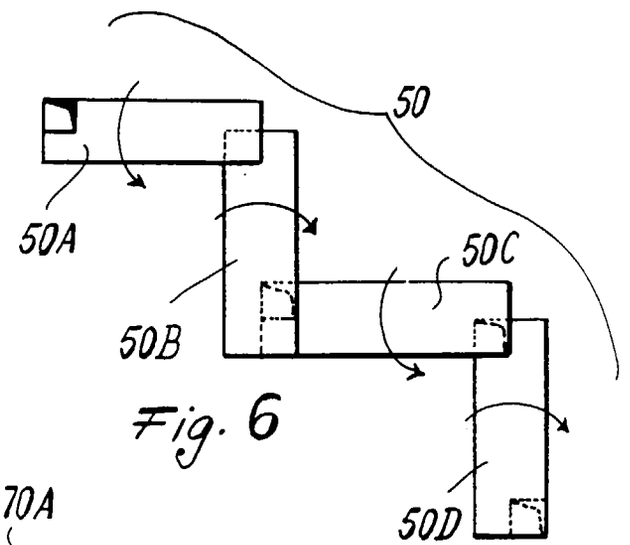

Fig. 6

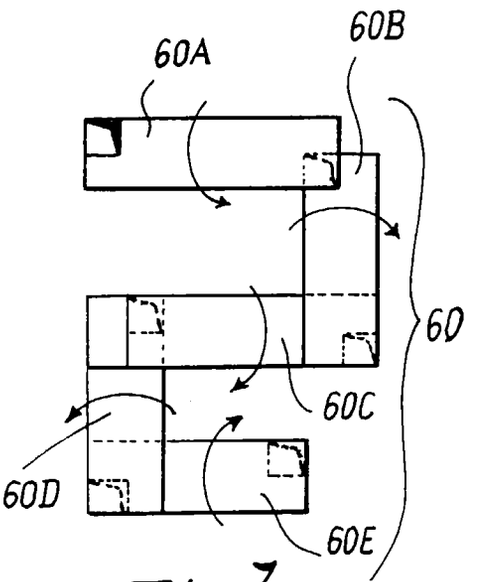

Fig. 7

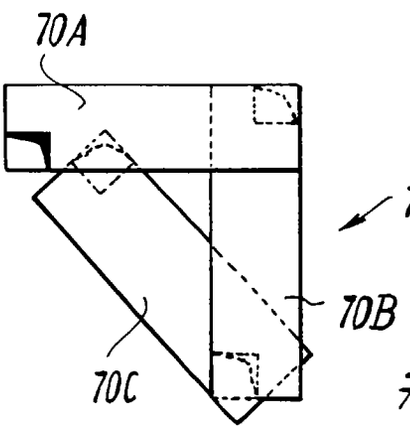

Fig. 8

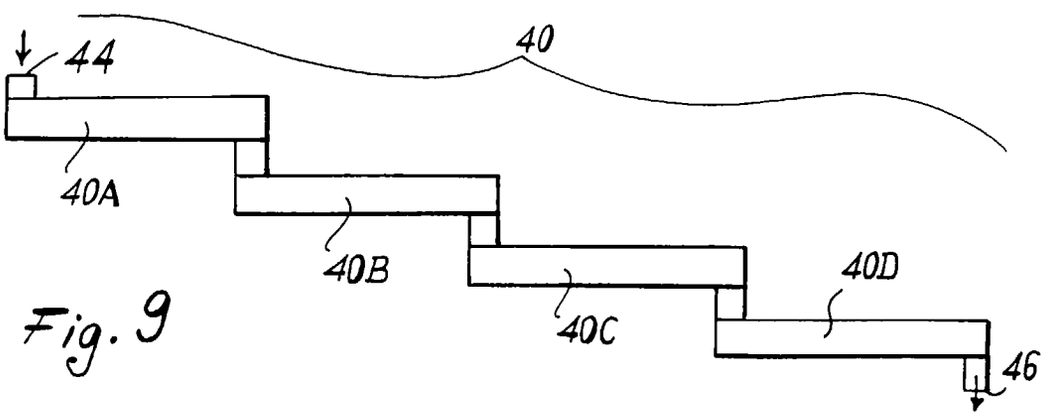

Fig. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 10 6328

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.6)
X Y	DE 26 53 711 A (DRAISWERKE GMBH) 1 June 1978 * page 9, line 20 - page 11, line 11 * * page 13, line 10 - page 14, line 14; figures * ---	1,2,4,6, 7,12 3	B27N1/02
X Y	GB 961 410 A (DRAISWERKE GMBH) * claims; figures * ---	1,2 8,9	
Y	DE 27 38 971 A (DRAISWERKE GMBH) 22 March 1979 * page 8, line 1 - line 11; figures 1,2,11,12 * ---	3	
Y	DE 12 28 402 B (HIMMELHEBER ET AL.) * column 6, line 63 - column 7, line 41; figures 7,8 * ---	8,9	
A	DE 11 04 164 B (HIMMELHEBER) * column 4, line 21 - line 56; figures * ---	1	
A	GB 759 009 A (DRAISWERKE GMBH) * figures * ---	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B27N B01F
A	US 3 924 835 A (HOHNFELD PETER ET AL) 9 December 1975 * claims; figure 5 * -----	5,10	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 August 1997	Voutsadopoulos, K

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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