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(54) **Method and system for production of a picture by means of tiles on a wall, floor or ceiling**

Verfahren und System zur Herstellung eines Bildes mittels Fliesen auf einer Wand, einem Boden oder einer Decke

Procédé et système de production d'une image au moyen de tuiles sur un mur, de plancher ou de plafond

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Description

TECHNICAL FIELD

[0001] This invention relates to a system and a method of production of a tile arrangement, comprising the steps of; choosing a picture for a tile arrangement, arranging for having said picture in digital form on a computer device, choosing a tile to be used for the tile arrangement, using software on said computer device for producing a production template enabling transfer of said picture onto a desired number of the said tiles, using a production unit for transfer of said production template onto each one of said tiles.

TECHNICAL BACKGROUND

[0002] The use of applying pictures to walls, floors, and/or ceilings has for long been a means for individuals and organizations to "decorate" a built in space, e.g. a room. Tiles are building elements that are preferred in many different situations thanks to their esthetic appearance and also their ability of providing strength and durability. The production of tiles includes relatively many production steps and in order to provide cost efficiency there is a need of producing a large number of each tile, having its own aesthetic appearance. This latter fact puts a limit to the ability of providing a customer an individualized picture applied by means of traditionally produced tiles. Production systems are known that may be used to produce individually designed tiles, but these systems are either very expensive or complex (e.g. US 2007/0246148 and US 2007/0085983) and therefore the cost for such tiles are very high resulting in a limited availability of such tiles.

[0003] US2007/0115336 relates to a digital ink jet printing process method comprising following procedures: 1. Choose the basic material, 2. Pre-process the basic material, 3. Print out graphics on basic materials directly; and, 4. After process on the surface of basic materials to protect the graphics on the surface of the basic materials; based on the procedures, choose the proper basic material to have the basic material with more variable colors, the graphics, colors are not limited, more saturated colors, better scratch-proof and water-proof; the graphics can stay on basic material longer with good weather fastness and grade in deposit standard.

[0004] EP2497647 (which constitutes prior art according to Art. 54(3) EPC) describes a process for decorating a glazed ceramic tile, comprising the steps of: (a) applying a primer composition on the tile and optionally wiping off the excess primer composition from the tile; (b) applying an ink composition comprising a radiation curable component on the primer composition by inkjet technology and (c) curing the ink composition. The process may further comprise the step of (d) optionally providing a protective coating on top of the cured ink composition.

[0005] There is a need for a production system and

method that enables a more cost efficient production of individually designed tiles.

BRIEF DESCRIPTION OF THE INVENTION

[0006] It is an object of the invention to provide a more cost efficient method/system for the production of individualized tiles, which is enabled by means of a system/method as defined in the appended claims.

[0007] Thanks to the invention there is facilitated the use of standard produced tiles as a basic raw material for the production of individualized tiles, which drastically increases flexibility, and lowers the cost, for productions of such individualized tiles.

BRIEF DESCRIPTION OF THE FIGURES

[0008] In the following the invention will be described with reference to the appended figures, wherein:

Fig. 1 shows a schematic view of a room arranged with a wall portion in accordance with the invention,

Fig. 2 shows a picture used as the original for producing tiled wall portion in accordance with the invention,

Fig. 3 schematically shows the steps for transforming the original picture into a production template,

Fig. 4 schematically shows a first preparation step for tiles in accordance with the invention, and,

Fig. 5 schematically shows the production line for a tile arrangement in accordance with the invention.

DETAILED DESCRIPTION

[0009] In Fig. 1 there is shown in a schematic manner, a room having a wall 1, wherein a part thereof has been arranged with a tile arrangement 2 in accordance with the invention. The tile arrangement 2 comprises a number of tiles 3 (or clinkers, slabs or the like), in this example twelve tiles, which together present a picture 20, which may be individually chosen. Accordingly each tile, e.g. 31 and 32, present a fraction of a total picture 20' and by positioning the tiles in a predetermined manner on the wall 1 they will present a totality picture 20 in accordance with that picture 20' chosen. As is evident also the rest of the wall 1 may of course be arranged with tiles, e.g. by means of using standard tiles in a traditional manner. Furthermore it is understood that the whole of the wall 1 may be used to present a picture 20, or a plurality of pictures and further that the presentation of the picture may be achieved by the use of tiles of varying size. Furthermore it is of course evident that the picture, or indeed pictures, may be applied also to either one or all of wall, ceiling and floor.

[0010] In Fig. 2 there is shown an original picture 20' intended for the use to present the picture that shall be produced by means of tiles 3 on a wall 1. The picture 20' may be a handmade painting, of any kind, or indeed any kind of picture that is positioned on a substrate (not shown) that is possible to handle for production of a production template.

A very convenient format for the original picture 20' is a digital photo, which preferably should be of high quality to enable high quality enlargement and reproduction.

[0011] In Fig. 3 there is shown a schematic view of a production facility 4,5,6,7 for production of a production template 20". In Fig. 3 there is presented an embodiment wherein the original desired picture 20' is in the form of a picture on a web shaped substrate, e.g. a sheet of paper or a sheet of cloth. The substrate 20' is then introduced into a scanner 4 which transforms the picture 20' into a digital representation and transmits the picture to a computer device 5. The computer device 5 has a software enabling production of a production template 20". As indicated the computer 5 may preferably be connected to the internet 7 and/or to database 6 (which indeed may be stored internally on the computer 5). By means of the connection to the database 6 (or internet 7) the person at the computer device 5 may chose a desired basic tile 3 from a large variety of available tiles registered in the database 6 and/or identified on the internet 7. Furthermore the person at the computer device 5 has knowledge of (preferably stored on the computer device) all needed input from the customer who has ordered the tile arrangement 2, e.g. size of the area intended for the picture 2, preferences regarding tile quality, preferences regarding size of each tile, preferences regarding basic color of the tiles, etc, etc. Based on all input the person at the computer device 5 will make an appropriate choice of a tile 3 for production of the template 20" and the computer device 5 will by means of the specific software produce a production template 20' that includes each one 31, 32, etc of all the tiles 3 that are needed to form the picture 20 of the tile arrangement 2.

[0012] In Fig 4 it is shown a pre treatment unit 8. The tiles 3, in a traditional manner, comprises backside 34, within appropriate surface for attachment thereof, an intermediate layer 36 forming the core of the tile, and a top surface 35 that is intended for exposure. The top surface 35 often comprises a sintered/glazed layer of a material that is not appropriate for application of any printed matter. As a consequence prior to applying any desired decoration on to the tiles 3 they are treated in the pre treatment device 4 to transform the top surface 35 into a modified surface 35' that is appropriate for application of printing material. Many different kinds of treatments may be used for modification of the surface 35. The most preferred treatment in accordance with the invention is the use of pickling to chemically transform the surface 35 into a printable top surface 35'.

[0013] Regarding the pre treatment of the tiles 3 the main purpose of that is to provide a surface that is ap-

propriate for the transfer of the printing onto it, and that is sustainable. There are many different methods that can be used in order to achieve an appropriate surface 35'. A preferred embodiment includes the use of pickling, i.e. using a pickling acid. The pickling acid is placed onto the top surfaces 35 of the tile, which preferably is performed by means of spraying it onto the surface 35. Alternatively the tiles 3 may be dipped into a vessel (positioned within the pretreatment device 8) containing the pickling acid. Varying kinds of pickling acids are feasible, which may include supplementing contents, depending on what kind of basic material and top surface there of the tile 3 to be treated. Preferably a mixture of at least two acids is used from the group hydrogen fluoride acid, nitric acid, sulphuric acid, phosphoric acid and hydrochloric acid. Tests have shown that preferably nitric acid is the main ingredient in the mixture, and then preferably containing at least 50% nitric acid. Once applied the pickling acid is allowed to be in contact with the surfaces 35 for a sufficient time (preferably between 1 and 24, more preferred between about 2-6 hours) to modify the surfaces 35 to a printable surfaces 35'. Also the time in contact with the surfaces will of course vary depending on the properties of the surfaces 35. Once a desired roughness/surface property of the tile 3 has been achieved, the tile 3 is cleaned, e.g. by means of flushing water onto it, preferably tempered water, between 20-70 degrees C°, often more preferred between 30-50 degrees C°. Thereafter the top surfaces 35' of the tile 3 are protected, e.g. by means of wrapping it into a protective cover and moved to the facility having the printing device 9.

[0014] Prior to introducing the tiles 3 into the printing device 9 the cover is first removed and there after the top surface 35' is cleaned, in order to remove possible stains and/or particles. A preferred cleaning means is based on some kind of alcohol, as active cleaning substance.

[0015] According to an alternative method the surfaces may be roughened by means of an abrasive blasting. Also other kind of an abrasive method may be used to obtain the desire surfaces 35'.

[0016] Once the tiles 3 have been prepared for printing they will be introduced into a production unit 9 wherein printing is performed onto the top layer 35' of each tile, by means of using the production template 20" and traditional printing technology, e.g. using a flatbed printer. As a consequence each one of the needed tiles, 31, 32, etc. will be produced to representing a specific fraction of said picture 20, by means of the production unit 9, i.e. to reproduce each and every fraction of the total picture 20 that is intended to be applied to the wall 1. Prior to the delivery of the tiles, a protective layer (not shown) is supplied on top of the printed picture of each tile 3, e.g. by means of applying varnish or any appropriate kind of seal, which may vary depending on the environment where the tile arrangement 2 is going to be applied.

[0017] In Fig.5 it is shown that one single tile at the time passes the production unit 9 so as to receive a frac-

tion of the total picture 20. It may of course be possible to feed the production unit 9 with a matrix containing more than one tile, e.g. containing one row tiles (e.g. 3 tiles) or a multiple rows, e.g. twelve tiles as shown in Fig.1, and to either print a sub-fraction of the total picture 20 on the matrix, or the whole picture 20 at once, meaning that each tile 31, 32 receives a fraction of the total picture 20. The printable width w' of the production unit will then have to be at least corresponding to the width w of the picture 20.

[0018] A major advantage with the production method/system in accordance with the invention is that the cost for an individualized tile picture 2 may be drastically reduced, compared to known methods. A further very important advantage is that it is easily feasible to reproduce one or more tiles 3, a later stage (e.g. due to damage) since the production template 20" may be easily stored for a very long time, implying that reproduction will be possible at relatively low cost.

[0019] Regarding the printing onto the surfaces 35 of the tile this may be achieved by the use of a flatbed UV (ultra violets) inkjet printer, e.g. a Durst, RBS Rigid Board Set, or Durst RBS30DM Rigid Premium Board Set. This technology is based on a digital inkjet concept, wherein the printing ink reacts/hardens in when exposed to ultra violet light. Preferably the ink should be free from VOC (volatile organic compounds).

[0020] Regarding the after treatment, i.e. treatment after removing the tiles 31, 32 from the printing device 9, they 3 are firstly properly cleaned, preferably by means of spraying an appropriate cleaner onto the printed surface 35', e.g. a silicon remover. There after the tiles 31, 32 are applied with a protective surface on top of the printed top surfaces 35'. The preferred method of applying a protective layer is by means of spray painting a transparent durable layer, e.g. an appropriate transparent varnish. Preferably the protective layer is applied in multiple layers. There after the protective layer is hardened, e.g. by resting in room temperature for a period of time, or at elevated temperature if a shorter time period is desired. Alternatively, powder varnish may be used, wherein the protective layer is obtained by means of melting the powder at elevated temperature (e.g. in an oven) A further alternative embodiment to achieve the protective layer is the use of a transparent film, which either is self-adhesive or is made adhesive by a applying high temperature (hot melting).

[0021] The invention is not limited by what has been described above, but may be varied within the scope of the appended claims. For instance it is well known by the skilled person that many different kind of seals may be used, e.g. also by the use of sintering a seal on to the tiles 3. Furthermore it is evident that the flexibility of the production method enables a large variety regarding many of the parameters, e.g. enabling use of differently sized and/or colored, basic tiles 3 for production of the picture 2. Moreover it is evident that the method/system according to the invention is not limited to the use of tiles

but may also be used together with any similar kind of basic building material, e.g. clinker, stone plates, etc.

5 Claims

1. A method of production of a tile arrangement, comprising the steps of;

- 10 - choosing a picture (20') for a tile arrangement (2),
- arranging for having said picture (20') in digital form on a computer device (5),
- 15 - choosing a tile (3) to be used for the tile arrangement (2),
- using software on said computer device (5), for producing a production template (20") enabling transfer of said picture (20') onto a desired number of the said tiles (3),
- 20 - using a production unit (9) for transfer of said production template (20") onto each one of said tiles (3),

characterized by chemically treating a top surface (35) of said tiles (3) in the form of pickling by means of a pickling acid, thereafter said picture (20') is transferred directly onto each one of said tiles (3) by means of a production unit (9) using a flatbed UV inkjet printer.

2. A method according to claim 1, **characterized in that** said pickling acid is a mixture of at least two acids from the group hydrogen fluoride acid, nitric acid, sulphuric acid, phosphoric acid and hydrochloric acid.

3. A method according to claim 1, **characterized in that** said tiles (3) are chosen from a ready to use, standard kind of tiles.

4. A method according to claim 2, **characterized in that** said mixture preferably contains at least 50% nitric acid.

45 5. A method according to claim 1, **characterized in that** said chemical treatment includes steeping

6. A method according to any preceding claim, **characterized in that** said production template (20") is stored on a database (6) arranged to enable reproduction of one or more of said tiles (31, 32) forming said tile arrangement (2).

55 7. A method according to any preceding claim, **characterized by** the use of a UV hardening ink for the printing.

8. A system for production of a tile arrangement com-

prising;

- a computer device (5) having software enabling storage of a picture (20') and production of a production template (20") for a tile arrangement (2),
- means (4) for preparing said picture (20') to be in digital form,
- a data base (6) and/or web connection (7) enabling access on said computer device (5) of needed parameters concerning a desired tile (3) to be used for the tile arrangement (2),
- software and processor means on said computer device (5), arranged to produce a production template (20') wherein said picture (20') is transferred onto a desired number of said tiles (3),
- a production unit (9) arranged to use said production template for transfer of said production template (20") onto each one of said tiles (3),

characterized in that said system further comprises a pre-treatment unit (8) for chemical treatment of a top surface (35) of said tiles in the form of pickling by means of acid and **in that** said production unit (9) includes means using a flatbed UV inkjet printer, arranged to directly transfer said picture (20') to said tiles (3).

9. A system according to claim 8, **characterized by** using tiles (3) chosen from a ready to use, standard kind of tiles.
10. A system according to claim 8, **characterized in that** said chemical treatment includes steeping.
11. A system according to any of claims 8-10 claims, **characterized by** including a database (6) for storage of said production template (20") arranged to enable reproduction of one or more of said tiles (31, 32) forming said tile arrangement (2).

Patentansprüche

1. Verfahren zur Herstellung einer Fliesenanordnung, umfassend die Schritte von :

- Auswählen eines Bildes (20') für eine Fliesenanordnung (2),
- Einrichten, dass das Bild (20') in digitaler Form auf einer Computervorrichtung (5) vorliegt,
- Auswählen einer Fliese (3), die für die Fliesenanordnung (2) verwendet werden soll,
- Verwenden von Software auf der Computervorrichtung (5) zur Herstellung einer Herstellungsvorlage (20"), die einen Transfer des Bildes (20') auf eine gewünschte Anzahl der Flie-

sen (3) ermöglicht,

- Verwenden einer Herstellungseinheit (9) für den Transfer der Herstellungsvorlage (20") auf jede der Fliesen (3),

gekennzeichnet durch chemisches Behandeln einer oberen Fläche (35) der Fliesen (3) in der Form von Beizen mittels einer Beizsäure, wobei das Bild (20') danach direkt auf jede der Fliesen (3) transferiert wird, mittels einer Herstellungseinheit (9), die einen Flachbett-UV-Tintenstrahldrucker verwendet.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Beizsäure eine Mischung von mindestens zwei Säuren aus der Gruppe von Flusssäure, Salpetersäure, Schwefelsäure, Phosphorsäure und Salzsäure ist.
3. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Fliesen (3) aus gebrauchsfertigen Fliesen einer Standardsorte ausgewählt sind.
4. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, dass** die Mischung bevorzugt mindestens 50% Salpetersäure enthält.
5. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die chemische Behandlung Einweichen einschließt.
6. Verfahren gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Herstellungsvorlage (20") in einer Datenbank (6) gespeichert ist, die eingerichtet ist, eine Reproduktion von einer oder mehreren der Fliesen (31, 32) zu ermöglichen, die die Fliesenanordnung (2) bilden.
7. Verfahren gemäß einem der vorstehenden Ansprüche, **gekennzeichnet durch** die Verwendung einer UV-härtenden Tinte für das Drucken.
8. System zur Herstellung einer Fliesenanordnung umfassend :

- eine Computervorrichtung (5), die Software aufweist, die Speicherung eines Bildes (20') und Herstellung der Herstellungsvorlage (20") für eine Fliesenanordnung (2) ermöglicht,
- Mittel (4), um das Bild (20') vorzubereiten, in digitaler Form vorzuliegen,
- eine Datenbank (6) und/oder Netzverbindung (7), die Zugriff auf der Computervorrichtung (5) auf benötigte Parameter ermöglichen, die eine gewünschte Fliese (3) betreffen, die für die Fliesenanordnung (2) verwendet werden soll,
- Software und Prozessormittel auf der Computervorrichtung (5), die eingerichtet sind, eine Herstellungsvorlage (20') herzustellen, wobei

das Bild (20') auf eine gewünschte Anzahl der Fliesen (3) transferiert wird,
 - eine Herstellungseinheit (9), die eingerichtet ist, die Herstellungsvorlage für den Transfer der Herstellungsvorlage (20") auf jede der Fliesen (3) zu verwenden, **dadurch gekennzeichnet, dass** das System weiterhin eine Vorbehandlungseinheit (8) zur chemischen Behandlung einer oberen Fläche (35) der Fliesen in der Form von Beizen mittels Säure umfasst und dadurch, dass die Herstellungseinheit (9) Mittel einschließt, die einen Flachbett-UV-Tintenstrahldrucker verwenden, eingerichtet, das Bild (20') direkt zu den Fliesen (3) zu transferieren.

9. System gemäß Anspruch 8, **gekennzeichnet durch** Verwenden von Fliesen (3) ausgewählt aus gebrauchsfertigen Fliesen einer Standardsorte.
10. System gemäß Anspruch 8, **dadurch gekennzeichnet, dass** die chemische Behandlung Einweichen einschließt.
11. System gemäß einem der Ansprüche 8-10 Ansprüche, **gekennzeichnet durch** Einschließen einer Datenbank (6) zur Speicherung der Herstellungsvorlage (20"), die eingerichtet ist, um Reproduktion von einer oder mehreren der Fliesen (31, 32) zu ermöglichen, die die Fliesenanordnung (2) bilden.

Revendications

1. Un procédé de production d'un agencement de carreaux, comprenant les étapes consistant à :
- choisir une image (20') pour un agencement de carreaux (2),
 - agir de façon à avoir ladite image (20') sous forme numérique dans un dispositif informatique (5),
 - choisir un carreau (3) à utiliser pour l'agencement de carreaux (2),
 - utiliser un logiciel sur ledit dispositif informatique (5), pour produire un modèle de production (20") permettant le transfert de ladite image (20') sur un nombre souhaité desdits carreaux (3),
 - utiliser une unité de production (9) pour transférer ledit modèle de production (20") sur chacun desdits carreaux (3),

caractérisé par le fait de traiter chimiquement une surface supérieure (35) desdits carreaux (3) sous forme de décapage au moyen d'un acide de décapage, ladite image (20') étant ensuite transférée directement sur chacun desdits carreaux (3) au moyen d'une unité de production (9) utilisant une imprimante à jet d'encre UV à plat.

2. Un procédé selon la revendication 1, **caractérisé en ce que** ledit acide de décapage est un mélange d'au moins deux acides du groupe de l'acide au fluorure d'hydrogène, de l'acide nitrique, de l'acide sulfurique, de l'acide phosphorique et de l'acide chlorhydrique.
3. Un procédé selon la revendication 1, **caractérisé en ce que** lesdits carreaux (3) sont choisis parmi un type de carreaux standard, prêt à l'emploi.
4. Un procédé selon la revendication 2, **caractérisé en ce que** ledit mélange contient de préférence au moins 50% d'acide nitrique.
5. Un procédé selon la revendication 1, **caractérisé en ce que** ledit traitement chimique comprend un trempe.
6. Un procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit modèle de production (20") est stocké sur une base de données (6) agencée pour permettre la reproduction d'un ou plusieurs desdits carreaux (31, 32) formant ledit agencement de carreaux (2).
7. Un procédé selon l'une quelconque des revendications précédentes, **caractérisé par** l'utilisation, pour l'impression, d'une encre durcissant aux UV.
8. Un système pour la production d'un agencement de carreaux comprenant :

- un dispositif informatique (5) ayant un logiciel permettant le stockage d'une image (20') et la production d'un modèle de production (20") pour un agencement de carreaux (2),
- des moyens (4) pour préparer ladite image (20') afin qu'elle soit sous forme numérique,
- une base de données (6) et / ou une connexion Web (7) permettant l'accès sur ledit dispositif informatique (5) à des paramètres nécessaires concernant un carreau souhaité (3) à utiliser pour l'agencement de carreaux (2),
- des moyens formant logiciel et processeur sur ledit dispositif informatique (5), agencés pour produire un modèle de production (20'), ladite image (20') étant transférée sur un nombre souhaité desdits carreaux (3),
- une unité de production (9) agencée pour utiliser ledit modèle de production pour le transfert dudit modèle de production (20") sur chacun desdits carreaux (3),

caractérisé en ce que ledit système comprend en outre une unité de prétraitement (8) pour le traitement chimique d'une surface supérieure (35) desdits carreaux sous la forme d'un décapage au moyen

d'un acide et **en ce que** ladite unité de production (9) comprend des moyens utilisant une imprimante à jet d'encre UV à plat, agencée pour transférer directement ladite image (20') sur lesdits carreaux (3).

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9. Un système selon la revendication 8, **caractérisé par** l'utilisation de carreaux (3) choisis parmi un type de carreaux standard prêt à l'emploi.

10. Un système selon la revendication 8, **caractérisé en ce que** ledit traitement chimique comprend un trempage.

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11. Un système selon l'une quelconque des revendications 8 à 10, **caractérisé en ce qu'**il comprend une base de données (6) pour stocker ledit modèle de production (20") agencé pour permettre la reproduction d'une ou plusieurs desdits carreaux (31, 32) formant ledit agencement de carreaux (2).

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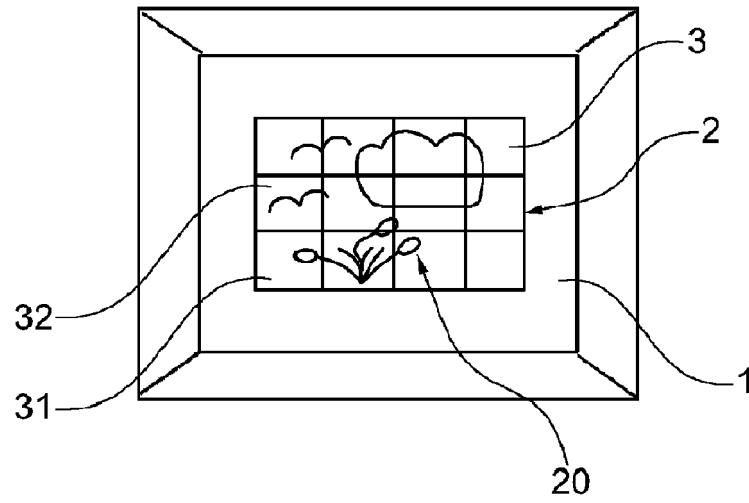


Fig. 1

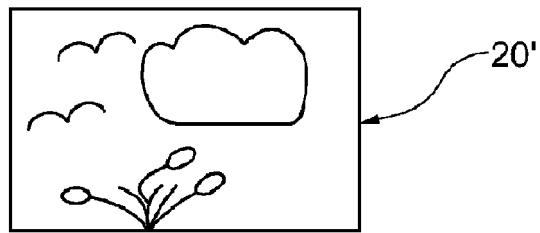


Fig. 2

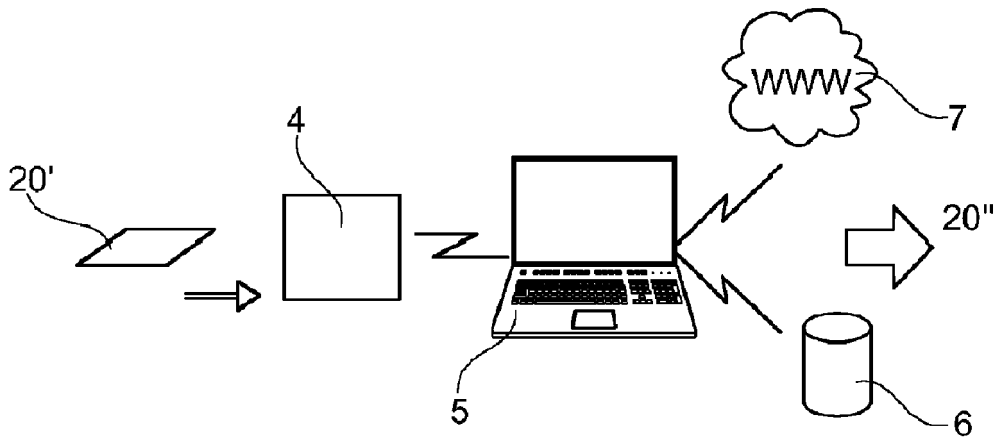


Fig. 3

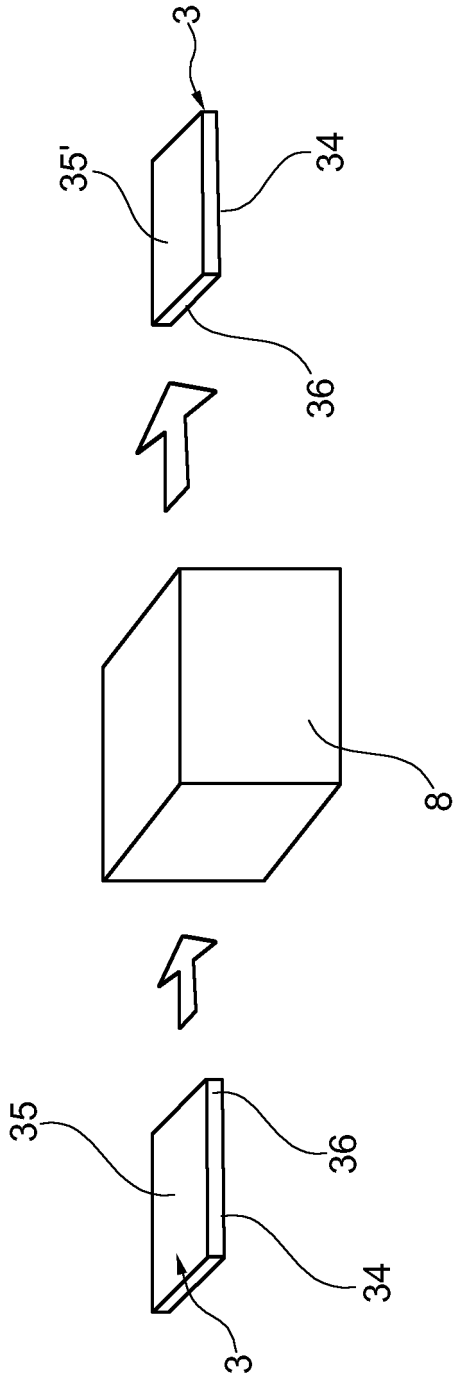


Fig. 4

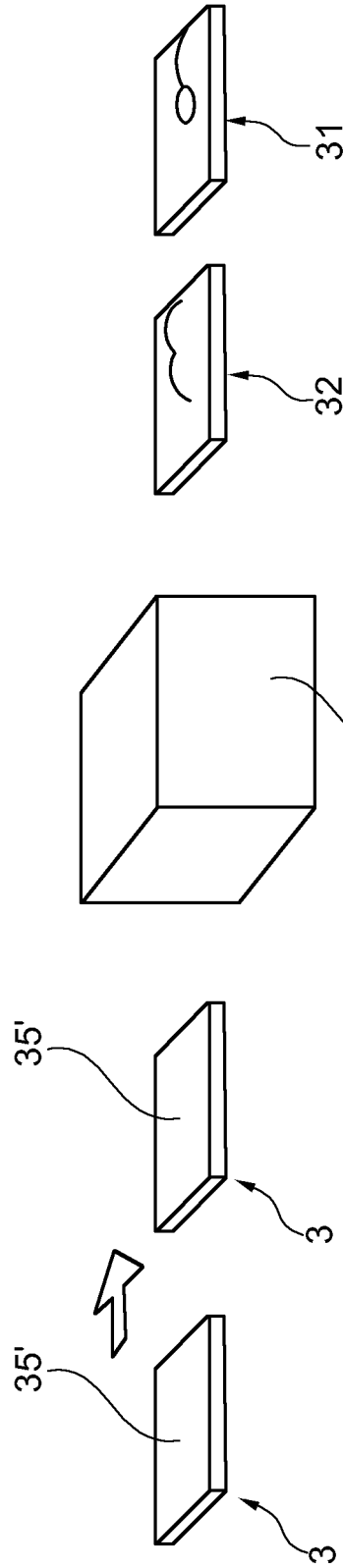


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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