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(71) Applicants:
- **Hesselberg UK Limited**
  Tunstall, Richmond DL10 7QZ (GB)
- **Barker, Rodney Edward**
  Tunstall, Richmond DL10 7QZ (GB)

(72) Inventor: **Barker, Rodney Edward**
Tunstall Richmond DL10 7QZ (GB)

(74) Representative: **McLean, Robert Andreas et al**
25 The Square,
Martlesham Heath
Ipswich IP5 3SL (GB)

(54) Method and apparatus for producing a decorative surface

(57) The invention relates to a method and apparatus for producing a decorative surface in which particles (4) are embedded in a substrate (2) leaving a surface (6) of the particles (4) exposed. The method makes use of a load member (12) which includes load sites (14) arranged in a predetermined pattern into which particles (4) may be loaded and retained by retaining means (16). The loaded load member (12) is positioned above a layer of fluid substrate (28) and the particles released from the load sites (14) enter into the layer of fluid substrate (28). The substrate is then hardened.

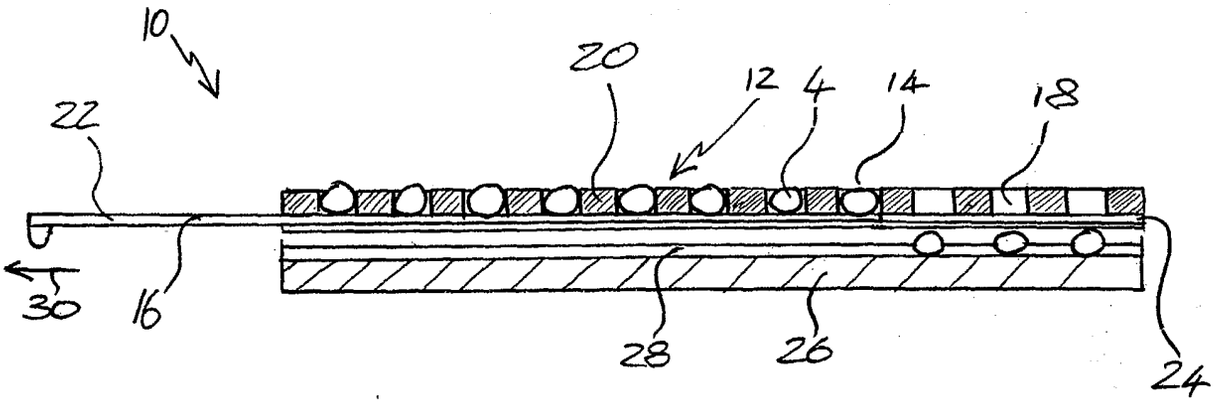

Fig. 3

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Description

[0001] The present invention relates to a method and apparatus for producing a decorative surface, particularly to a decorative surface comprising glass beads embedded in a resin substrate.

[0002] Architects and designers often use unusual or decorative surfaces in buildings for aesthetic reasons or to highlight certain features. Decorative flooring may be used, for example, to define areas such as pathways or seating areas and must be hard wearing as well as decorative. Decorative floors have been created in the past using glass beads embedded in resin with a top surface of the beads protruding from the resin to produce the desired aesthetic effect.

[0003] When inserting the beads into a resin care must be taken to avoid the bead rotating after contact with the resin. If rotation occurs the protruding bead surface may be coated in resin and this will alter the appearance of the surface. Typically the glass beads are inserted into the resin by hand, which is a labour intensive and time consuming process. Hand inserting the beads may also result in inconsistent bead density and there is still the possibility that the protruding surface may become coated in resin.

[0004] It is an object of the present invention to provide a more convenient method of producing a decorative surface and apparatus for carrying out said method.

[0005] According to the invention there is provided a method for producing a decorative surface, the method comprising the steps of;

a. providing a load member, said load member comprising retaining means and a plurality of load sites, the load sites being arranged in a predetermined pattern and the retaining means being arranged to releasably retain at least one particle in each load site;
b. loading at least one particle having a first dimension into each of a plurality of said load sites such that the particles are arranged in the predetermined pattern;
c. providing a layer of fluid substrate having a depth less than the first dimension of the particles;
e. arranging the load member above said substrate layer;
f. using the retaining means to release the particles from their respective load sites such that the particle enters said substrate layer leaving at least a portion of said particle protruding from said substrate layer; and
g. hardening said substrate layer.

[0006] The invention also provides apparatus for creating a decorative surface, the apparatus comprising a load member having a plurality of load sites, said load sites being arranged in a predetermined pattern and said apparatus further comprising retaining means and a layer of fluid substrate, wherein:

a. each load site is adapted to accept at least one particle having a first dimension such that particles in the load sites are arranged in the predetermined pattern;
b. the retaining means is arranged to releasably retain at least one particle in each load sites;
c. the layer of fluid substrate has a depth less than the first dimension of the particles and is arranged such that particles released from the load sites by the retaining means enter the layer of fluid substrate leaving at least a portion of said particle protruding from said substrate layer.

[0007] Providing a load member allows particles to be loaded into the load sites so that they are arranged in the predetermined pattern. The particles are retained in the load sites by the retaining means and are then released into the substrate such that the particles form the predetermined pattern in the substrate.

[0008] The load sites can be rapidly loaded as rotation of the particle within the load site during loading will not result in unwanted resin coating of the particles. It is preferred that, when the particles are released from the load member, the particles enter the fluid substrate substantially perpendicular to a plane of an upper surface of the substrate. It is also preferred that the particles do not rotate upon contact with the substrate.

[0009] The upper surface of the substrate is preferably arranged substantially perpendicular to gravitational vertical as this substantially prevents the substrate flowing under gravity and also allows the particles released from the load member to fall under gravity into the substrate and enter the substrate substantially perpendicular to the fluid substrate layer. This reduces the manufacturing complexity of the load member and retaining means means, but it should be understood that the particles may be forced from the load member into the substrate by mechanical, electrical or other means.

[0010] It is preferred that the particles are substantially spherical as this eliminates any requirement to orientate the particles correctly within the substrate or load member, however, it should be understood that other shapes could be used to produce different visual effects, for example cubes, ovoids or other shapes. It is also preferred that the particles are substantially translucent, for example they may be made of glass or plastic and the substrate is preferably coloured. These features enable the visual appearance of the decorative surface to be enhanced by a light source placed behind a finished decorative surface which further highlights the surface. Optical fibres or other light sources may optionally be embedded within the substrate for other lighting effects.

[0011] The first dimension of the particles is preferably the smallest dimension of the particle, but an elongate particle having a smallest dimension smaller than the thickness of the substrate layer could be arranged

within the load member such that, upon release and entry into the substrate layer at least a portion of the particle protrudes from the substrate layer. It is preferred that the particles have a first dimension of between 3mm to 15mm and preferably between 7mm to 8mm. It is also preferred that the distance between the load member and the surface of the layer of fluid substrate is less than 20cm and preferably less than 10cm as this reduces the likelihood of distortion of the predetermined pattern as the particles are released from the load member and enter the substrate.

[0012] It is preferred that each of the load sites in the load member is loaded with at least one particle, and preferably exactly one particle before the particles are released into the substrate. This creates an easily repeatable pattern of particles in the load member and subsequently in the substrate that may be accurately reproduced a plurality of times. This may allow a plurality of tiles to be created that are substantially identical. This allows a designer to reliably and quickly create a plurality of predetermined patterns on different area of substrate that may then be combined to create a larger pattern for a display surface.

[0013] The load member may comprise a first plate having apertures therethrough and a second plate slidably mounted underneath. The apertures form the load sites and allow the particles to be arranged in the predetermined pattern.

[0014] The particles are prevented from falling though the apertures by the retaining means, in this case the second plate. When the load sites have been loaded with particles as desired the load member is located above the substrate layer and the second plate moved by sliding substantially parallel with the first plate to release the particles such that the particles fall through the apertures and into the substrate. The first plate preferably has a thickness of between 4mm and 10mm and more preferably between 5mm and 7mm as these dimensions provide suitable restraint for the particles. It should be understood that the load member may be located above the substrate layer before the load sites are loaded and may be permanently affixed in position.

[0015] In a preferred embodiment the load member comprises a plurality of recesses that correspond to the predetermined pattern of the particles and form the load sites. In each recess a conduit is formed and each conduit couples the load site to the suction means. A particle may be retained within each recess by using the suction means to create a region of low pressure between the particle and the load site. The particle may be released by reducing or ceasing the suction caused by the suction means. This allows a greater density of particles per unit area to be applied to the substrate. The recesses may be formed by taking an impression of a preformed decorative surface having the desired predetermined pattern of particles as the protruding portions of the particles will form the required recesses in the mould. The conduits through the mould can then be formed in each recess. It is preferred that the conduits are between 1mm and 3mm in diameter. The suction means may be attached to each conduit individually, or one or more conduits could connect to a plenum chamber such that a plurality of conduits may be coupled to the suction means using a single coupling means.

[0016] It should be understood that a load member including recesses could comprise a slidably mounted retaining means. The load sites could be loaded with particles and the slidable retaining means inserted over the particles. The load member could then be inverted so that the particles were prevented from falling by the retaining means and substantially prevented from lateral movement by the recesses in the mould.

[0017] In the embodiments of load members described above, the apparatus is capable of creating a decorative surface covering an area substantially equal to the area of the load member. This will typically be used for creating a tile, a plurality of which may be used to cover a larger area. However, the load member may comprise a movable belt on which the load sites are arranged. The load sites may be loaded at one location during the travel of the belt and released at a different location as this may permit a continuous strip of decorative surface to be produced. If such a belt load member was coupled with apparatus capable of laying a layer of substrate on a surface a decorative surface could be produced in the desired location.

[0018] The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a view from above of a decorative floor tile formed according to the present method;

Figure 2 shows a view from the side of the tile of Figure 1;

Figure 3 shows a cross section though apparatus according to the present invention; and

Figure 4 shows a cross section through a different apparatus according to the invention.

[0019] Figures 1 and 2 show views from above and from the side respectively of a decorative floor tile 1 produced according to the method. The floor tile comprises a resin substrate 2 in which glass beads 4 are embedded such that a surface 6 of the glass bead protrudes above a surface 8 of the resin substrate 2. The beads are 7mm in diameter and the tile has an area of 1200mm by 1200mm.

[0020] Figure 3 shows a cross section view through apparatus 10 according to the invention. The apparatus 10 comprises a load member 12 which includes load sites 14 and retaining means 16. The load sites 14 are formed by apertures 18 through a first plate 20. The first plate 20 has a thickness of 6mm in this embodiment.

The retaining means in this case comprises a second plate 22 which is slidably mounted in runners 24 below the first plate 20 to retain beads 4 in the load sites 14.

[0021] The load member 12 is arranged above a frame 26 in which a layer of fluid substrate 28 is located. The second plate 22 is located below the first plate 20 and beads 4 are located in the load sites 14. In this figure the second plate 22 is being moved in a removal direction 30 and releasing beads 4. The released beads 4 fall into the fluid substrate layer 28 leaving a surface 6 of the bead 4 exposed.

[0022] Figure 4 shows a cross section through a different embodiment of a load member 112 according to the invention. Features that are the same as in the previous embodiment will be labelled with the same reference numeral. In this case the first plate 120 is a mould taken of an existing decorative surface that has the desired predetermined pattern. The load sites 114 are defined by recesses 115 in the first plate. Each recess 115 includes a conduit 50 which fluidly connects the load site 114 with a plenum chamber 52. The plenum chamber 52 is connected to suction means 54 which may be activated to reduce the pressure in the plenum chamber 52 and therefore in the load sites 114 to retain particles 4 within said load sites 114.

[0023] The suction means 54 is controllable to reduce or cease the suction applied to the plenum chamber 52 to release the beads 4 so that they fall into the layer of fluid substrate 28 below.

[0024] Once the beads 4 are positioned within the fluid substrate layer 28 the substrate is hardened by curing.

[0025] It should be understood that the invention has been described above by way of example only and that modifications in detail may be made without departing from the scope of the invention as defined by the claims.

Claims

1. A method for producing a decorative surface, the method comprising the steps of;

   a. providing a load member (12), said load member (12) comprising retaining means (16) and a plurality of load sites (14), the load sites (14) being arranged in a predetermined pattern and the retaining means (16) being arranged to releasably retain at least one particle (4) in each load site;
   b. loading at least one particle (4) having a first dimension into each of a plurality of said load sites (14) such that the particles (4) are arranged in the predetermined pattern;
   c. providing a layer of fluid substrate (28) having a depth less than the first dimension of the particles;
   e. arranging the load member (12) above said substrate layer;
   f. actuating the retaining means (15) to release the particles (4) from their respective load sites (14) such that each particle (4) enters said substrate layer (28) leaving at least a portion of said particle (4) protruding from said substrate layer (28); and
   g. hardening said substrate layer (28).

2. A method as claimed in claim 1, in which the load member (12) is loaded with particles (4) and then inverted before the particles (4) are released.

3. A method as claimed in claim1 or claim 2, in which the method further comprises the step of ensuring that each load site (14) is loaded with at least one particle (4) .

4. A method as claimed in claim 3, in which it is ensured that each load site (14) is loaded with exactly one particle (4) .

5. A method as claimed in any preceding claim, in which the particles (4) are substantially spherical.

6. A method as claimed in any preceding claim, in which the substrate (28) is hardened by curing.

7. Apparatus (10) for creating a decorative surface, the apparatus comprising a load member (12) having a plurality of load sites (14), said load sites (14) being arranged in a predetermined pattern and said apparatus (10) further comprising retaining means (12) and a layer of fluid substrate (28), wherein:

   a. each load site (14) is adapted to accept at least one particle (4) having a first dimension such that the particles (4) in the load sites (14) are arranged in the predetermined pattern;
   b. the retaining means (12) is arranged to releasably retain at least one particle (4) in each load sites (14);
   c. the layer of fluid substrate (28) has a depth less than the first dimension of the particles (4) and is arranged such that particles (4) released from the load sites (14) by the retaining means (12) enter the layer of fluid substrate (28) leaving at least a portion of said particle (4) protruding from said substrate layer (28).

8. Apparatus as claimed in claim 7, in which the load member (12) comprises a first plate (20) including apertures (18) therethrough to define said load sites (14).

9. Apparatus as claimed in claim 7, in which the load member comprises a first plate (120) including recesses (115) to define said load sites (114).

10. Apparatus as claimed in claim 9, in which the retaining means comprise suction means (54) and each recess (115) includes a conduit (50) that fluidly connects the recess (115) to said suction means (54).

11. Apparatus as claimed in claim 8 or claim 9, in which the retaining means comprises a second plate (16) slidably mounted to said first plate (20).

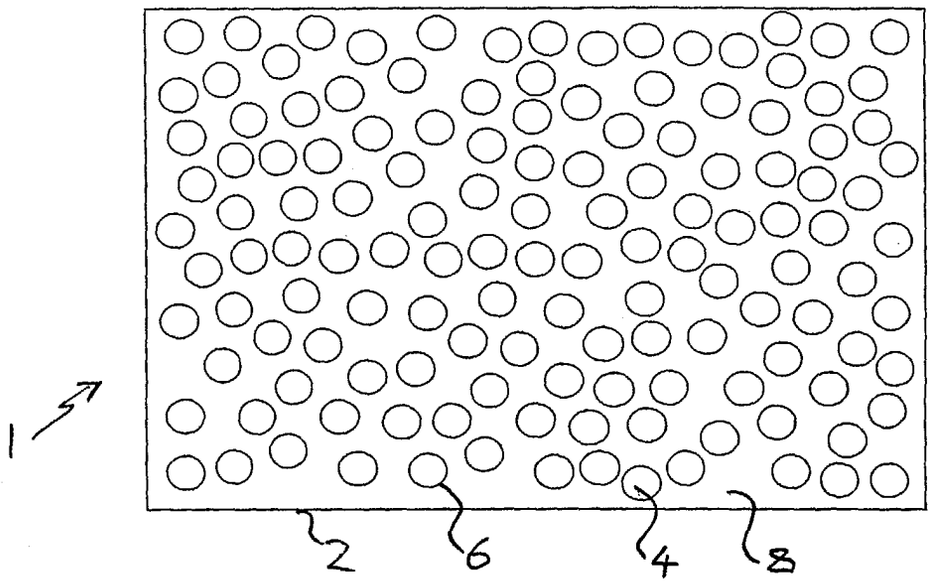

Fig. 1

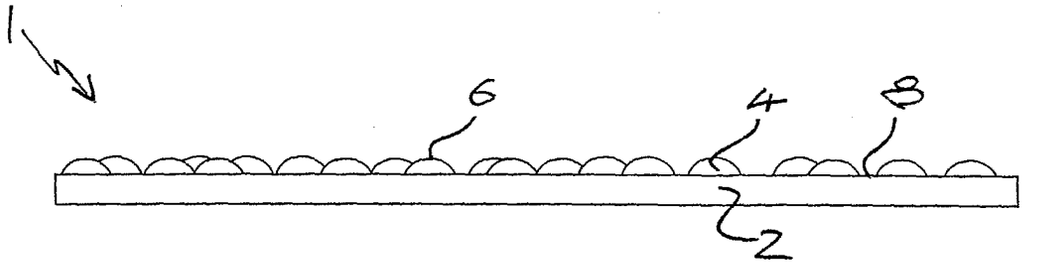

Fig. 2

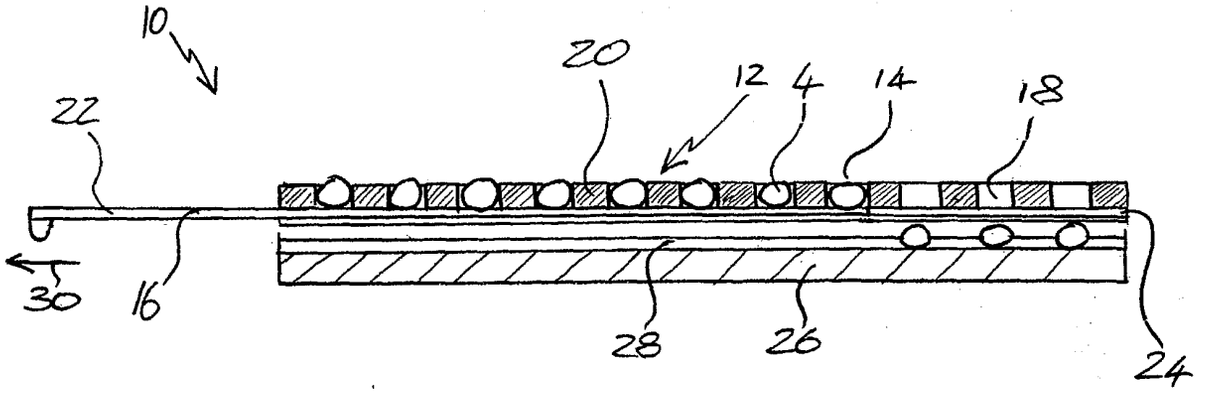

Fig. 3

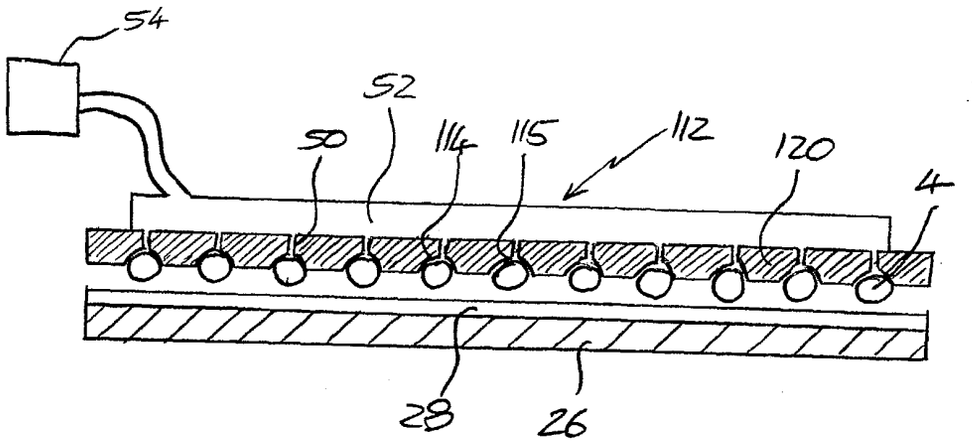

Fig. 4