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(11) **EP 1 543 929 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
22.06.2005 Bulletin 2005/25

(51) Int Cl.7: **B28B 11/06**, B28B 11/10,
B28B 13/02

(21) Application number: **03709828.2**

(86) International application number:
PCT/ES2003/000099

(22) Date of filing: **07.03.2003**

(87) International publication number:
WO 2004/014624 (19.02.2004 Gazette 2004/08)

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

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(30) Priority: **29.07.2002 ES 200201785**

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(54) **METHOD AND EQUIPMENT FOR DECORATING CERAMIC PIECES AND PRODUCT THUS OBTAINED**

(57) It consists of obtaining some ceramic pieces with some somewhat special decorations by means of a really cheap and automatic process from the forming of the bisque in a press that includes a bottom plate with a cavity where the components forming the cited bisque are placed and a top plate that presses on said components for the formation of the initial bisque (1).

The top plate includes some male elements (6) that upon pressing on the bisque (1) of the bottom plate forms some notches (5) with a superelevated perimetric edge (7).

In subsequent steps these recesses are filled with a mixture (15) of granules and dry glue and afterwards the assembly of the bisque with the filling mixture (15) are put inside a kiln so that the mixture solidifies, integrating into the bisque, thus obtaining the unprocessed ceramic piece (2).

Finally, the superelevated areas of the ceramic piece (2) will be ground. These areas correspond with the superelevated edges (7) of this notches, thus forming the ceramic piece with its decorative surface totally flat.

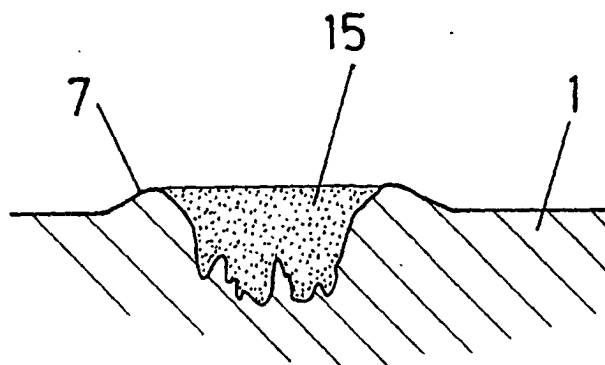


FIG. 3

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Description

[0001] The invention consists of a method and equipment for decorating ceramic pieces and the obtained product.

[0002] It is a question of manufacturing a type of ceramic pieces with a relatively low cost in relation to other pieces and conventional processes that are much more expensive. Furthermore, a higher quality product is obtained by means of the present invention.

[0003] Initially, ceramic pieces during the pressing step of the earth (materials or components of the bisque of the pieces to be obtained) inside a mold make some notches on the visible surface of such pieces, notches that are afterwards filled with a decorative material, such as granules or the like, that include in their composition dry glue that improves their adherence.

[0004] At the end of the process, after putting the ceramic pieces inside the kiln and the visible surface has been subsequently ground, this visible surface will be totally flat and level.

[0005] The new method permits us to make upon the bottom of the notches in the pressing process some projections or ribs that will be visible as long as the granules filling such notches is of transparent material, in such a way that the inclusion of such ribs or projections on the inside of the notches constitute some new very original and very striking aesthetic and decorative elements.

BACKGROUND OF THE INVENTION

[0006] Currently there are different types of ceramic pieces for coverings and pavings that have different types of decoration on their visible surfaces, made by means of serigraphy processes and methods, among others.

[0007] In some cases, the visible surfaces of the ceramic pieces are coated with varnish and afterwards the pieces are put inside a kiln as a final step of the process.

[0008] In other cases, such as for example in porcelain earthenware type ceramic pieces, in one of the steps of the process some notches that will be filled afterwards with a liquid product (colored or uncolored enamel) that will brim over or it will be necessary to spread it over the entire surface of the visible surface of the ceramic piece. Afterwards, this piece will be put inside a kiln and later on the entire surface of the visible surface will be ground in order to try to obtain uniformity and flatness of the visible surface, since contractions of the material are normally produced in the areas where the notches are as a result even of some low reliefs, which need to be made level with the rest of the surface.

[0009] This grinding of the entire surface of the visible surface of the ceramic piece implies a high cost due to the wear of the abrasive elements, as well as the time involved in such a polishing operation.

[0010] Besides, at the end, the obtained product, although its appearance may be very attractive, it will be

too expensive and possibly not very profitable.

DESCRIPTION OF THE INVENTION

[0011] In order to achieve the aims and avoid the above-cited inconveniences, the invention proposes a method and device for decorating ceramic pieces and the obtained product.

[0012] In the first step, the pressing of the material comprising a bisque which in turn comprises the ceramic piece itself is carried out.

[0013] In this pressing, a bottom plate comprises a cavity corresponding to the bisque, whereas a top plate presses the materials placed in this cavity in order to compact and form the initial bisque.

[0014] The first characteristic of the invention is centered on some notches that are made in this first pressing step on the top surface of the bisque which will later be the visible surface of the ceramic piece.

[0015] For this purpose, the top plate has some protrusions or projections, in such a way that upon pressing on the material of the bisque, complementary notches on this bisque will be obtained.

[0016] During this pressing operation and due to the protrusions or projections of the top plate of the press, part of the material of the bisque will brim over and the notches will be surrounded by some small ring or frame type perimetric superelevated elevations with respect to the surface of the top surface of the bisque.

[0017] These notches may have any shape and also a surface formed by several surfaces arranged on different planes.

[0018] There is also the possibility that the notches include projections, ribs, or other small low relief areas. These elements can constitute at the end an even more striking decoration if possible.

[0019] In a subsequent step and automatically, the bisque is conveyed towards a roller bed that forms part of a machine that is responsible for filling the notches of the bisque exclusively with granules, all of the same color or of various colors.

[0020] For this purpose, the machine includes a top hopper with various departments along the machine, in such a way that the bisque will be placed under a screen that has some windows opposite the notches of the bisque. The notches and the windows have the exact same shape.

[0021] The hopper has a vibrating mechanism that facilitates the discharge of the material that is regulated by means of one or several material regulating elements or gates.

[0022] Once the notches or hollow spaces of the bisque have been filled, the bisque passes to a rear part of the machine where aside from the roller bed, there are other top rollers that press on the granules in order to press and compact said granules.

[0023] The pressure exerted by said pressing rollers provides a compacting effect that eliminates the empty

spaces inside the notches of such bisques.

[0024] In the different formulae of granules that we can use, at least 3% dry glue has been established, since all these functions are carried out at least at 70°C, a sufficient temperature so that this product remains fastened in the notches by the action of said glue and can be conveyed by loading and unloading machines without problems of falling.

[0025] The grain size of the granules, as well as the size of the dry glue is between a minimum value of 5 micra and a maximum value of 1,000 micra.

[0026] In a subsequent step the bisque is removed from the machine in order to be put into a kiln where the mixture of granules and dry glue will dissolve to a liquid state, reducing its volume somewhat, although its top level will always exceed the surface of the visible surface of the ceramic piece.

[0027] Finally the obtained ceramic piece in an unprocessed state will be subjected in the kiln to a grinding process that will only affect the projecting areas corresponding with the notches filled by the filling mixture, in such a way that in an extremely small period of time the entire surface of the visible surface will be leveled at a same level.

[0028] When the notches contain ribs, projections or small low relief areas, the granules will be of a transparent material so that these added decorative elements can be seen.

[0029] The entire process is automatic, beginning with the initial pressing step, following the steps of the machine, the baking steps and the final polishing or grinding step.

[0030] Between the machine for filling and pressing the mixture of granules and glue there is a stacking station for the purpose of being able to stack several pieces when there is some interruption, slow down or acceleration of any of the parts of the equipment assembly.

[0031] In this way the assembly of the automatic process will not be interrupted.

[0032] In order to recover the production lost during these interruptions the steps of the machine and subsequent steps can be accelerated.

[0033] Given that the machine for filling and pressing the granules and dry glue can collect three or more pieces in order to decorate in the same pattern arrangement, it is essential to collect the package of pieces of a pressing that are conveyed by the line and return it thereto, in the same arrangement, in such a way that the designs that we had on each piece (since they may be different) are not changed with the normal program.

[0034] Continuing with the deficiencies of machine currently existing for traditional decoration by serigraphy, we find that by changing an element appropriate for this need in the machine of this invention, we manage to eliminate this deficiency with very good results.

[0035] The machine may be adapted to a traditional serigraphy system but with different directions by eliminating the hopper and pressing rollers, although this is

not the object of the patent in question.

[0036] On the other hand, the possibility of painting the side surfaces of the recesses in order to achieve a chromatic effect in terms of the side of visual incidence is provided for.

[0037] This operation would be carried out before making the bisque pass to the machine for filling and pressing the granules and glue and only optionally.

[0038] On the other hand, it should be pointed out that by keeping the grain size of the glue and granules between the above-cited values, we will obtain a top quality product with a perfect finish. In this respect, it is important to point out that if the indicated grain size values are not maintained, the decorative motifs of the ceramic pieces can be deformed producing some low reliefs that notably make such decorative motifs ugly and deteriorated and they would later be visible.

[0039] Hereinafter to provide a better understanding of the specification, some figures that represent the object of the invention are attached hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040]

Figure 1 shows a view where a ceramic piece in an initial step of the method of the invention is seen. Essentially a notch with a perimetric projecting partition obtained in the initial pressing step of a bisque from which the ceramic piece will be obtained, is seen.

Figure 2 shows a view of the notch filled with a material that slightly brims over the perimetric projecting partition.

Figure 3 shows a view similar to the previous one where the filling material is level with the free edge of the perimetric projecting partition of the notch.

Figure 4 shows a perspective view of a machine for filling and pressing the granules in the hollow spaces or notches of the bisques made in the initial pressing step.

Figure 5 is a plan view of the machine.

Figures 6 A-D show different arrangements of pieces that can be decorated in the machine for filling and pressing.

Figure 7 shows a view of a decoration added to the notches by means of an aerographic mechanism or the like.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0041] An embodiment of the invention in accordance with the numbering used in the figures is described hereinafter.

[0042] In an initial pressing step the material or materials comprising the initial bisque (1) and subsequent ceramic piece to be obtained (2), a top plate (4) presses on said bisque (1) placed in a cavity of a bottom plate

(3) of the press. This top plate in turn makes during the pressing operation some notches (5) in the initial bisque (1) thanks to some projections, protrusions or male elements (6) that this top plate (4) includes, in such a way that in this pressing operation a small superelevated perimetric partition (7) that surrounds these recesses (5) as a result of the pressure exerted by the male elements (6) on the bisque (1), emerges upward.

[0043] Obviously, the recesses (5) will be established on the visible surface of the piece or bisque.

[0044] The notches (5) have a depth of approximately 2.2 mm, whereas the superelevated partitions (7) that brim over have a height of approximately 1 mm.

[0045] The notches (5) can include ribs (8), projections, low relief areas or any other decorative element, as well as a rounded surface or a surface formed by several surfaces on different planes, all depending on the shape of the male elements (6) integral to the top plate (4) of the press.

[0046] In a subsequent stage, the bisques (1) obtained in the press pass to an intermediate stacking station (9) and from here to a roller bed (10) that forms part of the machine (11) for filling and pressing granules (15) that will be poured into the recesses or notches (5) of the bisques (1).

[0047] These bisques (1) obtained in the first pressing step could also pass directly to the cited machine (11).

[0048] Since it is an automatic process, the stacking station (9) is very convenient for when there is some variation or interruption in any of the mechanisms and devices, either in the press, machine or any other.

[0049] The machine (11) likewise comprises a horizontal screen (12) arranged above the roller bed (10) and which includes some windows (13) that correspond exactly with the notches (5) of the bisques (1), in such a way that when these notches and windows (13) are opposite one another, a mixture (15) comprised of granules and dry glue to fill the notches (5) of the bisques (1) will drop by gravity from a top hopper (14) longitudinally moveable. The screen (12) may move in a vertical direction for the purpose of regulating its approach to the bisques (1), depending, for example, on the thickness thereof.

[0050] The hopper (14) can include a single or several departments for the purpose of being able to pour the granules (15) of different colors into the notches (5). The discharge of the material from the hopper (14) will be regulated by means of one or several material regulating elements (16).

[0051] The hopper (14) includes a vibrating mechanism (17) that facilitates the discharge of the material, at the same time that it is coupled to some small supports (18) coupled in turn to some longitudinal guides (19) with insertion of some rubber shock absorbing elements (20) to absorb the vibrations of the hopper (14) produced by the cited vibrating mechanism (17).

[0052] The movement of the hopper (14) in order to make its outlets coincide with the notches (5) of the

bisques (1) in order to pour the mixture (15) of granules and dry glue is carried out by means of a motor element (21) associated to a chain, belt (22) or the like, that is coupled to the hopper by its ends and connected to a pinion (23) fit in the shaft of said motor element (21).

[0053] Once the notches or hollows spaces (5) of the bisque (1) have been filled, the bisque passes to a rear part of the machine where aside from the roller bed (10), there are two top rollers, a front one (24) and a rear one (25), which press on the mixture (15) in order to press and compact same, this mixture (15) of granules and dry glue being approximately level with the free edge of the superelevated partitions (7) that surround the different notches (5).

[0054] The grain size of the granules and dry glue will be between some minimum values of 5 micra and a maximum value of 1,000 micra. In this way the compacting without empty spaces of the mixture (15) inside the recesses will be notably increased. Likewise, the quality of the decorative motifs will be noticeably increased without any deformations in such decorative motifs.

[0055] In order to obtain a better result if this were possible, the first pressing roller (24) turns at the same speed as the rollers (10) that act as the bed and seat for the bisque (1), whereas the other similar pressing roller (25) will turn at a slower speed, at an approximately 10% slower rotating speed.

[0056] The pressure exerted by these two pressing rollers (24) and (25), essentially the second one, provide a compacting effect without empty spaces in the mixture (15) of granules and dry glue inside the notches of the bisques (1).

[0057] In a subsequent step, the bisque (1) is removed from the machine (11) in order to be placed inside a kiln where the mixture of granules and dry glue will dissolve to a liquid state, the volume thereof reducing somewhat, although its free level will exceed the surface of the visible surface of the ceramic piece (2) already formed, where the filling mixture (15) will be integrated in said unprocessed ceramic piece (2).

[0058] Finally, the ceramic piece (2) will be subjected to a grinding process that will only affect the projecting areas corresponding with the notches (5) filled with the mixture (15) of solidified granules and dry glue, in such a way that at the end of an extremely small period of time, the entire surface of the visible surface will all be at the same level.

[0059] In the event that the design does not require a notch to be wider than 5 mm, the plate itself of the press will make an intermediate rib which is decorative on the product and thus the desired measurement is achieved without any problems of contractions and couplings. Consequently, any desired length may be obtained.

[0060] The possibility of including one or several aerographs (26) in order to paint the side surfaces of the recesses (5) has been provided for in order to obtain a chromatic effect in terms of the side of visual incidence.

[0061] This operation will be carried out before pass-

ing the bisque under the hopper in order to fill the notches thereof.

[0062] Optionally, the filling mass could be comprised of a liquid or pasty material, whereby the pressing rollers (24) and (25) could be omitted.

Claims

1. Method for decorating ceramic pieces, that comprises an initial step of pressing a conglomerate of materials comprising an initial bisque obtained in a press that has a bottom plate with a cavity where said conglomerate of materials is placed and a top plate that presses on these materials in order to form the initial bisque, from which the ceramic piece will be finally obtained, a piece previously passing through a baking step, **characterized in that** in this initial pressing step some notches (5) are simultaneously formed in the formation of the bisque by pressure of the top plate on the conglomerate of the bottom plate, by means of some male elements (6) integral to the top plate (4), emerging upward in this pressing operation a perimetric partition (7) that surrounds such notches (5) brimming over the top visible surface of said bisque (1), a surface that corresponds afterwards with the decorative surface of the ceramic piece obtained;
 - a step where the bisque (1) formed in the initial pressing step is conveyed to a machine (11) that at least carries out the task of filling said notches, essentially by means of a mixture (15) comprised of a solid material containing granules and dry glue;
 - a step where the bisque (1) together with the filling material of the notches (5) are placed inside a kiln in order to dissolve at least the mixture (15) of granules and dry glue integrating into the bisque (1), the same also essentially converting inside the kiln into the ceramic piece itself (2);
 - a step where the ceramic piece (2) removed from the kiln is subjected to grinding on its visible surface in order to eliminate the superelevated areas corresponding to the part of the filling mixture (15) that occupies the notches (5) and to the superelevated edges (7) that surround said notches (5), the visible surface of the ceramic piece (2) thus all being coplanar with some attractive decorative elements corresponding with the notches (5) filled with the mixture (15) of granules and dry glue.
2. Method for decorating ceramic pieces, according to claim 1, **characterized in that** in a final step of the machine (11), the machine carries out pressing of the filling mixture (15) that brims over the free edge of the perimetric partitions (7) that surround the notches (5).
3. Method for decorating ceramic pieces, according to claim 1, **characterized in that** the amount of dry glue applied in the filling mixture (15) varies between 2% and 5%.
4. Method for decorating ceramic pieces, according to any of the preceding claims, **characterized in that** in a step prior to the filling of the notches (5) of the bisque (1), a step wherein the surface of said notches (5) is impregnated with at least one color, for example by means of some aerographs (26)) has been provided for; all in order to obtain a visible added decoration when the filling mixture (15) of these notches (5) is at least partially transparent.
5. Method for decorating ceramic pieces, according to any of the preceding claims, **characterized in that** in a step after the pressing, a stacking station (9) of the bisques has been provided for; all in order to prevent interruptions or slow downs as much as possible in the automatic process of decorating the ceramic pieces.
6. Method for decorating ceramic pieces, according to claim 1, **characterized in that** the grain size of the dry glue and granules varies between a minimum value of 5 micra and a maximum value of 1,000 micra; all in order to obtain some quality decorative motifs without deformations or other defects visible from the outside.
7. Equipment for decorating ceramic pieces, that comprises:
 - a press provided with at least one bottom plate with a cavity where a conglomerate of materials is placed and a top plate that presses on said conglomerate of materials in order to obtain a bisque (1) comprising the ceramic pieces (2);
 - a kiln where the bisque (1) will be put in order to obtain the decorative ceramic piece itself;**characterized in that** the top plate includes at least one male element (6) that contacts the conglomerate of materials of the bottom plate (3) producing some notches (5) in the bisque, and an superelevated edge that surrounds said notch (5); a machine (11) for filling and pressing a mixture (15) of granules and dry glue that is poured into the notch (5) of the bisque (1) also being included.
8. Equipment for decorating ceramic pieces, according to claim 7, **characterized in that** the machine (11) comprises:

- a roller bed (10) to receive and convey the bisques (1) coming from the press along the cited machine (11) ;
 - a top hopper (14) for placing the filling mixture (15) that will drop by gravity into the notches (5) of the bisque (1), said hopper (14) including at least one compartment containing said filling mixture (15);
 - an intermediate screen (12) that has some windows (13) that correspond with the notches (5) of the bisque (1), windows (13) that act as a means to direct the material in its free fall towards the notches (5); said screen (12) being located between the hopper (14) and the roller bed (10), right above the bisque (1);
 - at least two pressing rollers: a front one (24) and a rear one (25), which are responsible for pressing on the filling mixture (15) that brims over the perimetric edge (7) of the notches (5) of the bisques (1) in their forward movement along the machine (11).
9. Equipment for decorating ceramic pieces, according to any of the claims 7 or 8, **characterized in that** the male elements (6) include recesses and projections, as well as different types of surfaces, either curved or formed by different planes, all in order to form some symmetric shapes in the notches (5).
10. Equipment for decorating ceramic pieces, according to claim 8, **characterized in that** the top hopper (14) is a movable element longitudinally displaceable along some side guides (14) for the purpose of pouring the filling mixture (15) in the different notches (5) of the bisque (1) sitting on the roller bed (10), the hopper (14) also including a vibrating mechanism (17), as well as at least one bottom material regulating element (16) that regulates the discharge of the filling mixture in its free fall towards the notches (5).
11. Equipment for decorating ceramic pieces, according to claim 10, **characterized in that** the hopper (14) is coupled to the side guides (19) by means of some small supports (18) and some shock absorbing elements (20).
12. Equipment for decorating ceramic pieces, according to either of the claims 10 or 11, **characterized in that** the hopper is moved by means of a motor element (21) whose shaft provided with a pinion (23) transmits its movement to a belt, chain (22) or the like, whose ends are connected to the cited top hopper (14).
13. Equipment for decorating ceramic pieces, according to claim 8, **characterized in that** the front roller (24) turns approximately at the same speed as the rollers (10) where the bisques (1) sit, whereas the rear roller (25) turns at a slower speed, approximately 10% slower.
14. Equipment for decorating ceramic pieces, according to any of the claims 7 to 13, **characterized in that** it includes a bisque (1) stacking station (9) established after the press where the bisques (1) are formed.
15. Equipment for decorating ceramic pieces, according to any of the claims 7 to 14, **characterized in that** at least an impregnating or painting mechanism, essentially an aerograph (26) has been provided for in order to impregnate at least one part of the notches (5) before they are filled.
16. Product obtained by the method and with the equipment for decorating ceramic pieces, that comprising a body with a decorative surface that includes some notches (5) filled with a material integrated into the flat body itself, is **characterized in that** the surface of said notches includes projections, recesses, surfaces impregnated with one or several colors; all so that when the filling material of the notches is transparent, said decorative elements are visible from the outside.
17. Product obtained by the method and with the equipment for decorating ceramic pieces, according to claim 16, **characterized in that** at least one part of the surface of the recesses (5) includes some areas arranged on different planes.

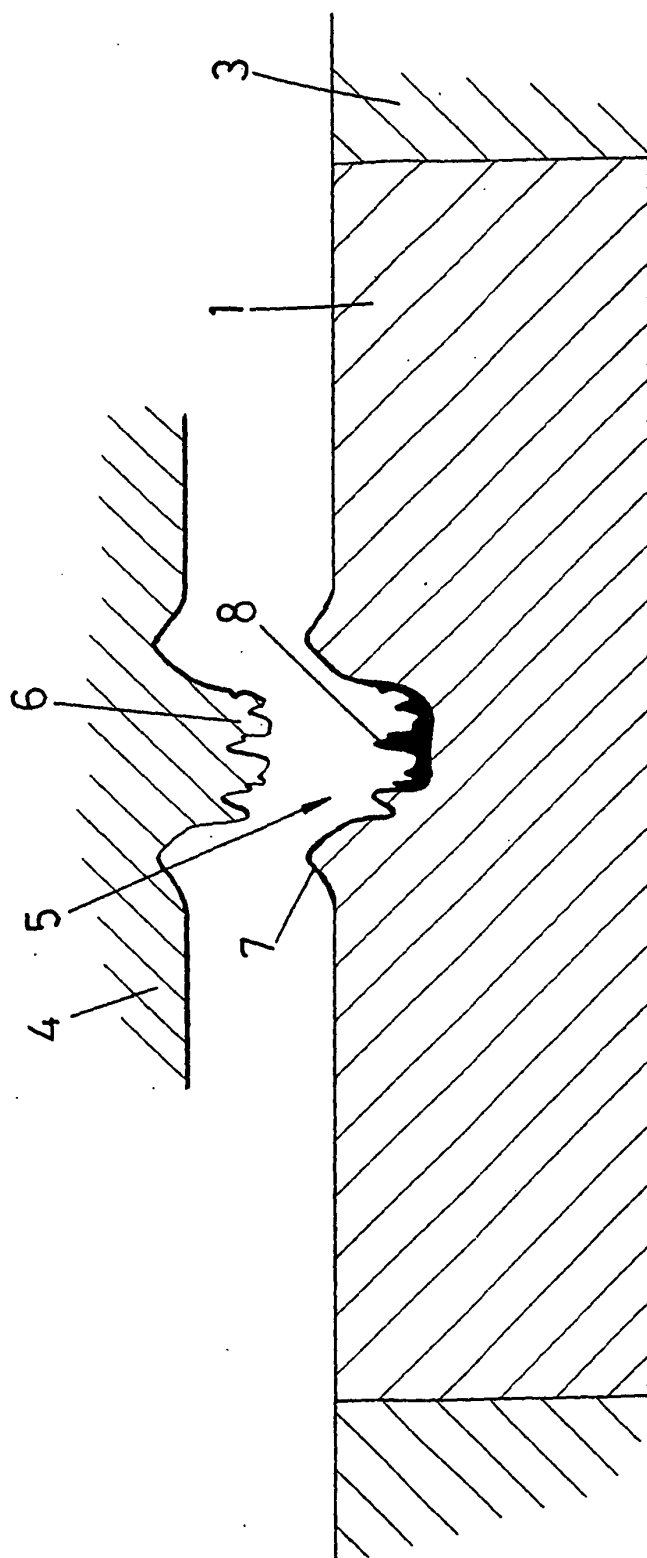


FIG. 1

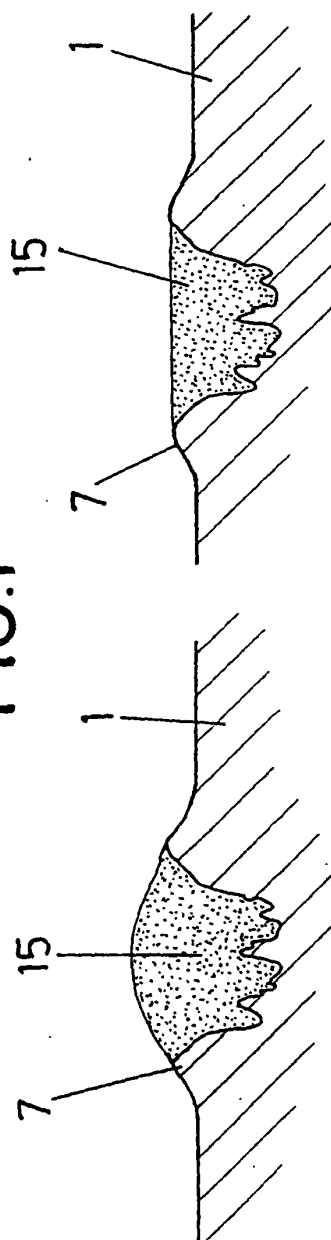


FIG. 3

FIG. 2

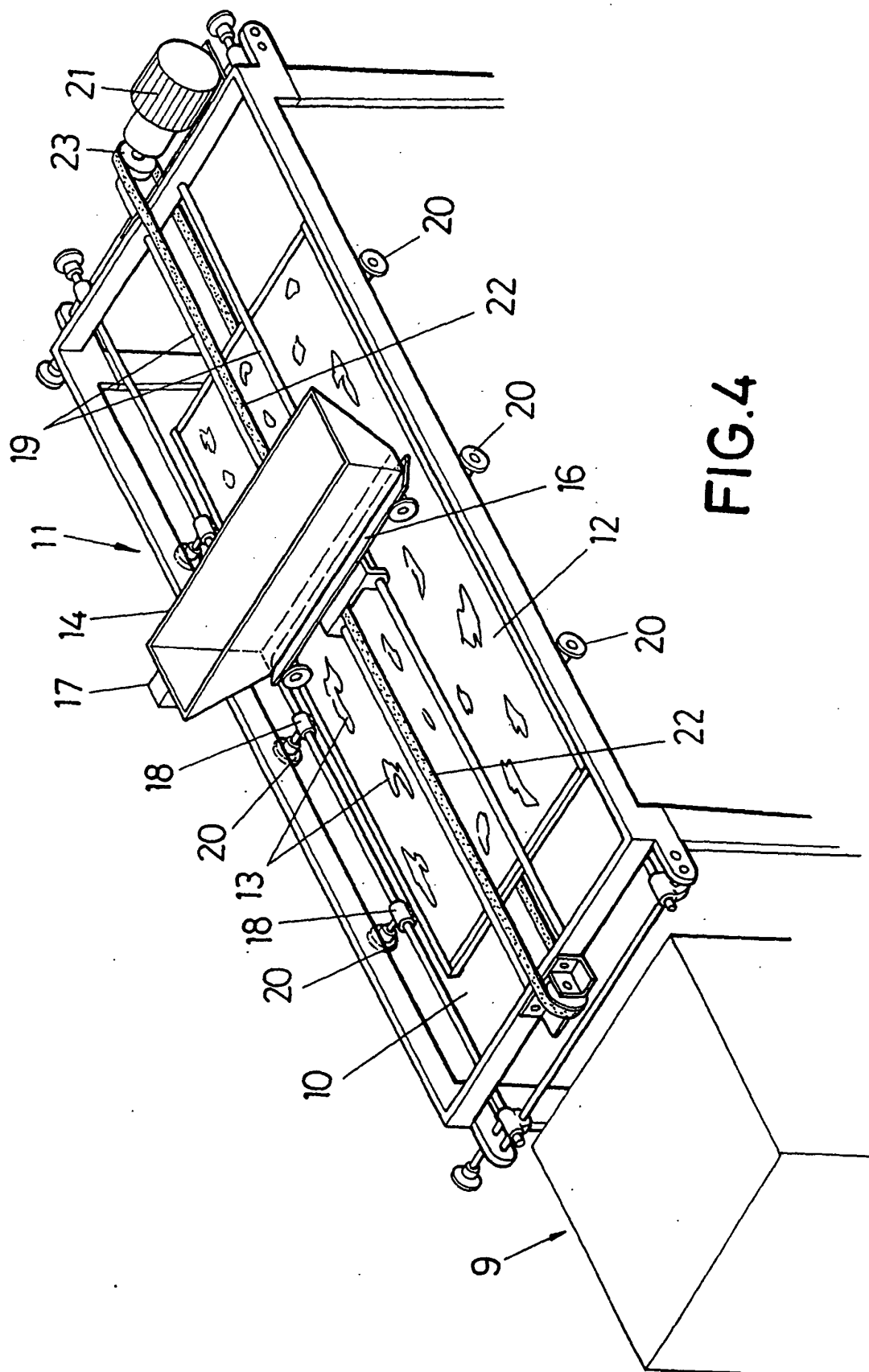


FIG. 4

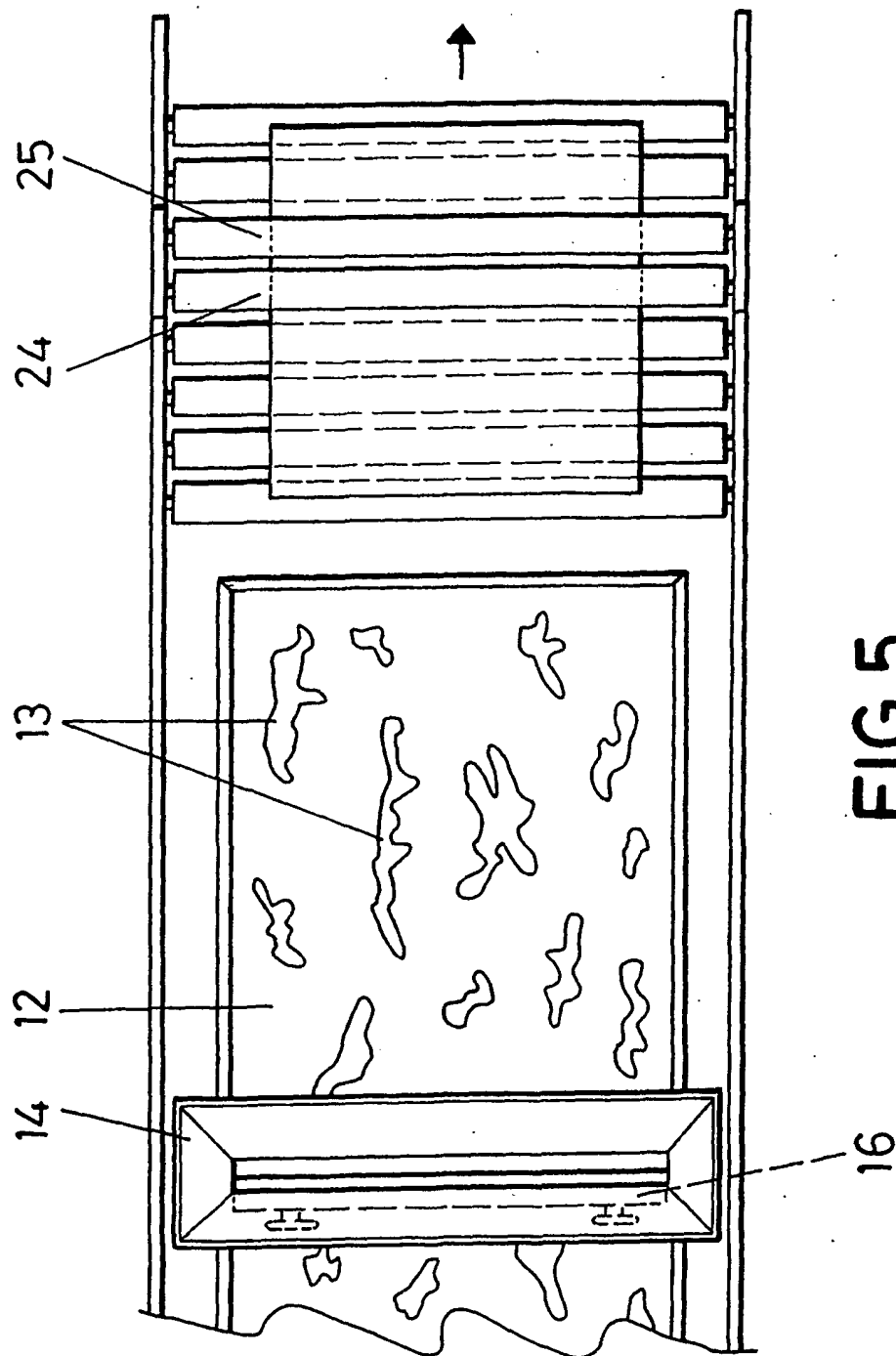


FIG. 5

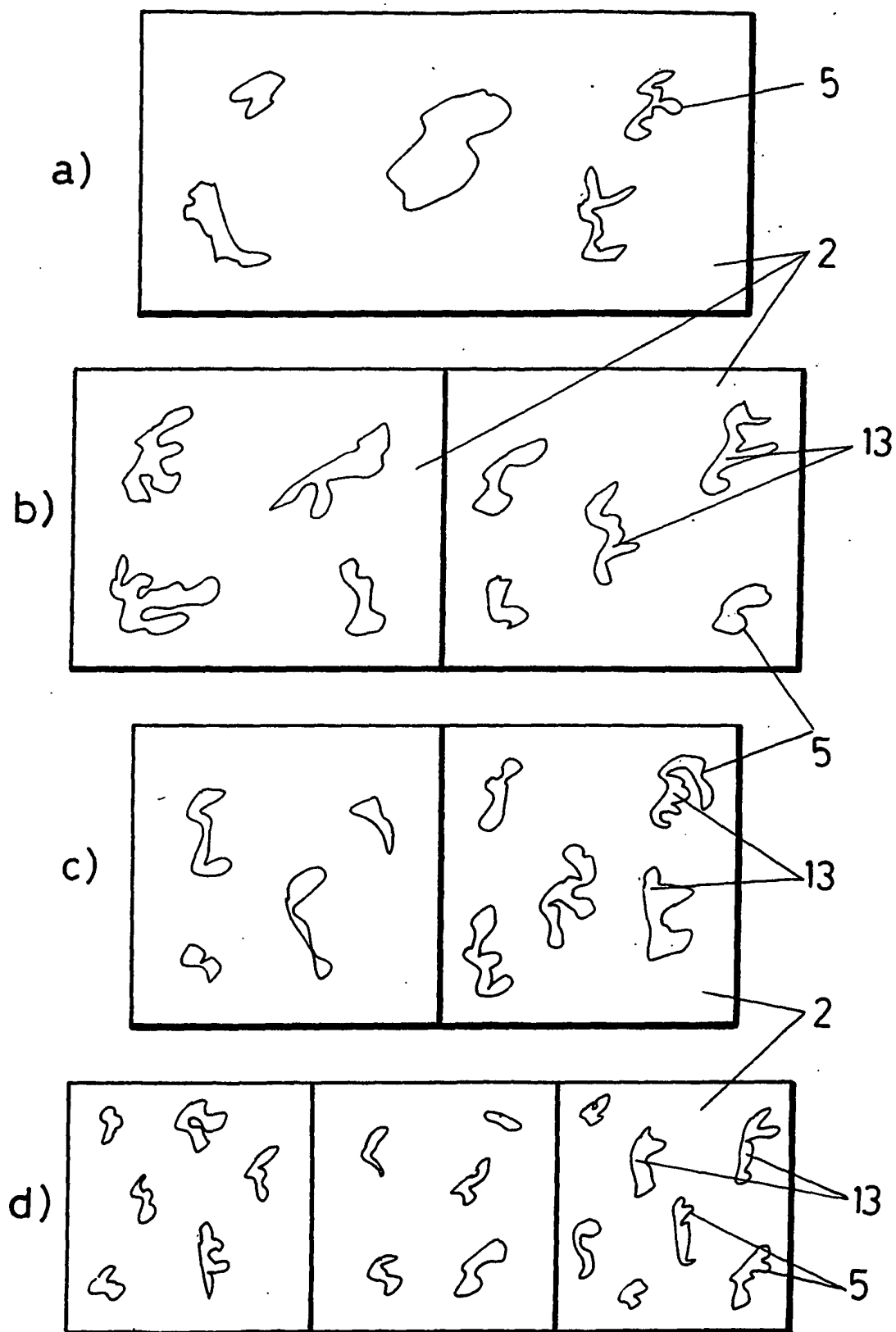
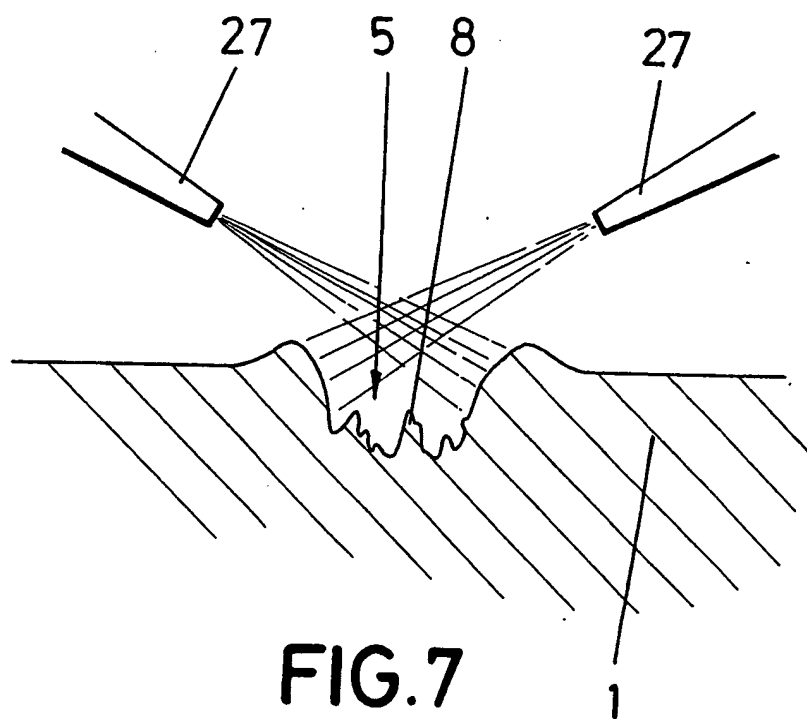


FIG.6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/ ES 03/00099

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7: B28B 11/06, 11/10, 13/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC 7 : B28B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WIP, EPODOC, MISTRAL, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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