Claims

1. An additive manufacturing device, comprising:

a vessel for containing a material which is polymerisable on exposure to radiation;

a bottom of the vessel including a transparent lower wall;

a build platform having a build surface arranged to have an object formed thereon, the build platform being mounted or mountable for movement upwards from the transparent wall~~relative to the vessel~~; and

a programmable radiation module in contact with a surface of the transparent lower wall, said radiation module comprising a dynamic mask component and a radiation source;

said radiation source ~~an array of individually addressable radiation emitting or transmitting elements, the array being~~ configurable to produce radiation having a predetermined pattern by selective activation of the dynamic mask component ~~elements of the array;~~,

wherein the programmable radiation module is positioned or positionable to irradiate uncured material adjacent the build surface, and the transparent wall such that, on curing, the layer is in contact with the transparent wall and the build surface to form a layer of the object,

wherein the radiation source includes an array of individually addressable elements~~, or adjacent a previously cured structure on the build surface, with the predetermined pattern without magnification~~.

~~2. An additive manufacturing device according to claim 1, wherein the vessel has a transparent lower wall towards which the build surface faces, and wherein the radiation module is positioned to irradiate upwardly through the transparent lower wall.~~

~~3.~~2. An additive manufacturing device according to claim 1 ~~or claim 2~~, wherein the radiation module is attached to or is integral with the vessel.

~~4.~~3. An additive manufacturing device according to ~~any one of~~ claims ~~1~~ or~~to~~ ~~2~~3, wherein the ~~radiation module comprises a~~ dynamic mask component includes~~containing the~~ an array of electronically addressable elements~~array, and a radiation source for irradiating through the dynamic mask component~~.

~~5.~~4. An additive manufacturing device according any one of~~to~~ claims 1 to 3~~4~~, wherein the dynamic mask component is attached to or is integral with the vessel.

~~6.~~5. An additive manufacturing device according to any one of claims 1 to 4 ~~or claim 5~~, wherein the dynamic mask component comprises a liquid crystal display (LCD).

~~7.~~6. An additive manufacturing device according to claim 5~~6~~, wherein the LCD is a monochrome LCD.

~~8.~~7. An additive manufacturing device according to any one of claims 1 to 6~~3~~, wherein the radiation module comprises an LED array or OLED array.

~~9.~~8. An additive manufacturing device according to any one of the preceding claims, wherein the vessel comprises a non-stick layer or polymerization-inhibiting layer as part of the transparent wall~~between the radiation module and the build platform~~.

~~10.~~9. An additive manufacturing device according to claim 8~~9~~, wherein the non-stick layer is formed from a silicone-based material.

~~11.~~10. An additive manufacturing device according to any one of the preceding claims, comprising a pivoting mechanism for allowing relative rotation between the vessel and/or the radiation module on the one hand, and the build platform on the other hand.

~~12.~~11. An additive manufacturing device according to any one of claims 1 to 10, wherein the vessel comprises a curing region adjacent to which the radiation module is positioned or positionable, and a separation region adjacent the curing region, the separation region having a depth different to that of the curing region; and wherein the device comprises a linear translation mechanism for changing the relative positions of the build platform and the radiation module such that the build platform or the radiation module is moveable from the curing region to the separation region.

~~13.~~12. An additive manufacturing method, comprising:

at least partially filling a vessel with a material which is polymerisable on exposure to radiation;

a bottom of the vessel including a transparent lower wall;

providing a programmable radiation module in contact with a surface of the transparent lower wall, said radiation module comprising ~~an array of individually addressable radiation emitting or transmitting elements~~a dynamic mask component and a radiation source;

providing a build platform having a build surface arranged to have an object formed thereon;

positioning the build platform upwards from the transparent wall~~relative to the vessel~~ such that an uncured layer of polymerisable material is defined between the build surface and transparent lower wall~~the programmable radiation module~~; and

irradiating the uncured layer of polymerisable material with radiation having a predetermined pattern, without magnification, by selectively activating elements of the array of the programmable radiation module in order to polymerise the uncured layer with the predetermined pattern, and so;

curing the layer of polymerisable material such that said layer is in contact with the transparent wall and the build surface to form a layer of the object,

wherein the radiation source includes an array of individually addressable elements.

~~14. An additive manufacturing method according to claim 13, wherein the vessel has a transparent lower wall towards which the build surface faces, and wherein the method comprises irradiating the uncured layer upwardly through the transparent lower wall.~~

~~16.~~13. An additive manufacturing method according to claim 12~~3 or claim 14~~, wherein the radiation module is attached to or is integral with the vessel.

~~17.~~14. An additive manufacturing method according to ~~any one of~~ claims 12 or 13~~ to 14~~, wherein the ~~radiation module comprises a~~ dynamic mask component includes~~containing the~~ an array of individually~~electronically~~ addressable elements~~array, and a radiation source for irradiating through the dynamic mask component~~.

~~18.~~15. An additive manufacturing method according to any one of claims 12 to 14~~16~~, wherein the dynamic mask component is attached to or is integral with the vessel.

~~19.~~16. An additive manufacturing method according to claim 14 or 15~~6 or claim 17~~, wherein the dynamic mask component comprises a liquid crystal display (LCD).

~~20.~~17. An additive manufacturing method according to claim 16~~8~~, wherein the LCD is a monochrome LCD.

~~21.~~18. An additive manufacturing method according to any one of claims 12~~3~~ to 17~~5~~, wherein the radiation module comprises an LED array or OLED array.

~~22.~~19. An additive manufacturing method according to any one of the claims 12~~3~~ to 18~~20~~, wherein the vessel comprises a non-stick layer or polymerization-inhibiting layer as part of the transparent wall~~between the radiation module and the build platform~~.

~~23.~~20. An additive manufacturing method according to claim 19~~21~~, wherein the non-stick layer is formed from a silicone-based material.

~~24.~~21. An additive manufacturing method according to any one of claims 12~~3~~ to 20~~2~~, comprising releasing the polymerized layer from a contact surface by pivoting the vessel and/or the radiation module relative to the build platform, or pivoting the build platform relative to the vessel and/or the radiation module~~vice versa~~.

~~25.~~22. An additive manufacturing method according to any one of claims 12~~3~~ to 21~~2~~, comprising releasing the polymerized layer from a contact surface by horizontally translating the vessel and/or the radiation module relative to the build platform, or horizontally translating the build platform relative to the vessel and/or the radiation module~~vice versa~~.