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(11) **EP 1 228 812 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.08.2002 Bulletin 2002/32

(51) Int Cl.7: **B05C 1/00, B05C 1/08**

(21) Application number: **01200351.3**

(22) Date of filing: **31.01.2001**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

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(54) **A method and an apparatus for applying a surface coating on edges of a mineral fibre board**

(57) The present invention concerns a method and an apparatus for applying a surface coating on edges of a mineral fibre board. In order to obtain a more uniform edge coating in particular by more complex edge profiles, the invention describes a method and an apparatus for applying a surface coating on edges of a mineral

fibre board wherein the applicator roller of the coating station is provided with a profiled perimeter edge corresponding to at least a portion of the profile geometry of the first edge to be coated on the mineral fibre board. Hereby a simple and cost effective process and apparatus is provided for achieving a strong, uniform edge coating on a mineral fibre board.

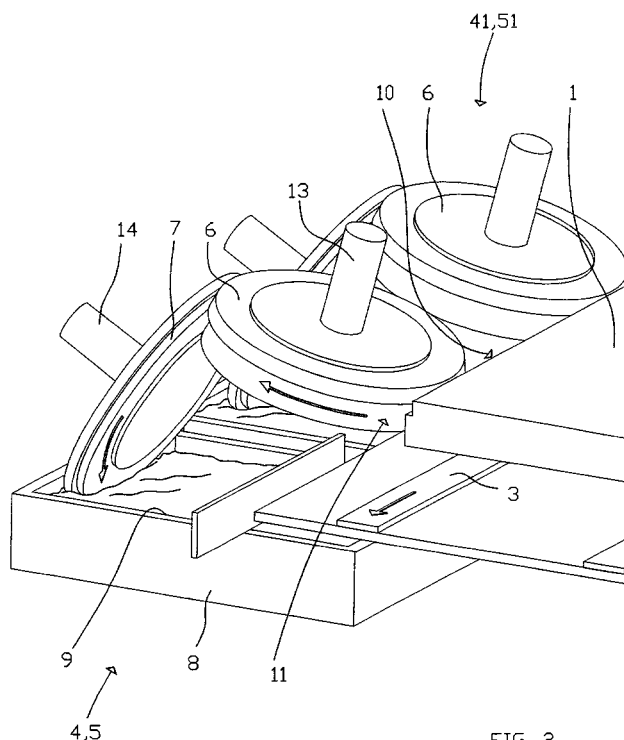


FIG. 2

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Description

[0001] The present invention relates to the field of a method and an apparatus for applying a surface coating on edges of a mineral fibre board for aesthetic purposes and in order to obtain a coating for strengthening the edges..

[0002] From British patent No. GB 1 394 621 a method of strengthening edges of fibrous sheet material is known. By this method a resin is applied to two opposite edges of a rectangular board simultaneously by a pair of applying roller arrangements positioned on opposite sides of a conveyor arrangement. Each roller arrangement comprises an applicator roller that is partly submerged in a bath of resin and a doctor blade that limits the amount of resin on the applicator roller before the resin is deposited on the edges of the fibre board. Though the position of the doctor blade is adjustable, the amounts of coating resin transferred to the edges are inaccurate by this method. This inaccuracy leads to an uneven coating layer on the board and increases when the speed of the process is increased. Moreover, this method is unsuitable for coating an edge with an uneven geometry. Another problem with the more complex geometry is to ensure a saturation of the edge region in order to strengthening the edges and to prevent flakes of coating from falling off.

[0003] Today, mineral fibre boards are manufactured with very different densities depending on the use of the mineral fibre board, ranging from insulation batts or panels with low density (about 80 - approx. 145 kg/m³) to boards or tiles with somewhat higher densities (> 200 kg/m³) for use as e.g. ceiling panels. In particular - but not exclusively - in the latter case, particular shapes of the edge regions may be provided for assembly purposes. This makes it desirable to provide an efficient and cost-effective production process for painting the edges on the boards.

[0004] Therefore, it is an object of the invention to provide a method and an apparatus for applying a surface coating on edges of a mineral fibre board with relatively complex edge geometry in a cost-effective manner. Another object is to provide a method and an apparatus for obtaining a uniform surface coating on the edges of a mineral fibre board. Still another object of the invention is to provide a method and an apparatus for saturating the edge region of a mineral fibre board with the surface coating.

[0005] The invention consists of a method and an apparatus for applying a surface coating on edges of a mineral fibre board having a first and second edge situated opposite of each other, said apparatus comprising conveying means for transporting the mineral fibre board through the apparatus in a transport direction generally parallel to the first and second edges, at least one coating station comprising an applicator roller for applying a surface coating to the first edge of the mineral fibre board, a reservoir containing a coating fluid, and means

for supplying the coating fluid to the applicator roller, counter support means for supporting the second edge of the mineral fibre board during the surface coating of the opposite edge for stabilising the mineral fibre board on the conveyor means in co-operation with the applicator roller, wherein said applicator roller having a profiled perimeter edge corresponding to at least a portion of the profile geometry of the first edge to be coated on the mineral fibre board.

[0006] By the present invention, a method and an apparatus is provided whereby it is possible to obtain a uniform coating layer on the edges of a mineral fibre board, also by more complex edge profiles. This is particularly advantageous in the coating of mineral fibre panels for e.g. ceilings as the panel boards can be supplied with a painting in the edge regions with a quality finish.

[0007] By profiling the applicator roller, a uniform layer of coating, i.e. paint, can be applied to the different edge surfaces. The resulting edge coating achieved by the invention provides the mineral fibre board with a satisfactory finish that does not require any further treatment. Moreover, edge coating according to the process of the invention may be performed at a relatively high process speed as it is ensured that a well-defined amount of coating fluid is applied to the edges in an adequate amount so that the coating covers the surface of the mineral fibre wool that has a surface that is inhomogeneous with apertures, loose wool or other irregularities. By the method according to the invention, a wide range of coating fluids with different viscosity may be used. The mineral fibre board can be either batts with low density or relatively high density fibre boards, so-called tiles.

[0008] The profile of the applicator rollers corresponds to at least partly to the profile of the edge of the board. Sometimes, it is sufficient to coat only the visible part of the edge of the mineral fibre panel, or only the visible part is coated a second time.

[0009] Preferably, the profiled perimeter includes a plurality of peripheral surfaces and the applicator roller is arranged with an inclination towards the edge to be coated. Hereby, the fibre board is held firmly against the conveyor means as the applicator roller provide a slight downwardly directed force on the fibre board.

[0010] In the preferred embodiment of the invention, the counter support means is a second coating station for simultaneous surface coating of the opposite second edge. Hereby two edges are coated simultaneously. The second coating station is similar to the first coating station in its design.

[0011] In an embodiment of the invention, the profiled perimeter of the applicator roller of the opposing second coating station is different from that of the applicator roller of the first coating station. Hereby fibre boards with different, e.g. complementary edge profiles may be coated in a single run through the edge coating apparatus.

[0012] When the applicator roller is rotated with a pe-

ripheral velocity substantially equal to the transport velocity of the mineral fibre board, it is ensured that the applicator roller "rolls" the coating onto the edge region of the fibre board ensuring an even layer of coating fluid along the edge.

[0013] In a first embodiment of the invention, the coating fluid supply means includes at least one transmitting roller that is partly immersed in the reservoir and that is in peripheral contact with the applicator roller for transferring the coating fluid onto the applicator roller. Hereby, the amount of coating fluid supplied to the applicator roller may be controlled in a precise manner. The transmission roller may be provided with a profile corresponding to the peripheral profile of the applicator roller in order to distribute the coating fluid evenly on the periphery of the applicator roller.

[0014] In the first embodiment of the invention, the transmission roller is a hard roller and the applicator roller is a soft roller provided with at least a peripheral region in an absorbent material, such as cellular rubber or similar spongy material. Hereby, it is ensured the applicator roller that a well-defined amount of coating fluid is painted onto the edges of the mineral fibre boards.

[0015] Preferably, the applicator roller has a frusto-conical periphery on at least a part of the periphery, and the transmission roller and the applicator roller are arranged with an angle between the axis of rotation of the rollers of substantially 90° minus half the top angle of the frusto-conical peripheral contact surface of the applicator roller. Hereby, a relatively compact design of the coating station may be achieved and an efficient transfer of the coating fluid is achieved, since a full contact between the relevant surfaces on the rollers is ensured.

[0016] Preferably, the transmission roller and the applicator rollers are rotated in the same direction, whereby the movements in the contact zone of the two rollers are oppositely directed. As the rotation velocity of the transmission roller is variable relative to the rotation velocity of the applicator roller, the amount of coating fluid transferred to the applicator roller may be regulated. In addition, the angle and/or the contact pressure between the two rollers may also be adjusted in order to transfer the prescribed amount of coating fluid.

[0017] In a second embodiment of the invention, the coating fluid supply means includes pumping means and a supply conduit for providing a flow of coating fluid from the reservoir onto the upper surface of the applicator roller, said upper surface being inclined towards the edge to be coated. Hereby, a method and an apparatus is achieved wherein the edge region is strengthened as the edge region of a mineral fibre board is saturated with the surface coating fluid. Since the coating fluid by this embodiment of the invention penetrates into the fibre wool in the edge region, the obtained edge coating layer is very well attached and the risk of damaging the edge coating so that it "flakes off" is considerably reduced. A coating fluid with a predetermined viscosity may preferably be chosen when strong edges are

required. The viscosity may be determined with respect to the density of the mineral fibre wool and the desired penetration of the fluid into the surface region.

[0018] In order to ensure that the supplied coating fluid is directed towards the edge of the mineral fibre board to be coated, a doctor blade is provided in association with the upper surface for removing coating fluid from said surface.

[0019] Preferably, in the second embodiment, the applicator roller is a hard roller, such as a roller of steel, a hard polymeric material or the like. Hereby, a smooth upper surface is achieved whereby the flow friction of the coating fluid towards the periphery of the applicator roller is minimised.

[0020] In order to ensure a good finish in a single run, two coating stations arranged successively in the transport direction at each side of the mineral fibre board. Hereby, it is ensured that a good finish is achieved in a cost effective manner.

[0021] Preferably, a second conveying means with a second transport direction generally orthogonal relative to the first transport direction is provided for conveying the partly edge-coated fibre board to one or more sets of further coating stations arranged at the second conveyor means for applying surface coating to the remaining edges of the rectangular mineral fibre board. Hereby, a rectangular mineral fibre board may be coated on all four side edges relatively quickly and without unnecessary intermediate handling of the mineral fibre boards.

[0022] The invention is described in detail in the following with reference to the accompanying drawings, in which:

- fig. 1 is a schematic top view of an apparatus according to a first embodiment of the invention,
- fig. 2 is a detailed view of a coating station according to the first embodiment of the invention,
- fig. 3 is a detailed view of the edge coating process according to the invention,
- fig. 4 is a top view of the roller in the first embodiment of the invention,
- fig. 5 is a schematic side view of same,
- fig. 6 is a schematic side view of a second embodiment of the invention,
- fig. 7 is a schematic top view of the same, and
- fig. 8 is a list of edge profiles of mineral fibre boards.

[0023] Figure 1 shows a surface coating plant for applying a coating on the edges 10 of a mineral fibre board 1. The apparatus includes a first and second coating arrangements for painting two opposite edges 10a, 10b of a mineral fibre board in the first coating process and subsequently painting the remaining second set of edges 10c, 10d of the board in a second coating process. The apparatus comprises a first conveyor means 2 including a number of conveyor belts arranged in parallel in a first conveying direction and second conveyor means 102 with conveyor belts 103 for conveying the mineral fibre

boards 1 in a second conveyor direction generally orthogonal to the first conveyor direction.

[0024] Along each side of the first conveyor means a pair of edge coating stations 4, 41 and 5, 51 are arranged. Similarly, edge coating stations 104, 141; 105, 151 are arranged along the second conveyor means 102. The edge coating equipment is used in a production line wherein rectangular panels or boards of mineral fibre wool with different edge profiles are coated. The edge surface coating takes place simultaneously on two parallel sides by passing the mineral fibre boards 1 through the equipment once or twice and/or through two of the coating stations 4, 41; 5, 51 on the first conveyor means and then afterwards passing the fibre boards through the second conveyor means for coating the remaining two edges of the boards.

[0025] In the figures 2 to 5, a coating station 4, 41; 5, 51 according to a first preferred embodiment of the invention is shown. The coating station includes an applicator roller 6 that is supplied with coating fluid 9 contained in a container bin 8 underneath the rollers 6, 7. The coating fluid 9 is transferred to the applicator roller 6 by at least one transfer roller 7. The profile of periphery 11 of the applicator roller 6 corresponds to the edge profile 10 of the mineral fibre board 1. The boards 1 is forwarded by the conveyor belts 3 whereby the edge of the board is brought in contact with the applicator rollers 6 of the two coating stations 4, 41 and 5, 51, respectively.

[0026] The applicator roller 6 is made of a soft material, e.g. cellular rubber or similar spongy material. The roller 6 is pressed against the edge 10 of the board 1 with a slight pressure whilst the roller 6 is rolling on the edge 10. The peripheral velocity of the applicator roller 6 is substantially equal to the conveyor speed of the conveyor belts 3. The coating fluid, i.e. paint, that is on the roller periphery 11 is then deposited on the edge 10 of the mineral fibre board 1 or at least a predetermined portion of the edge 10, such as shown in fig. 3. A counter pressure equivalent to the slight pressure applied by the applicator roller 6 of the first coating station 4 is simultaneously applied to the opposite side edge of the board, preferably by a second applicator roller 6 of a second coating station 5 situated opposite the first coating station 4 (see fig. 1).

[0027] The coating fluid is transferred to the applicator roller 6 by the transfer roller 7. The transfer roller 7 is partly submerged in a bath of coating fluid 9 in a container 8. A portion of coating fluid sticks to the surface of the transfer roller 7 and is lifted out of the bath and up to the contact area between the transfer roller 7 and the applicator roller 6, where the coating fluid is transferred from the transfer roller 7 to the applicator roller 6 due to a relative movement between the two rollers 6, 7. In the contact area, the transfer roller 7 may be provided with a profiled shape corresponding to that of the applicator roller 6, such as shown in fig. 2 and 5, or - as an alternative - merely be provided with a plane surface, as shown in fig. 4 exploiting the resiliency of the periph-

ery of the applicator roller 6 due to the material.

[0028] The transfer roller 7 slides on the applicator roller 6, preferably due to a different direction of rotation of the two rollers 6, 7 (as indicated by the arrows in fig. 2). By regulating the rotation velocity of the transfer roller 7, the amount of paint transferred from the transfer roller 7 to the applicator roller 6 is controlled. Hereby the amount of paint that is deposited on the edge of the mineral fibre board 1 may be regulated. By high velocity on the transfer roller 7 a large amount of coating fluid 9 is transferred onto the applicator roller 6 and vice versa by low velocity.

[0029] The velocities of the applicator roller 6 and the conveyor 3 (that are equal) are normally about 20-60 m/min. The peripheral velocity of the applicator roller 6 is calculated from a certain reference diameter D_R - a kind of medium diameter, as the applicator roller 6 does not display a well defined diameter due to the profiled shape of the periphery. The velocity of the transfer roller 7 is preferably regulated within a range of 60 % more or less relative to the velocity of the applicator roller 6.

[0030] The applicator roller 6 is assembled around a shaft 13 with a hub onto which a disc of cellular rubber is provided. The particular profile of the periphery is then prepared by a grinding process or the like so that it is ensured that the roller 6 and its periphery 11 is concentric.

[0031] The material for the peripheral disc of the applicator roller 6 may be a cellular rubber with a closed cellular structure, a hardness of 20-40 shore 00, a water absorbency of less than 5 %, and a compression resistance in the area of 350-650 g/cm² to 25 % compression.

[0032] The elasticity of the material makes it possible to coat the edges 10 with an inhomogeneous structure that is characteristic for mineral fibre wool products. It is imperative that the panel or board maintains its shape and planar position throughout the edge coating process so that it is able to absorb the elastic force from the applicator rollers 6 on the opposite sides of the fibre board 1.

[0033] The elasticity in the cellular rubber material makes it possible to produce mineral fibre panels with coarse tolerances. The different edge profiles of the fibre boards (see some examples thereof in figure 8) makes it necessary to use different applicator rollers 6 with corresponding peripheral profiles 11. However, as shown in fig. 4, it is not necessary to exchange the transfer rollers 7 according the peripheral profile of the applicator roller 6. The angle between the drive shafts 13, 14 of the applicator roller 6 and the transfer roller 7, respectively, is adjustable so that a full contact between the profiles of the two rollers 6, 7 is established or the most proper and uniform contact as possible is obtained. Hereby, it is possible to obtain a uniform distribution of coating fluid on the applicator roller 6 even through the profiles of the rollers 6, 7 do not completely correspond. The position and the contact pressure between the board 1 and the applicator roller 6, and between the two

rollers 6, 7 may also be individually adjusted in order to regulate the coating process.

[0034] The coating fluid may be water based acrylic paint with a suitable viscosity. Moreover, the coating fluid may be selected according to desired properties of the edge coating, including requirements such as penetration ability and covering capability.

[0035] A second embodiment of the invention, is shown in figures 6 and 7. In this embodiment, the applicator roller 6 is a hard roller made of steel or the like. In this embodiment, the edge coating apparatus is designed in the same manner as in the first embodiment with one or more rollers along a first conveyor and the same along a second conveyor with an angular displacement between the two conveyors. The angular displacement may be achieved by rotation means turning the mineral fibre boards between the two aligned conveyors or by setting up the two conveyors with a mutual angle.

[0036] In the second embodiment, the coating fluid 9 is supplied directly on the upper surface 61 of the applicator roller 6, such as shown in fig. 6. The coating fluid 9 is supplied by pumping means 17 from the reservoir 8 underneath the coating station. Since the applicator roller 6 is tilted, the upper surface is inclined towards the edge 10 of the mineral fibre board 1 and the coating fluid will flow along the surface 61 and onto the profiled periphery 11 of the applicator roller 6. The applicator roller 6 has the same velocity as the conveyor 3 and the coating fluid 9 is deposited on the edge region 10 of the mineral fibre board 1. Due to the surplus amount of paint, and the steel roller 6, the coating fluid is forced deeper into the mineral wool of edge region reinforcing the edge 10 of the mineral fibre board 1.

[0037] The coating fluid 9 is dispensed onto the rotating upper surface 61 of the applicator roller 6 through the nozzle 18 of a pipe 16 that is connected to the pump means 17. Since the roller 6 is spinning, the coating fluid 9 is centrifuged towards the peripheral region 11 of the roller 6. At the upper surface 61, a scraper 62 may be arranged to ensure that surplus amounts of coating fluid 9 is removed from the upper surface, prior to the coating of the edge, i.e. prior to the point where the applicator roller 6 and the edge 10 of the board 1 makes contact.

[0038] The surplus amount of fluid 9 is collected by the reservoir 8 underneath the coating station and reused by the pumping means 17.

[0039] The applicator rollers 6 in this embodiment are designed similarly to the rollers 6 in the first embodiment with a peripheral profile corresponding to the edge profile 10 of the mineral fibre board 1 to be coated. The object achieved by this embodiment is a process for providing edges on mineral fibre boards with improved strength. The type of coating fluid may therefore be selected among paints with high penetration capabilities and less surface covering properties. The smoothness of the coated edges may not be in finishing quality, but this could be applied by running the fibre boards through

a machine according to the first embodiment afterwards.

[0040] It is understood that many variations of the embodiments described above may be performed without departing from the scope of the invention as set forth in the accompanying claims.

Claims

1. A method of applying a surface coating on edges of a mineral fibre board having a first and second edge situated opposite of each other, including the steps of:

conveying the mineral fibre board through one or more coating stations in a transport direction generally parallel to the first and second edges, in which a method in a coating station comprises:

applying a surface coating to at least the first edge including:

supplying a coating fluid from a reservoir to an applicator roller that by peripheral contact with the first edge of the mineral fibre board apply the coating fluid to said first edge at a perimeter edge of the roller corresponding to at least a portion of the profile geometry of the first edge of the mineral fibre board, and providing a counter support at the second edge.

2. A method according to claim 1, wherein an essentially simultaneous surface coating of the first and second edges is performed.

3. A method according to claim 2, wherein the surface coating is applied to the first and second edges having different profile geometry.

4. A method according to any of the preceding claims, wherein the applicator roller is rotated with a peripheral velocity substantially equal to the transport velocity of the mineral fibre board.

5. A method according to claim 4, wherein the applicator roller is pressed slightly against the fibre board edge to be coated and that said pressure may be adjusted.

6. A method according to any of the preceding claims, wherein at least one transmission roller supplies the coating fluid from an underlying reservoir in which the transmission wheel is partly immersed and smears the coating fluid onto the periphery of the

applicator roller.

7. A method according to claim 6, wherein the direction of rotation of the transfer wheel and the applicator roller is the same.

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8. A method according to any of claims 1 to 5, wherein the coating fluid is pumped from the reservoir and supplied onto the upper surface of the applicator roller, said upper surface being inclined towards the edge of the fibre board to be coated.

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9. A method according to claim 8, wherein the coating fluid is substantially removed from the upper surface by sweeping said surface.

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10. A method according to any of the preceding claims, wherein the mineral fibre board is transferred to a second conveying path with a second transport direction generally orthogonal relative to the first transport direction, and where further coating stations are arranged for applying surface coating to a second set of opposite edges of the mineral fibre board.

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11. An apparatus for applying a surface coating on edges of a mineral fibre board having a first and second edge situated opposite of each other, said apparatus comprising:

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conveying means for transporting the mineral fibre board through the apparatus in a transport direction generally parallel to the first and second edges;

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at least one coating station comprising an applicator roller for applying a surface coating to the first edge of the mineral fibre board, a reservoir containing a coating fluid, and means for supplying the coating fluid to the applicator roller;

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counter support means for supporting the second edge of the mineral fibre board during the surface coating of the opposite edge for stabilising the mineral fibre board on the conveyor means in co-operation with the applicator roller;

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said applicator roller having a profiled perimeter edge corresponding to at least a portion of the profile geometry of the first edge to be coated on the mineral fibre board.

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12. An apparatus according to claim 11, wherein the profiled perimeter includes a plurality of peripheral surfaces and the applicator roller is arranged with an inclination towards the edge to be coated.

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13. An apparatus according to claim 11 or 12, wherein the counter support means is a second coating station for simultaneous surface coating of the opposite second edge.

14. An apparatus according to claim 13, wherein the second coating station comprises an applicator roller for applying a surface coating to the first edge of the mineral fibre board, a reservoir containing a coating fluid, and means for supplying the coating fluid to the applicator roller and wherein said applicator roller is provided with a profiled perimeter edge corresponding to at least a portion of the profile geometry of the first edge to be coated on the mineral fibre board.

15. An apparatus according to claim 13 or 14, wherein the profiled perimeter of the applicator roller of the opposing second coating station is different from that of the applicator roller of the first coating station.

16. An apparatus according to any of claims 11 to 15, wherein the applicator roller is rotated with a peripheral velocity substantially equal to the transport velocity of the mineral fibre board.

17. An apparatus according to any of claims 11 to 16, wherein the coating fluid supply means include at least one transmitting roller that is partly immersed in the reservoir and that is in peripheral contact with the applicator roller for transferring the coating fluid onto the applicator roller.

18. An apparatus according to claim 17, wherein the transmission roller is provided with a profile corresponding to the peripheral profile of the applicator roller.

19. An apparatus according to claim 17 or 18, wherein the transmission roller is a hard roller and the applicator roller is a soft roller provided with at least a peripheral region in an absorbent material, such as cellular rubber or similar spongy material.

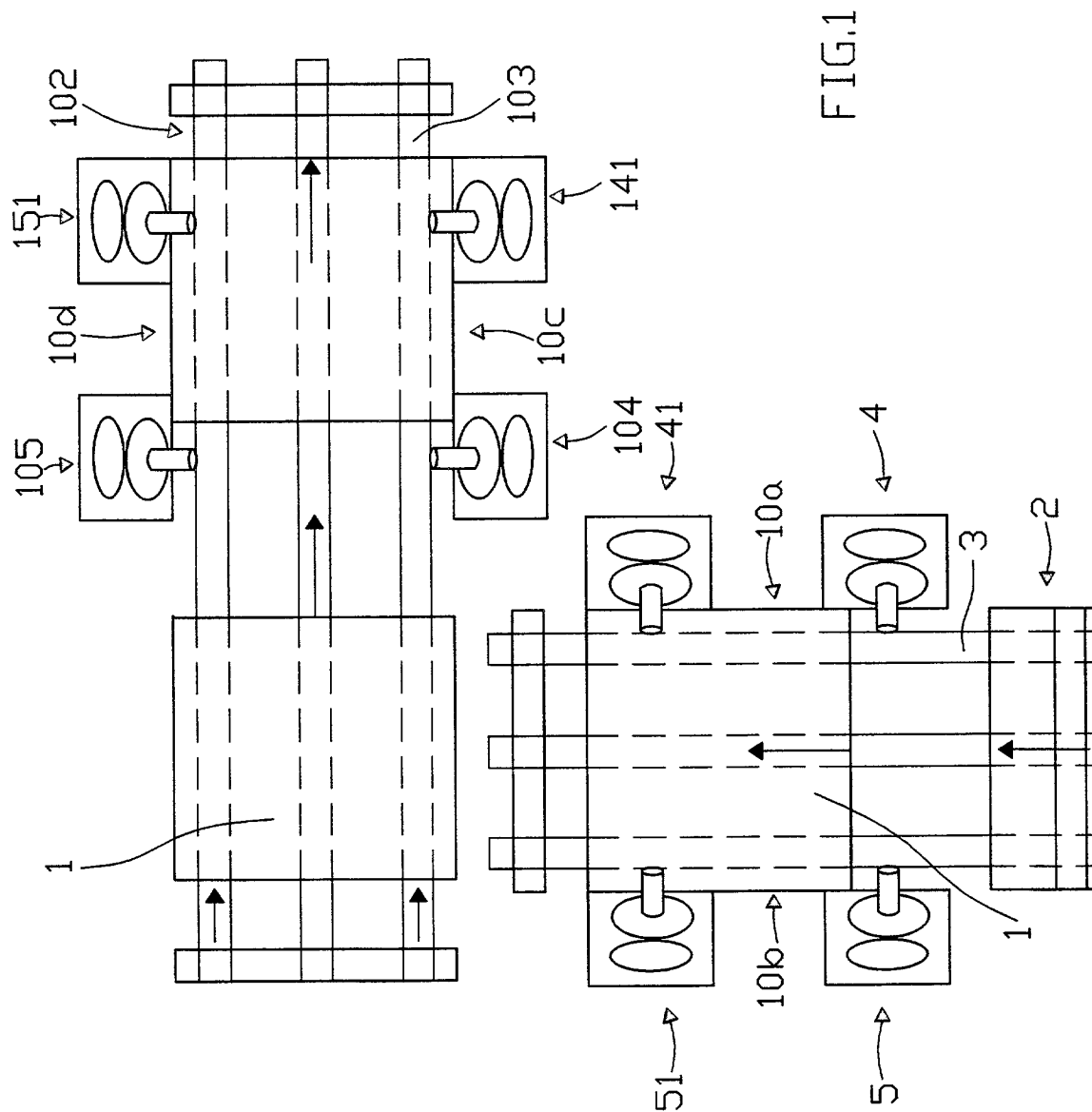
20. An apparatus according to any of the claims 17 to 19, wherein the applicator roller has a frusto-conical periphery on at least a part of the periphery, and the transmission roller and the applicator roller are arranged with an angle between the axis of rotation of the rollers of substantially 90° minus the top angle of the frusto-conical peripheral contact surface of the applicator roller.

21. An apparatus according to any of the claims 17 to 20, wherein the transmission roller and the applicator rollers are rotated in the same direction.

22. An apparatus according to any of the claims 17 to

21, wherein the rotation velocity of the transmission roller is variable.

23. An apparatus according to any of the claims 11 to 16, wherein the coating fluid supply means includes pumping means and a supply conduit for providing a flow of coating fluid from the reservoir onto the upper surface of the applicator roller, said upper surface being inclined towards the edge to be coated. 5
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24. An apparatus according to claim 23, wherein a doctor blade is provided in association with the upper surface for removing coating fluid from said surface. 15
25. An apparatus according to claim 23 or 24, wherein the applicator roller is a hard roller, preferably made of steel, a hard polymeric material or the like.
26. An apparatus according to any of the claims 11 to 25, wherein two coating stations arranged successively in the transport direction at each side of the mineral fibre board. 20
27. An apparatus according to any of the claims 11 to 26, wherein a second conveying means with a second transport direction generally orthogonal relative to the first transport direction is provided for conveying the partly edge-coated fibre board to one or more sets of further coating stations arranged at the second conveyor means for applying surface coating to the remaining edges of the rectangular mineral fibre board. 25
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28. An apparatus according to any of the claims 11 to 26, wherein the applicator roller is pressed slightly against the fibre board edge to be coated and that said pressure may be adjusted. 35
29. A mineral fibre board with one or more edges that are supplied with a finish coating by the performance of a method according to claims 1 to 7. 40
30. A mineral fibre board with one or more edges that are supplied with a finish coating by the performance of a method according to claims 8 to 9. 45
31. A mineral fibre board according to claim 29 or 30, wherein the density of the mineral fibre board is less than 175 kg/m³. 50
32. A mineral fibre board according to claim 29 or 30, wherein the density of the mineral fibre board is more than 175 kg/m³. 55



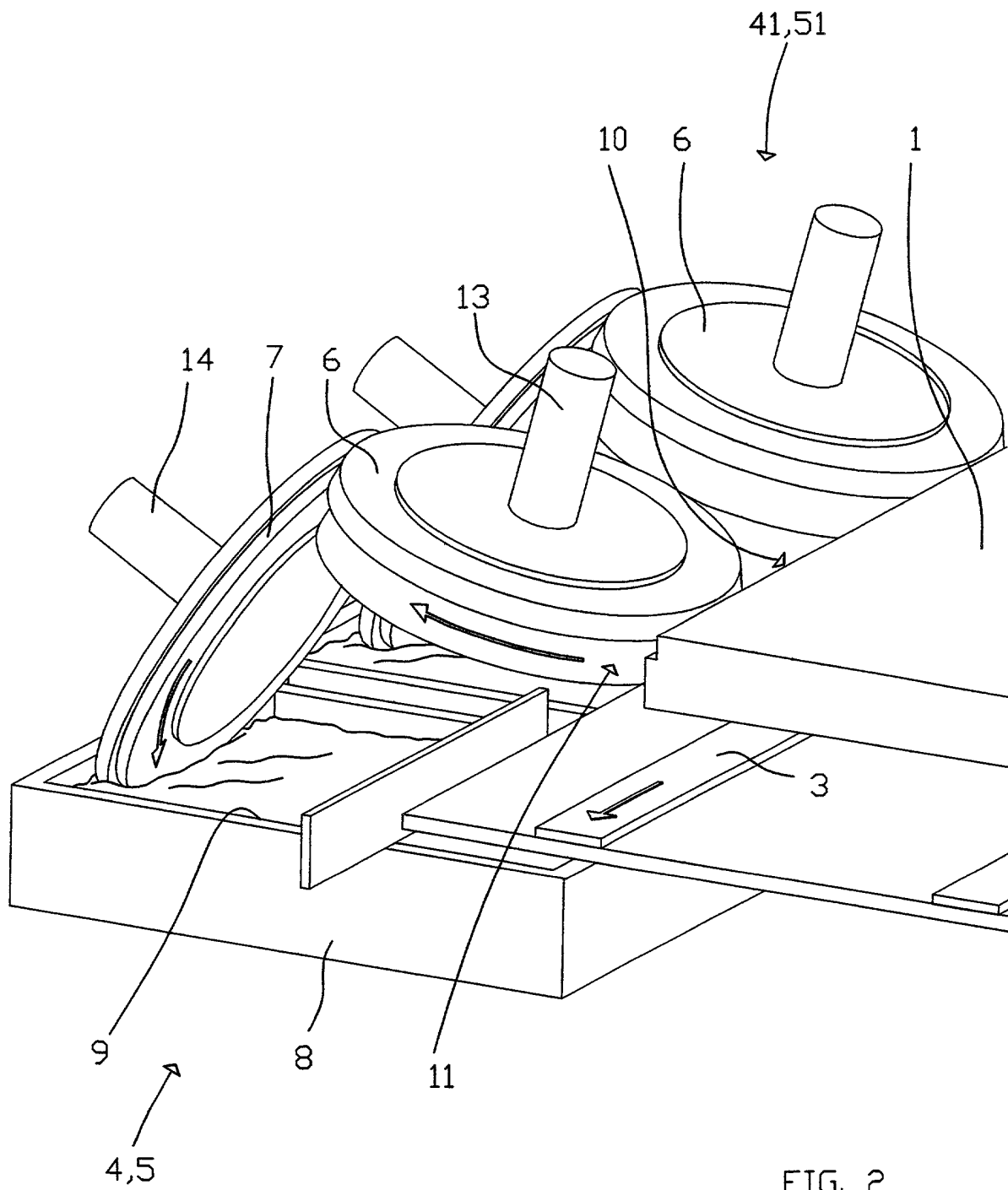


FIG. 2

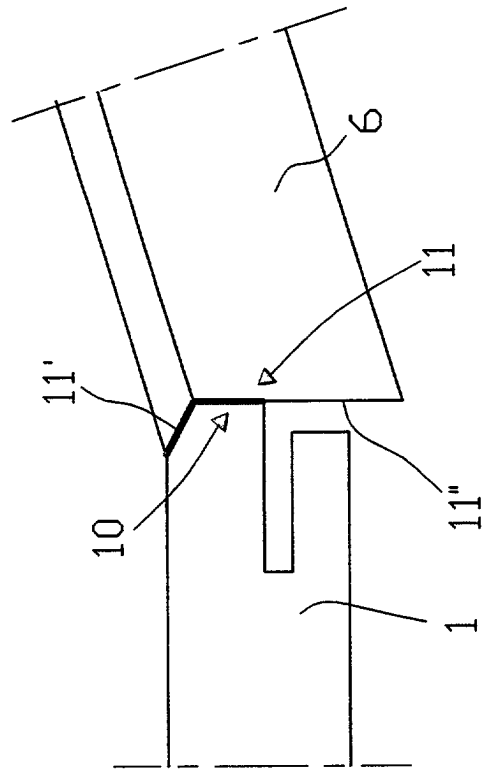
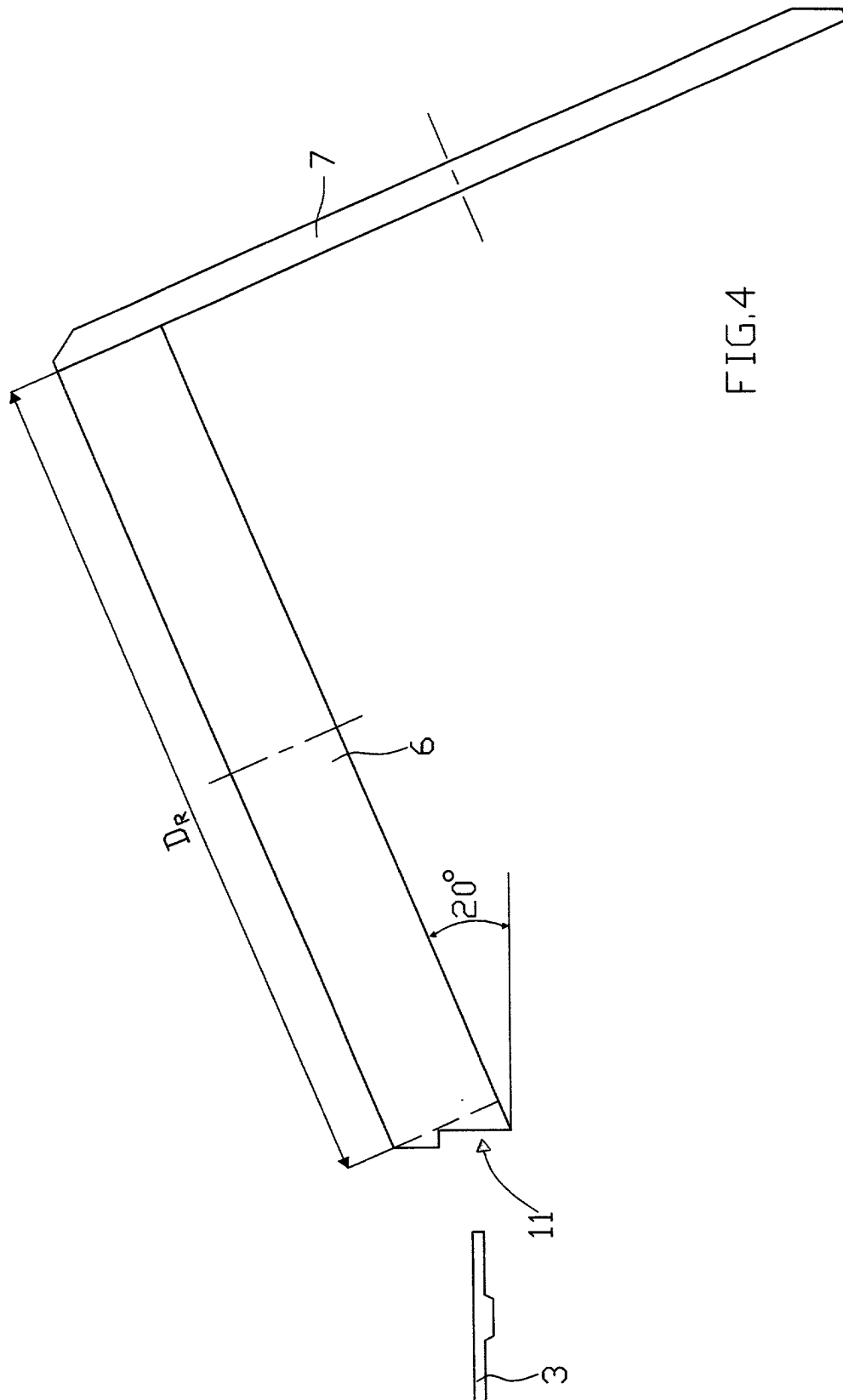


FIG. 3



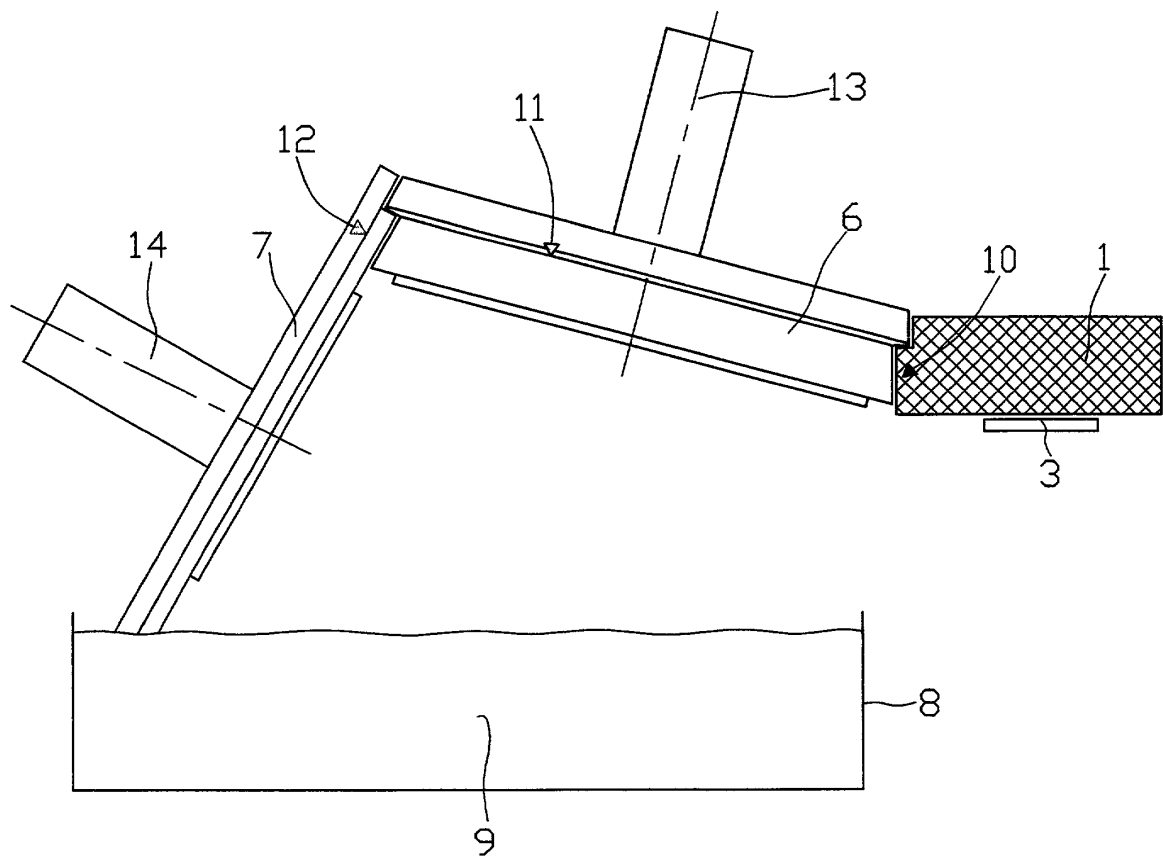
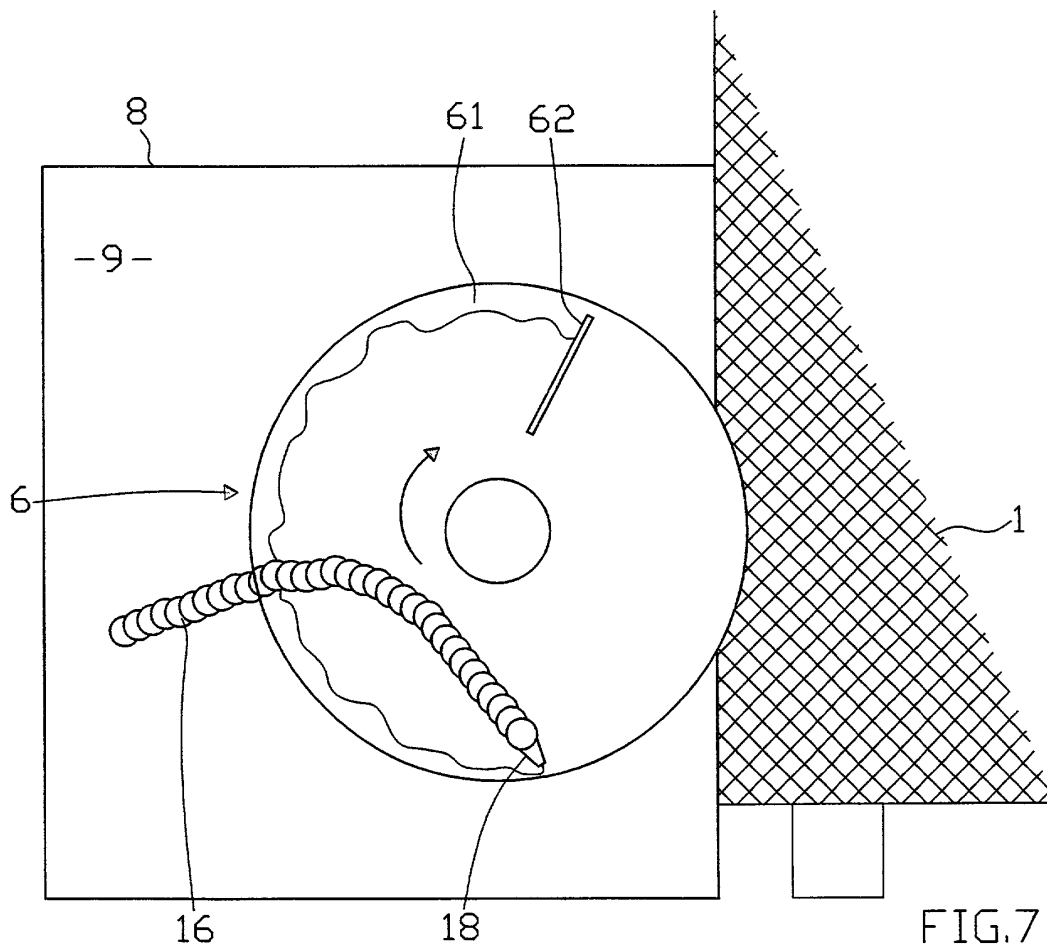
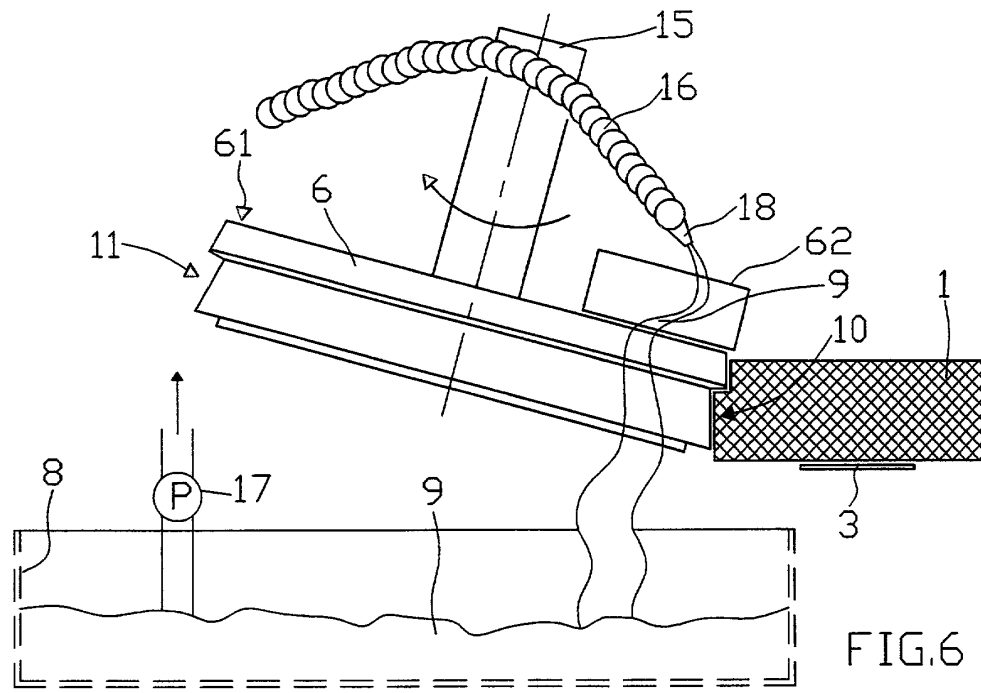


FIG.5



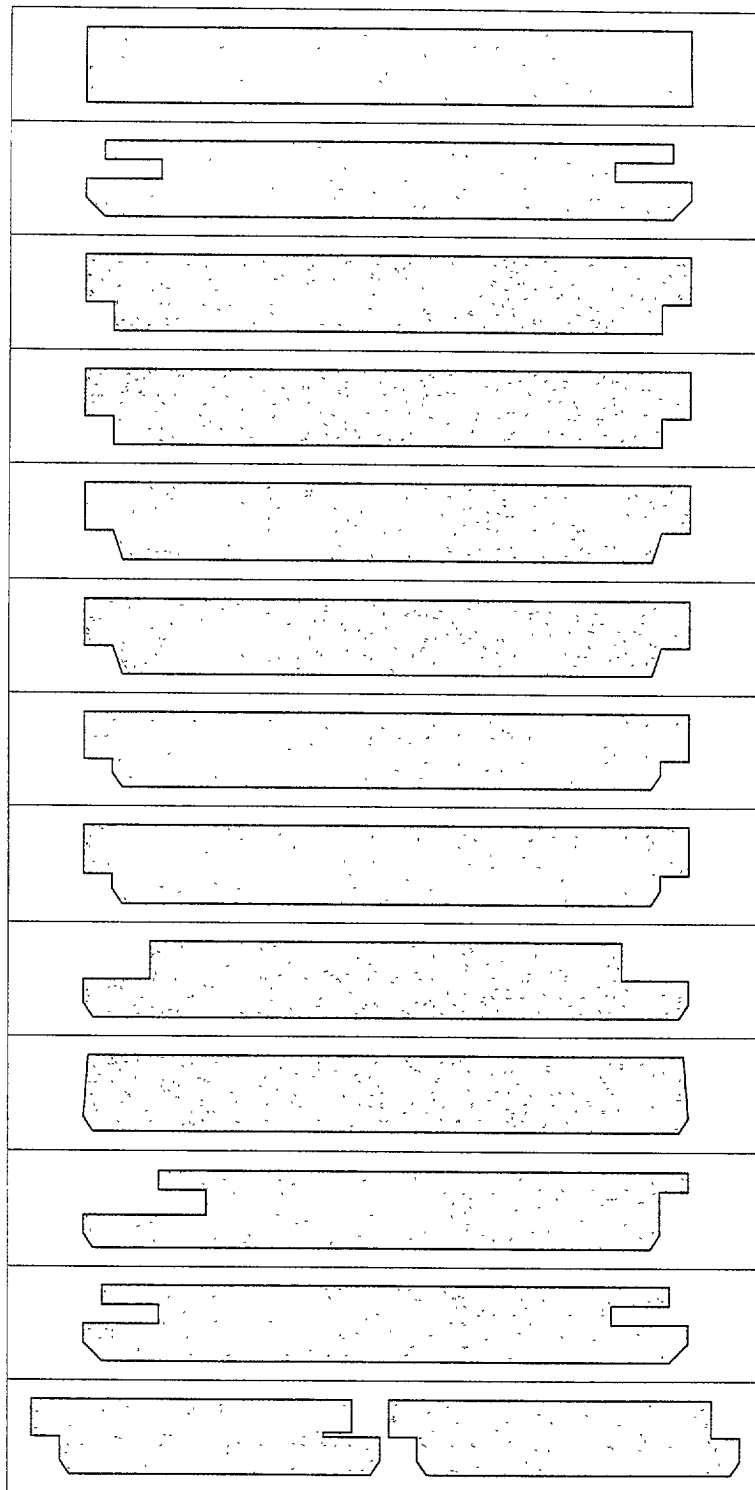


Fig. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 20 0351

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
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A	* column 3, line 14 - line 71; figures * ---		
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A	* column 1, line 56 - line 70 * * column 2, line 70 - column 3, line 13 * * column 3, line 36 - column 4, line 52; figures * ---		
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A	* page 5, line 9 - page 6, line 5; figures * *	5	
A	DE 195 25 634 A (KOLBUS GMBH & CO KG) 16 January 1997 (1997-01-16)	8	
	* column 3, line 11 - line 20; figure 2 * --- -/--		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 4 September 2001	Examiner Brévier, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03 B2 (P44001)



European Patent
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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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