(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 456 864 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90109345.0**

(22) Date of filing: **17.05.90**

(51) Int. Cl.[5]: **D06H 7/00**, D05C 17/00, D06H 1/00

(43) Date of publication of application:
21.11.91 Bulletin 91/47

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

(71) Applicant: **BONDAX CARPETS LIMITED**
34 Bedford Row
London WC1R 4JH(GB)

(72) Inventor: **Wild, Thomas Walter**
Marlpool Gardens, 9 Aldermere Road
Kidderminster, Worcestershire DY11 5HN(GB)

(74) Representative: **Lewis, Samuel Hewitt et al**
FORRESTER & BOEHMERT
Widenmayerstrasse 4/I
W-8000 München 22(DE)

(54) Method of and apparatus for cutting carpet.

(57) Patterned carpet is formed by implanting coloured lengths of yarn in a layer of adhesive on a pre-formed web (10). Marginal portions of the web are marked in predetermined positions relative to the rows of tufts and the web is subsequently cut at predetermined positions relative to the marks to form tiles of carpet.

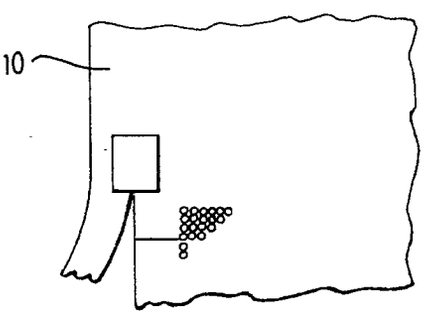

FIG. 2

EP 0 456 864 A1

The present invention concerns the cutting of patterned carpet, for example to form carpet tiles which can subsequently be placed edge-to-edge to form a predetermined overall pattern.

Apparatus and a method for cutting patterned carpet is described in GB 2,133,733 published on 1st August 1984. The apparatus described in the published specification includes indicators which overlie the pile of the carpet. The indicators are marks, pins or similar elements and the positions of these are compared with the positions of predetermined tufts in the carpet. The carpet is adjusted relative to the indicators until the predetermined tufts coincide with the indicators. The carpet backing is then cut by cutting blades having a predetermined positional relation to the indicators.

In a method in accordance with a first aspect of the present invention, the web of a carpet comprising a web and a pile of tufts on one face of the web, the tufts defining a pattern of the carpet, is marked in predetermined positions relative to the positions where the respective tufts are attached to the web and the web is then cut along lines which bear a predetermined relation to the positions of the marks.

The use of marks on the web leads to greater accuracy in the positions of the cuts than is achieved by comparing the positions of individual tufts with indicator overlying the pile. Whilst the tufts of the pile will generally be upstanding with respect to the web, the attitude may differ from one tuft to another within a piece of carpet and from one piece of carpet to another piece. Handling and stacking pieces of carpet, prior to cutting, may vary the attitudes of some tufts to an unpredictable degree.

In the establishment of a predetermined relation between the cutting elements and the marks on the web, there may be used one or more indicator elements having a known positional relation to the cutting elements. There may be used one or more indicator elements which is in a position beside the web, assuming the carpet to be resting on a generally horizontal surface with its pile uppermost, and/or one or more indicator elements which is at a level immediately below the level of the web, for example being present on a surface on which the carpet rests. Preferably, there is also provided one or more indicator elements at a level above web so that a mark on the web can be brought into alignment with two indicator elements, one above the web and the other either at the same level as or below the web.

The marks on the web may be formed by applying a marking medium to the web or by modifying the web locally, for example severing the web or modifying the web to change its appearance. In a case where a marking medium is applied, it may be applied as a thin film or as an element which has a substantial thickness, relative to that of the web. In a further alternative, a pre-formed marking element may be applied to the web. The marking medium or marking element may have a character substantially different from that of the web, for example, a metallic character, so that the position of the mark can readily be identified by a sensing device.

According to a second aspect of the invention, there is provided apparatus for use in cutting patterned carpet and comprising a support on which the carpet rests during positioning and during cutting, cutting means for cutting the carpet whilst on the support and means for moving the cutting means relative to the support to effect cutting, wherein the support incorporates indicator elements which lie in, on or close to the surface on which the carpet rests.

The indicator elements may be formations, for example apertures or grooves, may be marks on the support or may be projected onto the support by suitable projection devices.

According to a third aspect of the invention, there is provided a method of manufacturing carpet wherein a pre-formed web is moved along a defined path through an attaching station, tuft-forming lengths of yarn are attached to the web at the attaching station and margins are cut from the web whilst the web is in said defined path.

The third aspect of the invention facilitates the production of carpet which has a predetermined width and wherein the tufts occupy predetermined positions with respect to the lateral edges of the carpet.

There are preferably applied to the web, whilst the web is in said defined path, marks which occupy predetermined positions relative to the tufts. These marks can then be used in positioning of the carpet for cutting.

According to a fourth aspect of the invention, there is provided apparatus for use in the manufacture of carpet and comprising guide means defining a path through the apparatus, drive means for moving a pre-formed web through the apparatus along said path, tuft-attaching means for attaching tuft-forming lengths of yarn to the web at an attaching station along said path and cutting means for cutting margins from the web whilst the web is in said path.

An example of apparatus embodying the second and fourth aspects of the invention and which is used in a method according to both the first and the third aspects of the invention will now be described, with reference to the accompanying drawing, wherein:-

FIGURE 1 is a diagrammatic representation of apparatus for applying tufts to a web,

FIGURE 2 is a diagrammatic representation, on an enlarged scale, of a part of the apparatus of Figure 1 and of the tufted web formed therein,

FIGURE 3 is a diagram similar to Figure 2 showing positioning of the tufted web for cutting; and

FIGURE 4 is a diagrammatic elevation of cutting apparatus.

The apparatus illustrated in Figure 1 applies tuft-forming lengths of yarn to a pre-formed web 10. The web is supplied as a roll 11 which is supported in the apparatus of Figure 1 in a known manner for unwinding. The apparatus includes guide means for guiding the web from the roll 11 along a defined path through a marking station 12, a heating station 13, an attaching station 14 and a trimming station 15 to a further roll 16 formed on a take-up reel. The guide means may include rolls and other known guide elements arranged in a generally known manner for guiding the web and will not be described in detail. Representative guide elements are indicated in the drawing at 17. Drive means is provided for moving the web along the path in a controlled manner to the take-up reel and for driving the take-up reel. For example, there may be provided downstream of the roll 11 a known accumulator 18 including one or more rolls which is or are driven when the length of web in the accumulator falls to a predetermined value. A further accumulator 18a, which may be identical with the accumulator 18, is provided upstream of the take-up reel. The take up reel may be driven in such a manner as to maintain tension in the web downstream of the second accumulator. The speed at which the web moves through the attaching station is controlled by a roll 17a which is driven intermittently and which has a carded surface to avoid slip of the web relative to the roll. Additional means for controlling the speed of the web at selected positions along the path may be incorporated, if required.

At the marking station 12, there is provided a pair of marking devices 19 which are operated in co-ordination with feeding of the web 10 along its path to place on respective margins of the web marks which are spaced at predetermined intervals along the margin of the web. The marks are placed on one face only of the web, called herein the upper face. The marking devices 19 may be known devices incorporating stamps which print on the web marks, each of which is a rectilinear line of ink, the length of the line being perpendicular to a longitudinal centreline of the web. Movement of the stamps onto the web is triggered by a photodetector which responds to movement of a yarn source or other member at the attaching station which is moved intermittently.

The web in the roll 11 has on its upper surface a layer of a thermoplastic adhesive. This layer extends between the margins of the web but preferably does not cover the margins. The marks applied by the devices 19 may be applied only to those margins of the web which do not bear the layer of adhesive. Alternatively, the marks may extend onto the layer of adhesive.

The marked web moves from the marking station 12 over the surface of a heating element 20 at the heating station 13. The element 20 has a surface of substantial area which is in contact with the underside of the web 10 and transmits heat through the web to the layer of adhesive to soften the adhesive. This surface is convex in a direction along the web and in a direction across the web. The web, bearing the layer of fluid adhesive, then moves into the attaching station 14.

At the attaching station, the web 10 is supported on a heating bar 21 which engages the underside of the web and supplies additional heat to the layer of adhesive at a rate which is at least sufficient to compensate for heat losses and maintain the adhesive in a fluid-condition. A slot is defined between guide members 22 and 23 which are spaced upwardly from the web 10 and the layer of adhesive thereon. The slot extends across the entire width of the web and lies directly above the heating bar 21. Grippers 24 are provided for drawing lengths of tuft-forming yarn from a yarn source 25 to respective positions overlying the slot and a presser 26 is arranged for reciprocation towards and away from the web 10 through the slot to press the lengths of yarn through the slot between the members 22 and 23 into the layer of adhesive on the web 10. After the presser 26 has withdrawn into the slot, the implanted tufts are pushed out of the slot by reciprocation of a pusher 27 across the underside of the slot. Movement of the web 10 through the attaching station is stepwise and is co-ordinated with movement of the pusher 27.

The general arrangement of the yarn-attaching means may be as disclosed in GB 1,422,524, to which reference should be had for further details. The yarn source 25 may be a known source, for example an assembly of spools connected together in a chain so that yarn can be drawn from successive spools.

From the attaching station 14, the tufted web passes through the trimming station 15 to the take-up roll 16. At the trimming station, there is mounted a pair of cutting blades, one adjacent to each lateral margin of the web. Each cutting blade is positioned to intersect the path of travel of the web and sever from the main body of the web either an entire margin or a part of the margin. The blades are adjustable towards and away from each other according to the required separation between the

lines along which the web is to be cut. Alternatively, a single blade may be provided to sever one margin only.

Prior to or after winding of the carpet onto the take-up reel, the carpet may be treated by re-heating as described in GB 1,422,524.

The carpet is subsequently unrolled and the web 10 is coated at its underside with a layer of bitumen or other settable material in a known manner. In a case where the coated carpet is relatively inflexible, the carpet may then be cut into pieces, called herein pelts, rather than being reformed into a roll. Subsequently, there is cut from each pelt one or more tiles.

A press for cutting tiles from the pelt is illustrated in Figure 4. The press comprises a frame 29 on which there is mounted for reciprocation towards and away from a base of the press a platen 31. The press includes a carrier 32 guided for sliding relative to the frame 29 in a direction perpendicular to the path of travel of the platen. The carrier can be withdrawn from a position directly beneath the platen and subsequently returned to that position.

The carrier 32 carries one or more blades 33 for cutting the web 10 of the pelt and a support 34 for the pelt. The support has a substantially flat, upwardly facing surface for receiving the pelt. This surface is interrupted by slots containing the blades 33. The cutting edges of the blades normally lie within the slots and just below the level of the upwardly facing surface of the support. That surface of the support is displaceable relative to the carrier 32 and relative to the blades 33, from the position illustrated in Figure 4 in a direction towards the base 30. The range of travel of the surface of the support is such that the cutting edges of the blades can protrude substantially above that surface, sufficiently to cut through the web 10 of a pelt of carpet lying on the support 34. The support may be formed of a resiliently flexible material, for example a foamed plastics material or a latex foam. The support may have a continuous skin which provides the support surface for the carpet pelts. Downward movement of the pelt and the upper surface of the support 34 is effected by means of the platen 31, when the carrier 32 and support are positioned directly beneath the platen.

The carrier 32 and support 34 are withdrawn from beneath the platen 31 to facilitate removal of carpet tiles from the support and placing of a further pelt on the support.

Indicating means is provided for indicating a required position of the pelt relative to the blades 33 and thereby facilitate placing of the pelt in a predetermined position relative to the blades.

In a case where the lateral extent of the support 34 is substantially greater than the corresponding dimension of each pelt, the indicating means includes marks or other indicating elements on the upwardly facing surface of the support 34 at positions which are overlapped by margins of the web 10 bearing the marks applied at the marking station 12. The indicating elements on the support 34 are preferably rectilinear lines which are at right angles to the direction of travel of the carrier 32 relative to the base 30.

Alternatively, in a case where all pelts to be cut have the same width, there may be provided immediately adjacent to the upper surface of the support 34 guide elements which engage opposite margins of the pelt, when the pelt is placed on the support 34. In this case, the indicating elements may be provided in the guide elements. In this case, the indicating elements may be at substantially the same level as the marks on the margin of the web 10. In a case where the indicating elements are on the support 34, those elements would lie slightly below the level of the marks on the web 10.

The indicating means further comprises a member 35 of plate-like form which can be moved relative to the frame 29 between a lowered position illustrated in Figure 4, in which the indicator member lies above and close to or rests on the upwardly facing surface of the carpet pelt, and a raised position in which the indicating member 35 is spaced upwardly from the pelt. In its raised position, the member does not impede removal of the carpet tile or tiles from the support and placing of the pelt on the support.

The indicating member 35 is adapted to permit the carpet pelt to be viewed through the indicator member, when the latter is in its lowered position. The indicator member may be transparent or may include a transparent part. Alternatively, there may be formed in the indicator member one or more apertures through which the carpet pelt can be viewed.

In the particular example illustrated, the indicator member 35 is connected with the frame 29 for pivoting relative thereto about a horizontal pivot axis 36. Alternatively, the indicator member may be arranged for reciprocation upwardly and downwardly. The pivot axis 36 is at a level somewhat above that occupied by the carpet pelt and is preferably spaced from the carpet pelt, when the carrier 32 is fully withdrawn from beneath the platen 31, in a direction towards the path of travel of the platen.

The indicator member has marks or indicator elements corresponding to marks and/or pile tufts of the carpet. The marks or other indicating elements on the member 35 include elements which, when the member is in its lowered position, lie directly above the marks on the support 34 or on the guide elements. The web 10 of the pelt lies

between the support 34 and the indicator member 35 and accurate positioning of the pelt in one direction, called herein the "fore and aft direction" can be achieved by aligning each of the marks on the web 10 with the corresponding mark on the support 34 and with the corresponding mark on the support 35.

For facilitating positioning of the carpet pelt in a direction transverse to the fore and aft direction, there are provided on the indicator member 35 marks, pins or other indicating elements which, when the pelt is in the required position, are aligned with predetermined tufts of the carpet pile. Such tufts may be of a colour different from the colour of adjacent tufts and may be in that part of the pelt which is cut away when the tile is formed from the pelt.

It will be noted that the tufts are comprised by U-shaped pieces of pile yarn, the base of the U being implanted in the layer of adhesive on the web 10 and the limbs of the U extending away from the web. These limbs are aligned in the fore and aft direction, that is a direction parallel to the trimmed margins of the web. If the tufts are subjected to downward pressure or other action which tends to cause the tufts to lean from an upright attitude relative to the web, they are likely to lean in a fore and aft direction and unlikely to lean in any lateral direction. Accordingly, the positions of free-ends of the tufts can be relied upon in positioning the web 10 in a lateral direction; whereas the position of the free-end of the tuft is unreliable for positioning of the web in the fore and aft directions.

An operator may position each carpet pelt on the support 34 manually, viewing the marks and indicator elements to decide when the pelt is in the required position relative to the blades 33. To facilitate gripping of the pelt by the operator, the indicator member 35 and the support 34 may be cutaway in a central region of a front edge of the indicator member and support, so that a front edge portion of the pelt is exposed and readily accessible.

In an alternative arrangement, the indicator means provided on the member 35 is adapted to respond to the presence in respective predetermined positions relative to the indicator member of certain tufts or certain pattern elements and of the marks applied at the marking station 12. For example, the indicator means may comprise optical sensing devices which respond to tufts of a certain colour or fluorescent tufts. Alternatively, the indicator means may be electro-magnetic and be adapted to respond to the presence of a metallic tuft or of a metallic medium applied to the margin of the web 10. The indicating means may incorporate lights or other means for providing a signal to an operator, when he has correctly positioned the pelt. Alternatively, positioning may be carried out automatically by means of grippers which grip the pelt and are moved in a predetermined manner by suitable drive means until the indicating means signals that the carpet pelt is in the required position.

We have mentioned hereinbefore that the marking devices may be known devices which apply to the web rectilinear lines, the lengths of these lines being perpendicular to a longitudinal centreline of the web. Additionally or alternatively, there may be provided at the marking station 12 known devices incorporating stamps which print on the web marks, each of which is a rectilinear line of ink with the length of the line extending along the web. Printing on the web in this way a line which extends along the web and bears a predetermined relation to the rows of tufts applied to the web facilitates cutting the web along lines parallel to a longitudinal centreline of the web in a predetermined relation to the rows of tufts. Printing on the web lines of ink, the lengths of which are perpendicular to the longitudinal centreline of the web facilitates cutting of the web along lines perpendicular to that centreline in predetermined relation to the lines of tufts. The lines of ink remain in the pelts which are cut from the carpet and are used during positioning of each pelt in the press illustrated in Figure 4. There may be provided in the press one set of indicator elements for comparison with marks on the web which are lines perpendicular to the longitudinal centreline of the web and a further set of indicator elements for comparison with marks on the web which are lines parallel to the longitudinal centreline of the web. Alternatively, indicator elements of one set may be adapted for comparison with both longitudinal and transverse marks on the web.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A method of cutting patterned carpet comprising a web and a pile of tufts on one face of the web which define the pattern of the carpet, wherein the web is marked in predetermined positions relative to the positions where respective tufts are attached to the web and the web is cut along lines which bear a predetermined relation to the positions of the marks.

2. A method according to Claim 1 wherein, in preparation for cutting, the carpet is moved to bring said marks into respective predetermined positions relative to indicator elements which are distinct from cutting elements which cut the web.

3. A method according to Claim 2 wherein the indicator elements include elements which are spaced apart in the direction of the thickness of the carpet and wherein one of the marks on the web is moved into alignment with said spaced indicator elements.

4. A method according to Claim 3 wherein the mark on the web lies in the space between the indicator elements.

5. A method according to any preceding Claim wherein the marks are applied to the web in apparatus which attachs the tufts to the web.

6. A method according to Claim 5 wherein the marks are applied to the web prior to application of the tufts to the web.

7. A method according to any preceding Claim wherein marginal portions are trimmed from the web after marking of the web and before cutting.

8. A method according to Claim 7 wherein the marginal portions are trimmed from the web in apparatus which applies the tufts to the web.

9. A method according to any preceding Claim wherein a further layer is applied to an underside of the web after marking of the web and before cutting of the web.

10. A method according to any preceding Claim wherein the tufts are upstanding limbs of U-shaped pieces of yarn.

11. Apparatus for use in cutting patterned carpet and comprising a support on which the carpet rests during positioning and cutting, cutting means for cutting the carpet whilst on the support and means for moving the cutting means relative to the support to effect cutting, wherein the support incorporates indicator elements which lie in, on or close to the surface of the support on which the carpet rests.

12. Apparatus according to Claim 11 further comprising an indicator member which overlies the carpet when the carpet rests on the support, the indicator member having or constituting a further indicator element aligned with a corresponding one of said indicator elements which lie in, on or close to the surface on which the carpet rests.

13. A method of manufacturing carpet wherein a pre-formed web is moved along a defined path through an attaching station, tuft-forming lengths of yarn are attached to the web at the attaching station and margins are cut from the web whilst the web is in said defined path.

14. A method according to Claim 13 wherein, whilst the web is in said defined path, marginal portions of the web are marked at positions which bear a predetermined relation to the positions at which the tuft forming lengths of yarn are attached to the web.

15. Apparatus for use in the manufacture of carpet and comprising guide means defining a path through the apparatus, drive means for moving a pre-formed web through the apparatus along said path, tuft-attaching means for attaching lengths of yarn to the web at an attaching station and cutting means for cutting marginal portions from the web whilst the web is in said path.

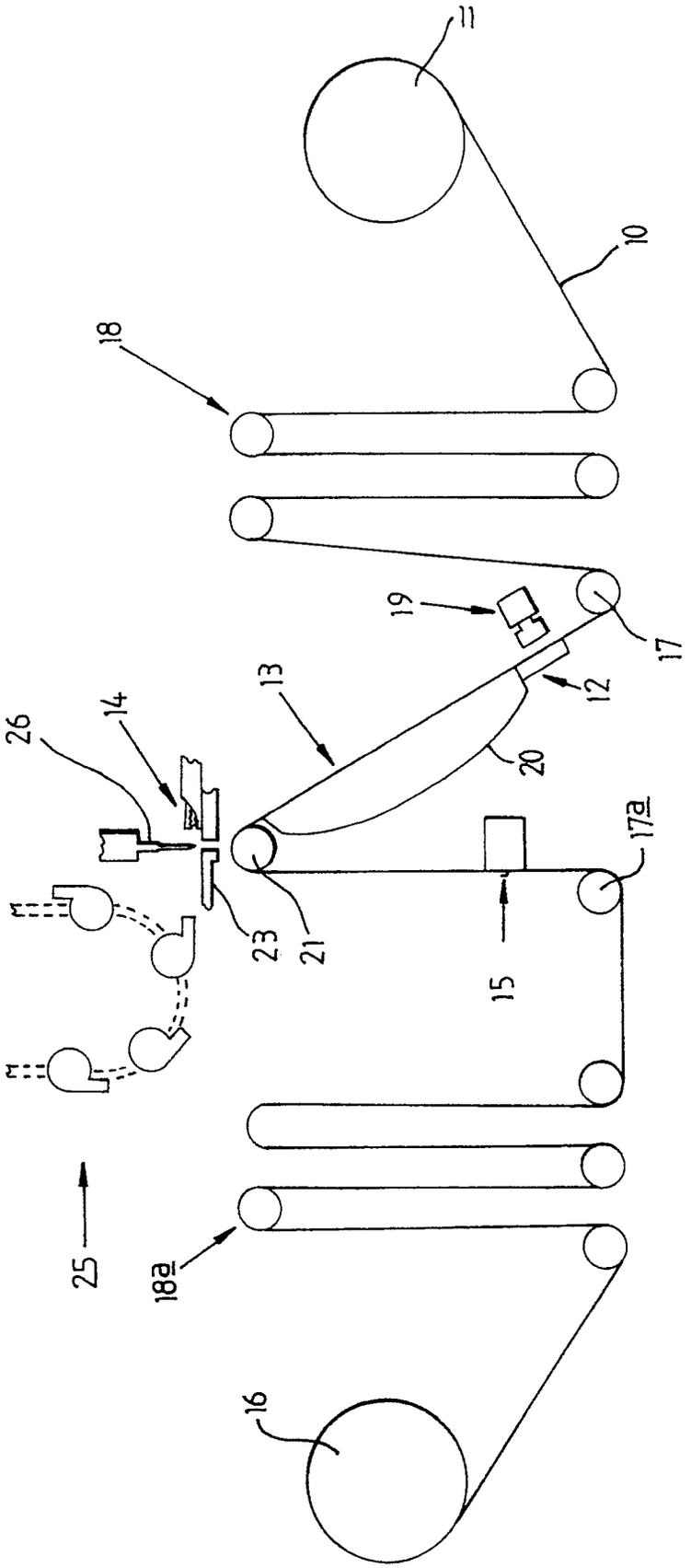

FIG. 1

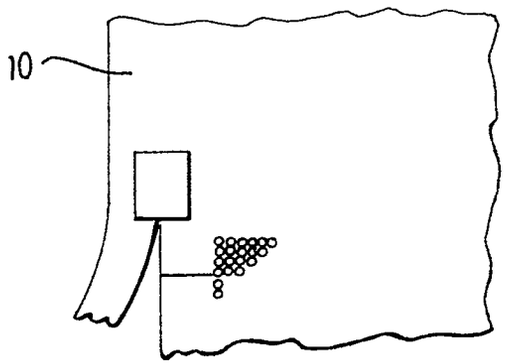

FIG. 2

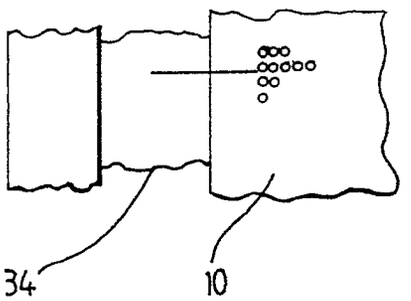

FIG. 3

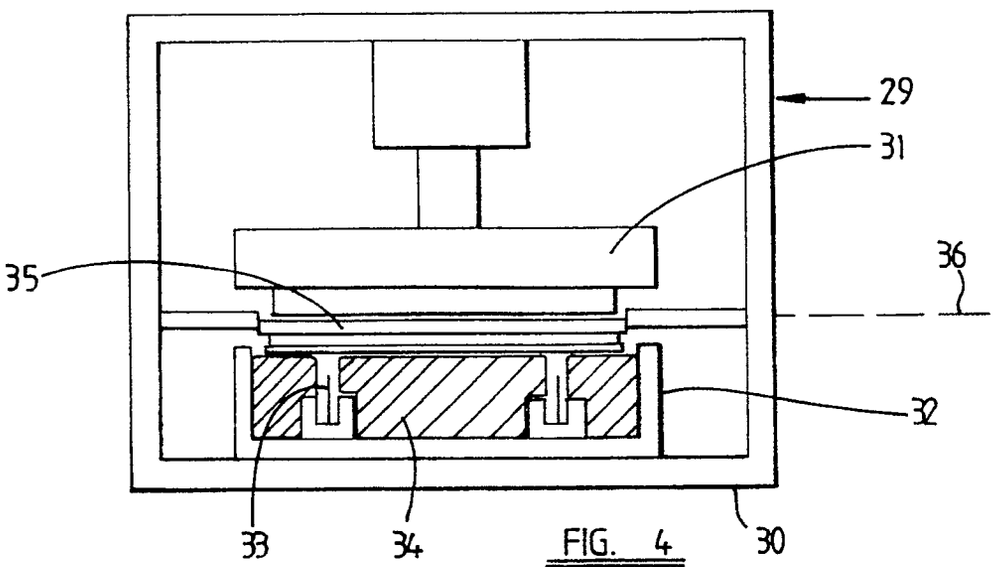

FIG. 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 9345

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)
X,Y	DE-A-2 737 140 (THE WALL PAPER MANUFACTURERS LTD.) * pages 6 - 8 *	1,2-4,12	D 06 H 7/00 D 05 C 17/00 D 06 H 1/00
D,Y,X	GB-A-2 133 733 (BONDAX CARPETS LIMITED) * page 2, line 78 - page 4, line 111 *	2-4,12,11	
X	GB-A-2 079 682 (WOOL DEVELOPMENT INTERNATIONAL LIMITED) * page 1, lines 41 - 64 * * page 2, lines 12 - 49 *	1,5	
X	US-A-3 688 804 (J.L.BROWN; W.O.HARLAN) * column 5, line 20 - column 6, line 8 *	1,5-8, 13-15	
X	US-A-4 785 750 (R.H.BEST) * column 4, line 67 - column 5, line 40 *	1	
A	FR-A-2 461 055 (P.T.RENAULT) * claims 1, 4, 5 *	7,15	
A	GB-A-1 468 200 (THOMSON SHEPHERD AND COMPANY LIMITED) * claims 1-3 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) D 06 H D 05 C
A	DE-A-3 225 375 (TEXPA-ARBTER MASCHINENBAUGESELLSCHAFT MBH) * claim 1 *	1,2,11	

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 February 91	D HULSTER E.W.F.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
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